EUROPEAN COMMISSION

Environmental Management System

EMAS
VERIFIED ENVIRONMENTAL MANAGEMENT
BE-BXL-000003

Environmental Statement 2022

2021 Results

Corporate Summary

Foreword

The Commission's *European Green Deal* initiative in 2019 required Member States to commit to significant emissions reductions while underlining the importance of sustainable food supply chains and maintaining biodiversity. Russia's unjustified and unprovoked war against Ukraine forced Member States to seek alternative energy sources while committing to reduce winter energy consumption by 15%.

In this context, the Commission's adoption in April 2022 of a Communication on Greening the Commission, alongside a new HR Strategy, was timely. Its main objective is to implement the ***European Green Deal*** as an organisation, by reducing CO_2 emissions by 60% from 2005 to 2030 (or 38% from 2019). Through applying carbon removals to the remaining emissions in 2030, the Commission seeks carbon neutrality two decades earlier than required from Member States. The actions needed to achieve this have been incorporated into the Commission's Eco Management and Audit Scheme (EMAS).

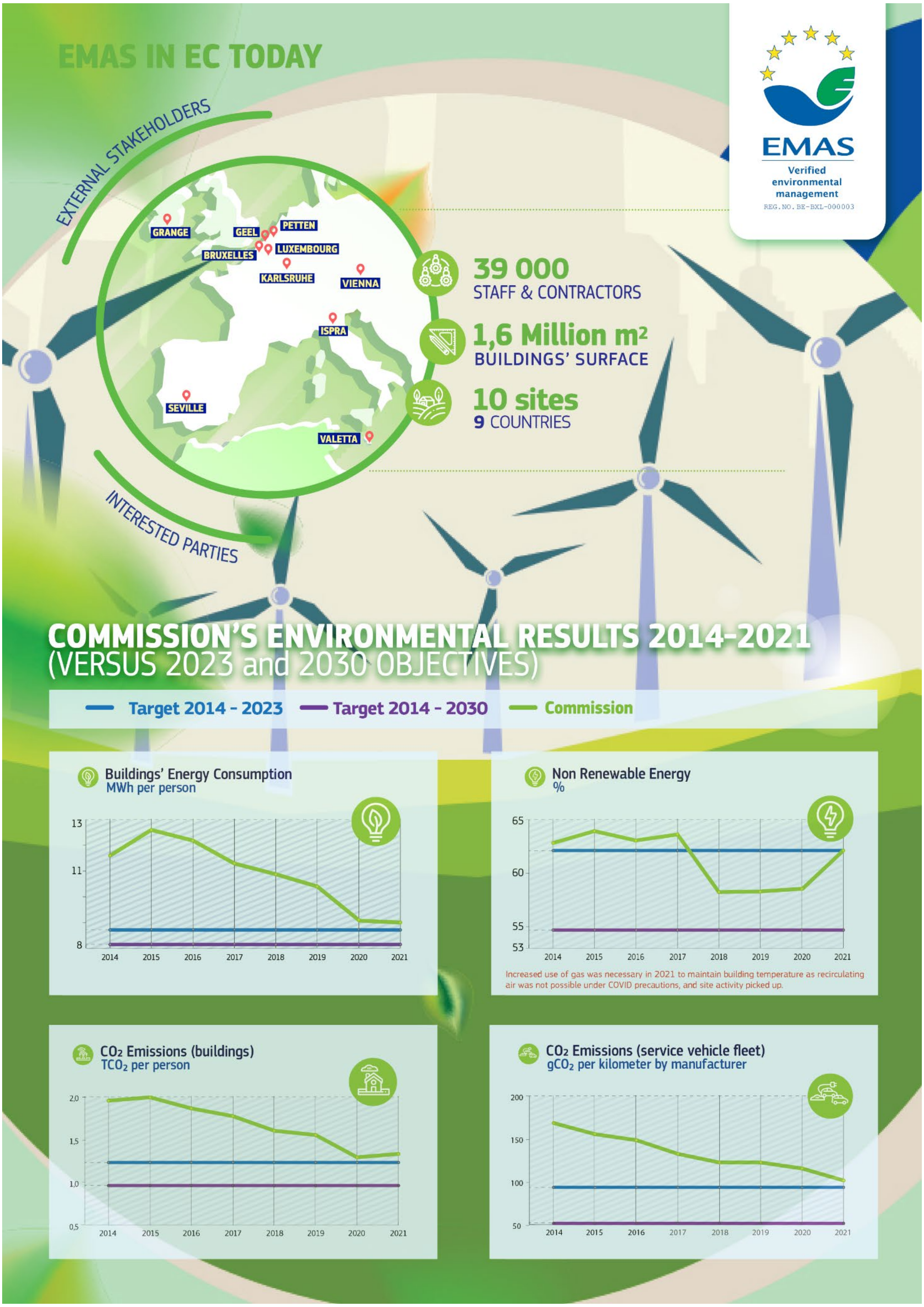
Under EMAS, the Commission publishes its environmental performance results annually in the Environmental Statement. Its commitment to reduce the environmental impact of its everyday activities was established in 2005 when it became the first EU Institution to achieve EMAS registration. Initially limited to Brussels, the scheme now includes its eight largest sites in Europe: Brussels, Luxembourg, Joint Research Centres Geel (Belgium), Petten (The Netherlands), Seville (Spain), Karlsruhe (Germany), and Ispra (Italy), along with Directorate General SANTE at Grange (Ireland). It is gradually being extended to premises of the Commission representations in EU Member States that are shared with the European Parliament's Liaison Offices, and collectively known as the Houses of Europe. Those of Vienna and Valletta were the first to achieve registration.

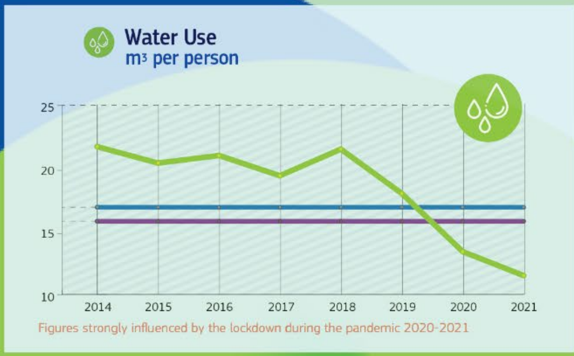
This Corporate Summary of the Environmental Statement includes Commission results up to 2021, aggregated across the eight larger sites. Due in part to the COVID pandemic, by 2021, the Commission had largely exceeded its targets for most core indicators, as was already the case in 2020. While increasing in geographical scope, the system continued to evolve in 2021, with improvements in the reporting such as incorporating emissions from teleworking and from experts' travel.

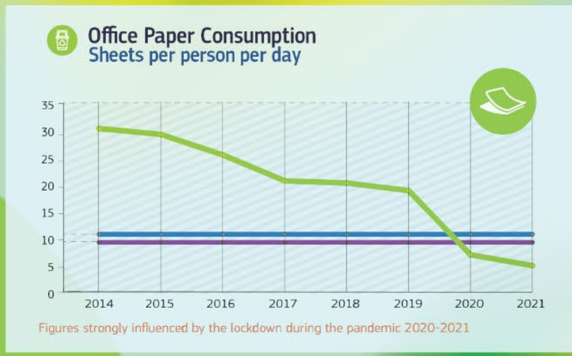
Longer-term targets (to 2030) for the Commission's core EMAS performance parameters were updated. First results show encouraging trends. However, achieving the 2030 targets will require full implementation of the action plan on greening the Commission.

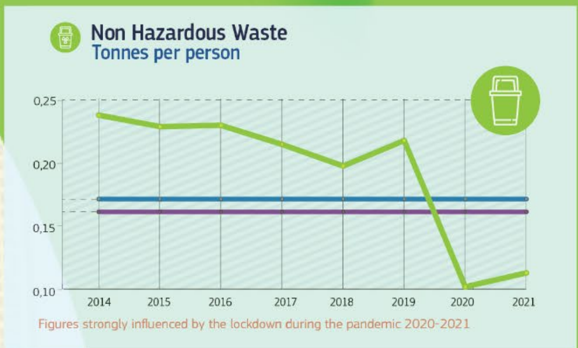
Gertrud Ingestad

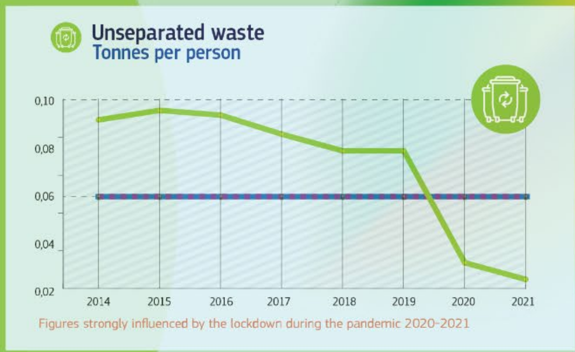
Director-General
President of the EMAS Steering Committee


EMAS IN EC TODAY
EMAS
Verified environmental management
REG.NO. BE-BXL-000003
EXTERNAL STAKEHOLDERS
INTERESTED PARTIES
GRANGE
GEEL
PETTEN
BRUXELLES
LUXEMBOURG
KARLSRUHE
VIENNA
ISPRA
SEVILLE
VALETTA
39 000
STAFF & CONTRACTORS
1,6 Million m²
BUILDINGS' SURFACE
10 sites
9 COUNTRIES
COMMISSION'S ENVIRONMENTAL RESULTS 2014-2021
(VERSUS 2023 and 2030 OBJECTIVES)
Target 2014 - 2023
Target 2014 - 2030
Commission
Buildings' Energy Consumption
MWh per person
13
11
8
2014 2015 2016 2017 2018 2019 2020 2021
Non Renewable Energy
%
65
60
55
53
2014 2015 2016 2017 2018 2019 2020 2021
Increased use of gas was necessary in 2021 to maintain building temperature as recirculating air was not possible under COVID precautions, and site activity picked up.
CO2 Emissions (buildings)
TCO2 per person
2,0
1,5
1,0
0,5
2014 2015 2016 2017 2018 2019 2020 2021
CO2 Emissions (service vehicle fleet)
gCO2 per kilometer by manufacturer
200
150
100
50
2014 2015 2016 2017 2018 2019 2020 2021

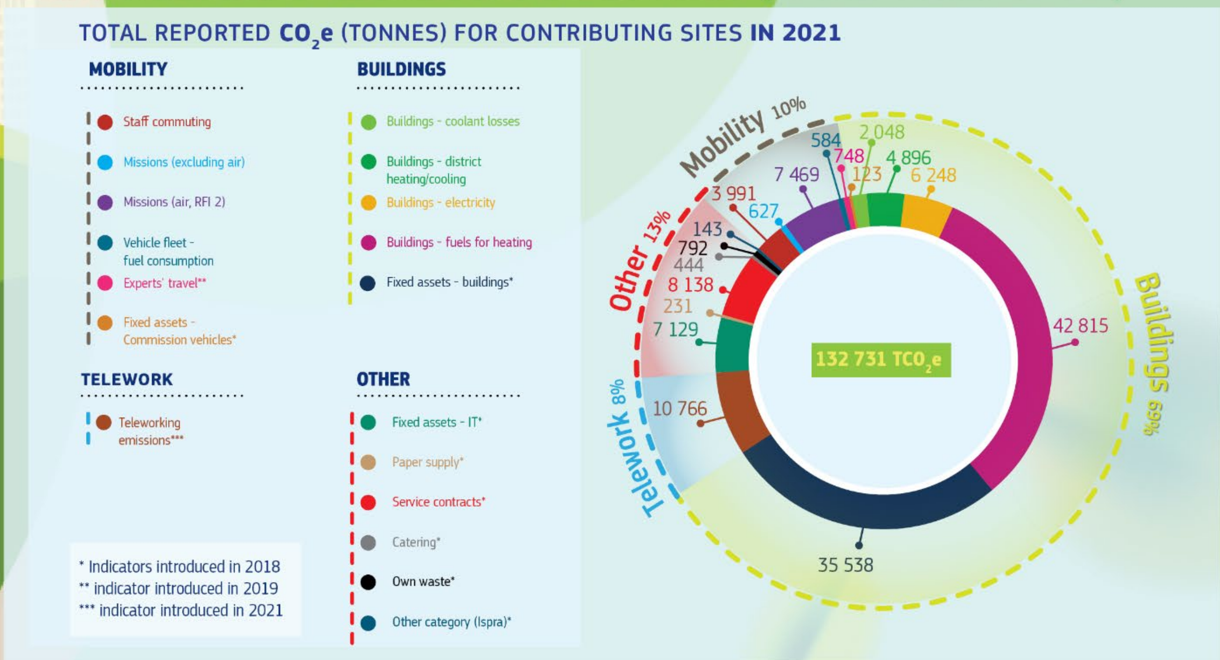








COMMISSION'S CARBON FOOTPRINT (EMAS PERIMETER)



EMAS IS ALSO ABOUT ...

Progress in implementing the EU's Eco Management and Audit Scheme (EMAS)

1) Current system scope: The Commission's EMAS system encompasses its services, including the Executive Agencies located at its eight largest sites in Europe plus, since 2021, some EC Representations in the Member States:

- The main administrative sites of Brussels and Luxembourg
- The five Joint Research Centre sites beyond the headquarters in Brussels: Petten (Netherlands), Geel (Belgium), Seville (Spain), *Karlsruhe (Germany)*([1]), Ispra (Italy)
- DG SANTE at Grange (Ireland)
- Following DG COMM's decision in 2020 to extend EMAS to the Representations in Member States (also known collectively with the European Parliament (EP) Liaison Offices (EPLO), as **Houses of Europe** (HoE)), starting with Valletta and Vienna. EMAS will be implemented jointly at the level of the Houses of Europe. EMAS will gradually extend to more locations starting with those that the Commission or EP owns, with the HoEs of Budapest and Nicosia next to be included

While Brussels, DG SANTE at Grange and JRC Seville host mainly administrative buildings, the remainder also have laboratories, the JRCs in particular have extensive technical infrastructure.

2) Changes in this report: The system has been relatively stable in geographic scope in recent years. Improvements incorporated in 2021 reporting are:

- Consideration of the impact of teleworking emissions in a structured way following an introductory discussion of possible approaches in 2020; and
- Consideration of the travel emissions of experts whose expenses are reimbursed by the Commission
- Consideration of targets to 2023 and 2030 for core parameters, that were formulated prior to data for 2021 becoming available, and which in some cases were already met.

3) Performance against 2023 and 30 targets for EMAS core indicators: The general positive trend observed for most core parameters up to 2019 accelerated in 2020 and in 2021 with final performance sometimes exceeding 2023 targets as shown below, in large part due to staff absence during the COVID pandemic. A clearer picture will emerge in the next few years when the situation of a new hybrid way of working will be stabilized.

([1]) Owing to logistical constraints, JRC Karlsruhe was not subject to a verification audit in 2022

No	Indicator *	Commission performance (%)		Future targets*			
		Target* 2014-20	Performance 2014-21	2014 to 2023	2030	2019 to 2023	2030
1a	Total energy consumption (Bldgs) - MWh/p	-5.2	**-23**	-21	-31	-12	-22
1a	Total energy consumption (Bldgs) - kW/m²	-5.2	**-7**	6,7	-6,6	-2,1	-14
1c	Non renewable energy (bldgs) - %	-3.3	-1.1	1,5	-8,2	8,7	-1,6
1d	Water consumption - m³/p	-5.4	**-47**	-21	-25	-5	-10
1d	Water consumption - L/m²	-4.8	**-36**	3	-3,5	0,8	-5,5
1e	Office paper consumption - Sheet/p/day or T/p	-34	**-84**	-47	-56	-15	-29
2a	CO_2 emissions (bldgs.) - TCO_2/p	-5.1	-32	-33	-49	1	-22
2a	CO_2 emissions (bldgs.) - $kgCO_2/m^2$	-5.2	**-20**	-11	-32	-6,5	-29
2c	CO_2 emissions (vehicles) - gCO2/km (manufacturer spec.)	-14	-40	-43	-67	-20	-54
3a	Non hazardous waste - T/p	-9.7	**-52**	-26	-31	-11	-16
3c	Unseparated waste (%)	-6.0	**-48**	-2,1	-4,0	0,6	-1,3
3c	Unseparated waste (T/p)**		**-74**	-22	-24	-14	-17

Note: *Global Annual Action Plan 2022; **New parameter since 2020

4) The trends in Commission performance (totals for selected core parameters) shown in the graphs below indicate that:

- Compared to 2020, some parameters like heating and non-hazardous waste generation increased. This is for various reasons such as the increase in ventilation as a Covid measure and in generation of furniture and contractors' waste.
- Other parameters continue the decrease started in 2020 mainly due to pandemic and low presence at the office

5) New policy framework On 5th April 2022, the College of Commissioners adopted the new HR Strategy and a Communication on Greening the Commission. The main objective is to reduce CO_2 emissions by at least 60% by 2030 compared to 2005 and to compensate the remaining emissions in 2030 with carbon removals. These new targets are being integrated into the EMAS process.

The COVID pandemic has accelerated a move towards digital working, more rational use of buildings, and led to a large reduction in missions. This year teleworking emissions were added to the carbon footprint.

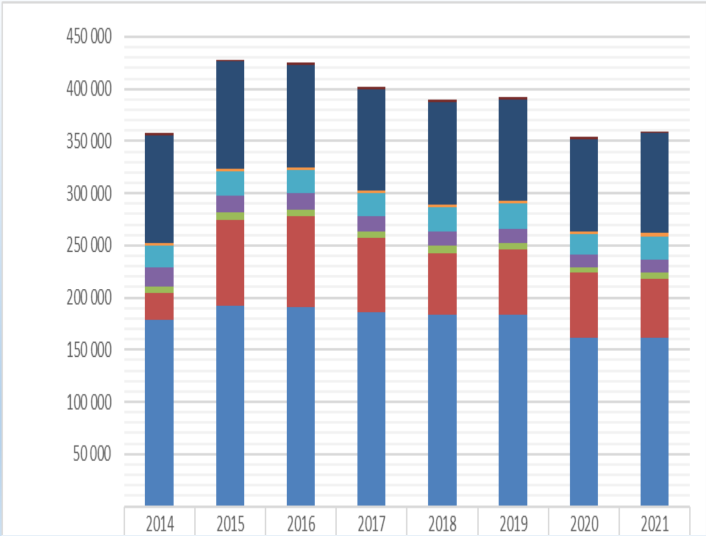
6) Impact of teleworking: The additional emissions associated with teleworking are estimated at 10.800 tonnes CO_2e, including space heating/cooling, electricity, videoconferencing and embodied emissions of IT equipment. Teleworking emissions are estimated at 8% of the total carbon footprint

7) Going forward: High on the agenda for 2022 and beyond will be the need to:

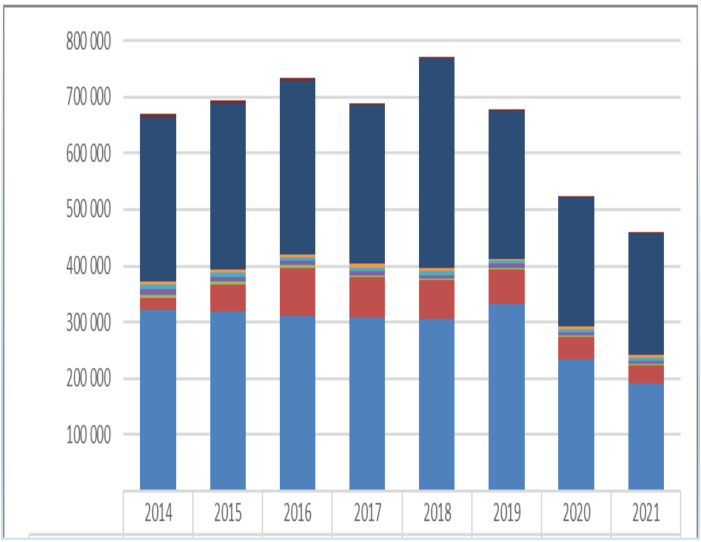
- Contribute to the GHG emissions reduction strategy for 2030 under the Green Deal and the subsequent Greening the Commission Communication
- Continue to integrate EC representations in Member States
- Continue to refine the approach to estimating the impact of teleworking

COMMISSION PERFORMANCE AT THE EMAS SITES, EVOLUTION OF KEY RESOURCE PARAMETERS

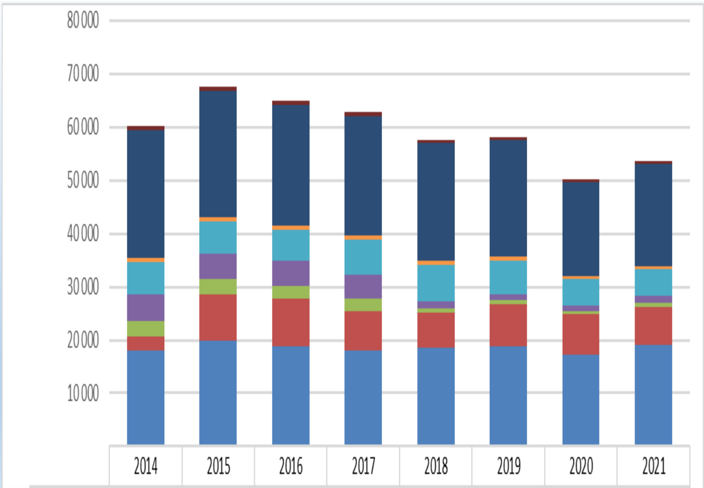
Buildings' energy consumption (MWh)



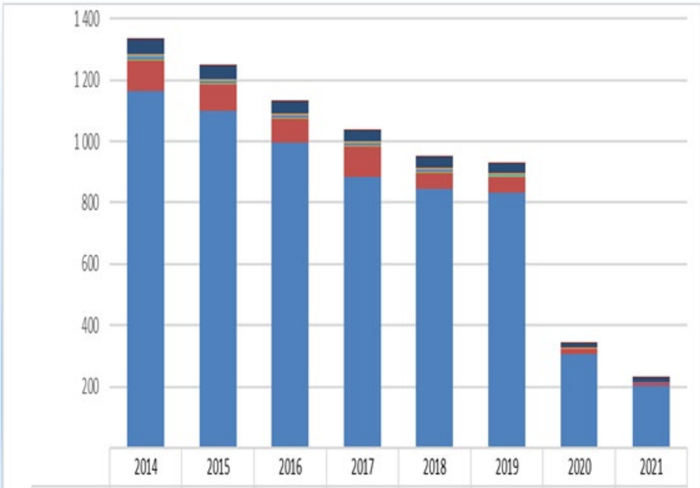
Water use (m3)



Emissions from buildings' energy use (tonnes CO_2e)

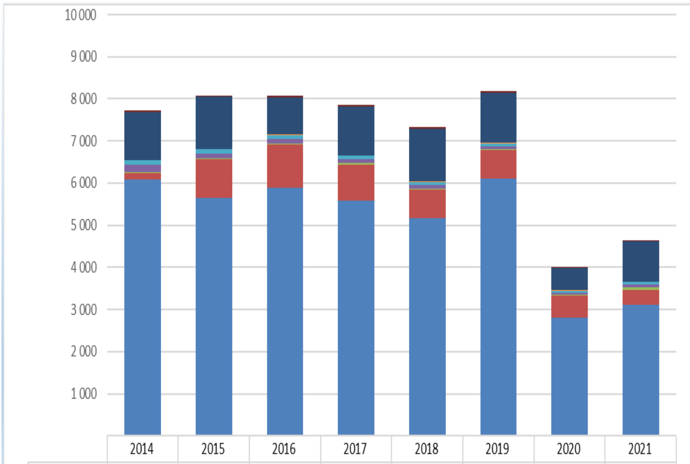


Office paper consumption (tonnes)



Legend

Non-hazardous waste generation (tonnes)



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Verification and validation declaration (insert at end of verification)

AENOR

ENVIRONMENTAL VERIFIER'S DECLARATION ON VERIFICATION AND VALIDATION ACTIVITIES

AENOR INTERNACIONAL, S.A.U., with EMAS environmental verifier registration number ES-V-0001, accredited for the scopes: 99 "Activities of extraterritorial organisations and bodies", 84.1 " Administration of the State and the economic and social policy of the community", 71.2 "Control activities and technical analysis", 72.1 "Research and experimental development in natural sciences and engineering", 72.2 "Research and experimental development on social sciences and humanities", 35.11 "Production of electricity", 35.30 "Steam and air conditioning supply", 36.00 "Water collection, treatment and supply", 37.00 "Sewerage" (NACE Code) declares

to have verified the sites as indicated in the environmental statement of **EUROPEAN COMMISSION**, with registration number BE-BXL-000003

meet all requirements of Regulation (EC) Nº 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community Eco-Management and Audit Scheme (EMAS), amended by Regulation (EU) 2017/1505 and Regulation (EU) 2018/2026.

By signing this declaration, I declare that:

— the verification and validation has been carried out in full compliance with the requirements of Regulation (EC) Nº 1221/2009 amended by Regulation (EU) 2017/1505 and Regulation (EU) 2018/2026,

— the outcome of the verification and validation confirms that there is no evidence of non-compliance with applicable legal requirements relating to the environment,

— the data and information of the environmental statement of the sites reflect a reliable, credible and correct image of all the sites activities, within the scope mentioned in the environmental statement.

This document is not equivalent to EMAS registration. EMAS registration can only be granted by a Competent Body under Regulation (EC) Nº 1221/2009 amended by Regulation (EU) 2017/1505. This document shall not be used as a stand-alone piece of public communication.

Done at Madrid, on December 30, 2022

Signature

Rafael GARCÍA MEIRO
Chief Executive Officer

ANNEXES A TO I ARE THE SITE REPORTS VALIDATED SEPARATELY DURING THE VERIFICATION AUDITS AT EACH SITE, BUT WITH COMMON STRUCTURE AND PAGE NUMBERS AS FOLLOWS:

		Annex A: Brussels	ANNEX B Luxembourg	ANNEX C: JRC Petten	ANNEX D: JRC Geel	ANNEX E: JRC Seville	*ANNEX F: JRC Karlsruhe (2)*	ANNEX G: JRC Ispra	ANNEX H: Sante at Grange	ANNEX I: DG COMM (EC Reps in Member States)
1	Overview of core indicators	A4	B4	C3	D3	E3	*F3*	G4	H4	I9
2	Description of activities, context, stakeholders	A5	B6	C5	D5	E5	*F5*	G5	H5	I8
3	Environmental impact of activities	A8	B9	C10	D12	E8	*F15*	G15	H8	I9
4	More efficient use of natural resources	A9	B9	C11	D14	E9	*F16*	G16	H10	I11
5	Reducing carbon footprint and air emissions	A15	B13	C16	D21	E13	*F22*	G24	H13	I16
6	Improving waste management and sorting	A22	B18	C23	D29	E18	*F29*	G35	H18	I21
7	Promoting biodiversity	A26	B20	C25	D33	E21	*F31*	G41	H19	I23
8	Green public procurement	A26	B20	C26	D36	E22	*F33*	G45	H21	I24
9	Legal compliance and emergency preparedness	A27	B21	C26	D38	E23	*F33*	G47	H22	I25
10	Communication	A29	B23	C26	D40	E24	*F35*	G49	H23	I26
11	Training	A29	B23	C27	D42	E25	*F36*	G52	H24	I27
12	EMAS costs and savings	A29	B24	C28	D43	E26	*F37*	G52	H24	I27
13	Conversion factors	A29	B24	C29	D44	E26	*F37*	G53	H25	I27
14	Summary buildings table (optional)	A30	B25	C29	D44			G54	H26	I28

(2) Although JRC Karlsruhe was not subject to verification audit in 2022, reporting is included to permit follow-up overall Commission trends

1 Introduction and background information

1.1 About this Environmental Statement

The European Commission (EC), implements the Eco-Management and Audit System (EMAS) Regulation ([3]) which requires organisations to publish an Environmental Statement (ES). The EC achieved its first EMAS registration in 2005 which covered part of its activities in Brussels.

The EC has since expanded the scope of its EMAS registration considerably and developped a site based approach. This ES, which reports on 2021 activities, is the basis for the EMAS registration update for the EC's eight main sites in Europe plus the European Commission’s Representations in Member States as listed in Table 1.1 in their order of incorporation into the EC's EMAS registration.

General Remark: it was not possible to perform the external verification audit at the JRC Karlsruhe site in 2022. Therefore the site is not included in the EMAS registration scope for 2022. The data of the site were not verified, neverthless and considering that the site should verify its data in 2023, we have maintained the information in the corporate volume to allow the reader to evaluate the trends of the European Commission as a whole.

Table 1.1 Commission sites included in the EMAS registration

Country	**Commission site**	**For further detail, see Annex**
Belgium	Brussels (EC main administrative centre,with over 40 Directorates and Services and six Executive Agencies*), with buildings located in the Brussels Region and in Flanders. (further detail in Annex A)	A
Luxembourg	Luxembourg (EC second administrative centre)	B
Netherlands	JRC Petten, (near Alkmaar)	C
Belgium	JRC Geel, (east of Antwerp)	D
Spain	JRC Seville	E
Germany	*JRC Karlsruhe***	*F*
Italy	JRC Ispra (near Milan)	G
Ireland	Facility of the Directorate General of Health and Food Safety,	H

([3]) Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC.

	located at Grange, near Trim, County Meath (DG SANTE Grange)	
Malta, Austria	DG COMM's*** EC Representations in Valletta and Vienna	I

Note:

*   The six Executive Agencies manage budgets of the policy instruments developped by their 'parent' Directorates

**   Site not subject to external verification in 2022, therefore not formally part of the EMAS registration for that year

***   DG Communication (DG COMM) manages the Commission's representations in EU Member States,

This ES was produced in two phases:

- **Phase 1**: Separate reports were prepared for each of the eight sites (and DG COMM's representations), as Annexes A to I of this report. The same structure was adopted for reporting at each site; and
- **Phase 2**: The site data was aggregated where possible to produce Commission results which are described in Chapter 2 of this report. Most of the data aggregated for Commission level reporting in this volume is from the eight main site annexes. Data from the EC Representations will be more fully integrated into the corporate summary when it is available for a larger number of sites, to avoid frequent incremental increases in the EMAS perimeter that could lead to a misinterpretation of results.

The remainder of this chapter provides information on EC activities and its environmental management system, as required by the EMAS Regulation.

1.2 What is the European Commission?

The European Commission is the executive arm of the European Union. Alongside the European Parliament and the Council of the European Union, it is one of three main institutions that govern the Union, and by far the largest. The Commission's activities are steered by 27 Commissioners, assisted by over 30 000 civil servants and other staff working in 34 Directorates-General (DGs), 16 services/offices, the Executive Agencies ([4]) and departments all over the world. Each Commissioner takes responsibility for a particular area of policy and heads one or more entities that are generally known as DGs.

The Commission's primary role is to propose and enact legislation, and to act as 'Guardian of the Treaties', which involves responsibility for initiating infringement proceedings at the European Court of Justice against Member States and others whom it considers to be in breach of the EU Treaties and other Community law. The Commission also negotiates international agreements on behalf of the EU in close cooperation with the Council of the European Union.

The Commission's headquarters are in Brussels (Belgium), but it also has offices in Luxembourg, Grange (Ireland), Geel (Belgium), Ispra (Italy), Karlsrhue (Germany), Petten (The Netherlands), Seville (Spain) and many other places, agencies in a number of Member States and representations in all EU countries. On 1st December 2009, the Treaty of Lisbon entered into force giving the Commission the institutional tools needed for the various enlargements and for meeting the challenges of an EU of 27 Member States.

([4]) The link http://ec.europa.eu/about/ds_en.htm provides access to information on the activities of the Commission Directorates, Services, and Agencies,

1.3 Why implement EMAS?

The EC developed EMAS in the 1990s as a tool to improve environmental management across Europe. It was designed first for implementation in industrial sectors and then later modifed so that it could be used for less energy intensive and polluting sectors such as public administration.

Since EMAS was introduced, the International Standards Organisation (ISO) developed ISO 14001, the international standard for environmental management which has been more widely adopted both in Europe and worldwide. EMAS remains however a more rigorous system than ISO 14001, with additional requirements such as:

- A commitment to continual improvement
- An obligation to publish results (Environmental Statement)
- Commitment to demonstrating legal compliance
- Employee involvement; and
- Registration by a public authority after verification by an accredited/licensed verifier.

The latest version of ISO 14001, (ISO14001:2015) incorporated some elements of the EMAS Regulation, but not some important ones such as mandatory reporting. So while the annexes of the EMAS Regulation have been updated to incorporate the ISO 14001:2015 requirements so that it remains attractive for those who also need ISO 14001 certification, especially for commercial reasons, EMAS will still be considered the "premium" environmental management system. The new version of the EMAS Regulation came into force in September 2018 ([5]).

Since 2018, the EMAS Regulation requires that Registered Organisations take into account the EMAS Sector Reference Document (with Best Environmental Practices) for Public Administrations which came into force in late 2017.

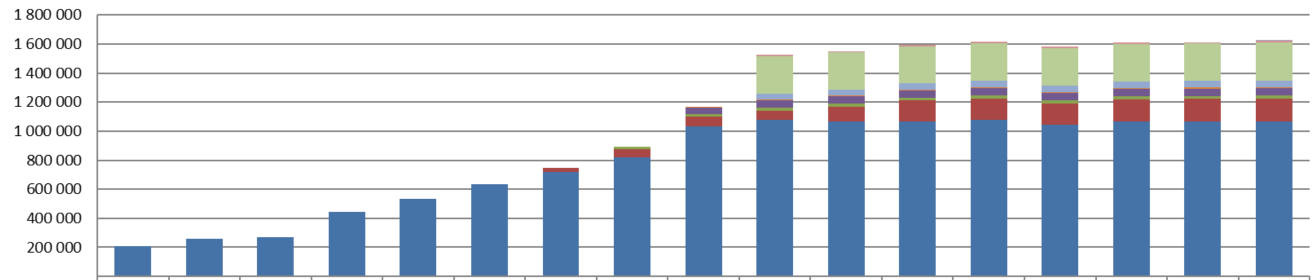
1.4 The development of environmental management through EMAS at the Commission

The Commission's EMAS implementation benefitted from the EMAS III Regulation of 2009, that made it possible to include sites in different countries under one registration. The Commission's EMAS registration which, subject to ongoing administrative procedures by the Brussels EMAS authority, now covers eight sites in seven countries plus two Representations in Valletta and Vienna.

Historically and for operational reasons, the Commission separated the EMAS registration of its staff activities (departments) and buildings. The system's communication aspects can be quickly addressed, enabling all staff across the Commission to be included. However, additional buildings in urban settings must be inspected and certified by the national authorities. This is time consuming, and therefore buildings at larger sites (Brussels and Luxembourg) have been added to EMAS each year according to resources available. Smaller sites, such as those of the JRC have been added entirely. Figure 1.1 shows how the "useful" surface area within the EMAS scope has evolved and reflects progress in incorporating new buildings individually at Brussels and Luxembourg, and new sites.

([5]) Commission Regulation (EU) 2017/1505 of 28 August 2017 amending Annexes 1, II and III to Regulation (EC) No 1221/2009. Registered organisations benefitted from transitional measures until 14 September 2018

Figure 1.1 The evolution of floor space in Commission managed premises ([6]) to be registered under EMAS (m^2)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	206 166	257 557	272 324	446 562	533 285	633 228	748 748	892 986	1 169 923	1 524 645	1 551 764	1 595 672	1 615 247	1 583 823	1 609 727	1 613 427	1 624 416
DG COMM																	1 107
Grange										10 010	10 010	10 010	10 010	10 010	10 010	10 010	10 010
JRC Ispra										256 077	253 428	254 356	259 828	261 713	258 539	258 546	265 519
JRC Karlsruhe										41 735	41 735	43 170	43 170	43 170	43 170	43 170	43 170
JRC Seville									6 497	7 017	7 165	7 165	7 580	7 580	7 698	7 756	8 039
JRC Geel									46 390	48 815	50 538	50 538	50 382	50 499	50 525	50 651	50 650
JRC Petten								19 150	19 150	19 458	21 397	20 502	20 842	19 996	19 996	19 996	19 996
Luxembourg							27 710	53 808	64 703	66 161	100 221	140 479	145 697	148 847	153 172	156 681	156 681
Brussels	206 166	257 557	272 324	446 562	533 285	633 228	721 038	820 028	1 033 183	1 075 372	1 067 270	1 069 453	1 077 739	1 042 008	1 066 617	1 066 617	1 069 244

In 2022 the EC will be seeking re-registration of eight sites plus first registrations of two EC representations ([7]) with altogether 1,63 Million square metres of useful floor space, based on reporting for 2021.

Appendix 1 describes how the Commission implements EMAS, including roles and responsibilities and major system components and requirements.

1.5 Description of activities at the Commission's EMAS sites

Brussels is the main site, the Commission's administrative centre, with a range of buildings dominated by offices but including conference centres, catering facilities, storage depots, print shops, childcare facilities, and sports facilities. The Luxembourg site is of a similar nature, though smaller but also includes a small radiation protection laboratory operated by DG ENER.

The five Joint Research Centre (JRC) sites are all incorporated under EMAS and include:

- JRC Ispra (Italy): a large campus with offices and research facilities, encompassing in addition its own power plant, fire station and water treatment facility, and over 80 heated buildings in total. Most of its nuclear activities (including reactors), are no longer operational. Nuclear plants and storage facilities are under a decommissioning programme that aims to restore "green field" status by 2046.
- JRC Karlsruhe (Germany) a self-contained site located in a research campus on the outskirts edge of Karlsruhe, with ongoing nuclear activities.
- JRC Petten (Netherlands) accommodates experimental equipment notably conducting research on fuel cells.
- JRC Geel (Belgium) contains Van de Graaff and Gelina Nuclear Accelerators, technical installations, and an array of laboratories.

([6]) In Brussels, this includes space occupied by six Executive Agencies. The premises of all Commission sites were registered under EMAS other than Luxembourg where the 2021 registration includes 15 of 18 buildings, and Brussels 61 buildings out of 62.

([7]) This EC Representations share premises with the European Parliament's (EP) liaison offices, the EC share of floor space is as 60% according to the financial agreement between the EP and the EC. This report will focus on the EC's proportion of combined EC and EP operations at each site

- JRC Seville (Spain) has advanced computing infrastructure, From an EMAS perspective, it is more similar in nature to the administrative centres of Brussels and Luxembourg, than to the other JRC sites, with the added complexity of being in fully rented premises.

DG SANTE's site at Grange Ireland is a purpose-built low level wooden clad structure dating from 2002 and set in countryside 45km northwest of Dublin. It accommodates Directorate F, Health and Food Audits and Analysis, but was previously known as the Food and Veterinary Office (FVO). Many staff members are inspectors or auditors and travel frequently, and typically up to half may be away from the office at any one time.
The Commission (DG COMM) agreed to implement EMAS in EC Representations ([8]) starting with Valletta and Vienna and focussing on buildings that they own. The Europe House located in central Valletta, Malta was inaugurated in 2009, and is used for various information activities including seminars, debates, exhibitions, school visits and cultural events, all with the European Union as their focal point. In Vienna, the Haus der Europäischen Union, also inaugurated in 2009 and located in the centre near the Stock Exchange, serves a similar purpose. Table 1.2 presents the NACE ([9]) codes for the Commission's eight EMAS sites and the two EX representations.

Table 1.2 NACE codes and descriptions of activities at the sites

Code	Description	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Seville	*JRC Karlsruhe**	JRC Ispra	DG SANTE at Grange	DG COMM (Vienna and Valletta)
99	Activities of extraterritorial organisations and bodies	✓	✓	✓	✓	✓	✓	✓	✓	✓
84.1	Administration of the State and the economic and social policy of the community	✓	✓						✓	✓
71.2	Testing and technical analysis		✓	✓	✓		✓	✓		
72.1	Research and experimental development in natural sciences and engineering			✓	✓		✓	✓		
72.2	Research and experimental development on social science and humanities					✓				
35.11	Electricity production							✓		
35.30	Steam and air conditioning supply							✓		
36.00	Water collection, treatment and supply							✓		
37.00	Sewerage							✓		

Note * JRC Karlsruhe not subject to verification audit in 2022

Characteristics of the sites in terms of staff and infrastructure are presented below:

([8]) Located in shared premises with European Parliament Liaison Offices (EPLO) that collectively are referred to as the Houses of Europe

([9]) Statistical classification of economic activities in the EU

Table 1.3 Basic characteristics of the Commission EMAS sites 2021

Site	Staff		Buildings for registration		Useful surface (m^2)	
	In EMAS buildings	Total	EMAS	Total	EMAS	Total
Brussels (all EMAS buildings)	30 604	31 440	60	61	1 069 244	1 078 072
Luxembourg	4 939	5 688	15	18	156 681	181 606
JRC Petten	240	240	12	14	19 996	19 996
JRC Geel	263	263	17	17	50 650	50 650
JRC Karlsruhe	*305*	*305*	*4*	*4*	*43 170*	*43 170*
JRC Sevilla	390	390	1	1	8 039	8 039
JRC Ispra	2 475	2 475	366	366	265 519	265 519
Grange	178	178	3	3	10 010	10 010
DG COMM*	36	36	4	4	1 107	1 107
Total	**39 430**	**41 015**	**482**	**488**	**1 624 416**	**1 658 169**

* Includes European Commission staff and space in House of Europe, just the portion related to EC

The Brussels site clearly dominates staff numbers with approximately three times more total staff than the other sites combined. Both Brussels and Luxembourg have buildings and facilities spread out throughout their respective cities and have implemented EMAS gradually. Brussels includes all its occupied buildings ([10]) within EMAS reporting effectively completing a phased implementation that started with its first EMAS registration in 2005 which included eight buildings.

Luxembourg started EMAS registration for its buildings in 2011 and by 2021 EMAS registered buildings accounted for 82% of floor space and accommodating 86% of staff. The EMAS scope for Luxembourg is now complete until new buildings enter Commission's real estate portfolio (new building for OP in 2023 and JMO2 starting from 2024) ([11]) ([12]), each of the JRC research sites and SANTE Grange were incorporated entirely into EMAS. The Vienna and Valletta Houses of Europe were incorporated into EMAS and account for a very small percentage of the total registered area.

1.6 Assessing the environmental impacts of European Union policies

The Commission takes environmental issues into account when drafting and revising EU policies, through the impact assessment system usually managed through the Secretary General. This document does not consider the impact assessment system and its application to the myriad of EU policies ([13]).

The Commission provides financial support for environmental projects via the LIFE programme and others and has policies addressing global warming and in relation to energy and transport. The following pages are among those dedicated to particular policies and important initiatives:

1. Impact assessment system: https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/impact-assessments_en

([10]) Buildings managed by OIB, Executive Agencies in COVE and other buildings, PALM building excluded.

([11]) FISCHER building in 2021 – remaining buildings CPE1 & 2 and Maison d'Europe may be replaced

([12]) JRC Seville occupies part of a commercial building.

([13]) Detailed information on EU policies available on www.europa.eu

2. EU environment policy and evaluation: http://ec.europa.eu/environment/index_en.htm
3. LIFE+ programme: http://ec.europa.eu/environment/life/index.htm
4. Climate policy: https://ec.europa.eu/clima/policies/eu-climate-action_en
5. Energy strategy: https://ec.europa.eu/energy/topics/energy-strategy-and-energy-union_en
6. Transport policy: http://ec.europa.eu/transport/index_en.htm
7. The European Green Deal: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

The impacts assessment system therefore takes into account the environmental impact of EU policies and legislation on Member States. All draft impact assessment reports must be submitted for quality and scrutiny to the Regulatory Scrutiny Board (RSB) ([14]). A positive opinion is in principle needed from the Board for an initiative accompanied by an impact assessment to proceed. RSB opinions ([15]) are alongside the final impact assessment report and proposal at the time of adoption. As the responsibility of the adoption of EU policies is shared with the European Council and European Parliament, the EMAS management system is not the appropriate tool for managing these policies.

The Commission's management system therefore focusses on the Commission's operational activities, i.e. those that EC management can control or influence.

1.7 The Commission's environmental policy

The corporate environmental policy is a pillar of the environmental management system and signed by the Director General of the Human Resources Directorate (DG HR) as chair of the EMAS Steering Committee. It is displayed at the entrance of all the EMAS sites and registered buildings. Updated in 2020, it sets out the Commission's political commitments and objectives to reduce the environmental impacts of its everyday work in accordance with the UN Sustainable Development's Goals:

([14]) http://ec.europa.eu/info/law-making-process/regulatory-scrutiny-board_en
([15]) http://ec.europa.eu/smart-regulation/impact/ia_carried_out/cia_2015_en.htm

EMAS ENVIRONMENTAL POLICY

EMAS
Verified environmental management
BE-BXL-000003

As a contribution to the Green Deal, the European Commission demonstrates its commitment to sustainable development, and sound environmental practice, by ensuring that it reduces the impact of its day-to-day activities in a manner consistent with the policies that it has developed for Europe.

Continuing efforts to improve its environmental performance that started in 1997, in 2005, the Commission achieved its first registration under the Eco Management and Audit Scheme (EMAS). In 2020, the Commission implements EMAS across its eight[1] largest sites in Europe. The Commission will endeavor to continue extending the scope of its registration to the Executive Agencies and to its representations across Europe.

The Commission will continue to protect the environment, including pollution prevention, and in 2019, her President, Ursula von der Leyen committed to make the Commission climate neutral by 2030.

Under EMAS the Commission seeks to continually improve its environmental management system and its environmental performance and therefore reduce the environmental impact of its everyday work in accordance to the UN's Sustainable Development Goals (SDGs) by:

(1) **Using natural resources more efficiently, particularly in relation to energy, water and products such as paper;**

(2) **Continuously reducing our operations' atmospheric emissions (mainly from buildings operation and transport) with the objective of making the Commission climate-neutral by 2030;**

(3) **Improving waste management and sorting, where waste prevention measures have been exhausted, so that waste recycling is optimised and residual waste reduced;**

(4) **Protecting biodiversity;**

(5) **Promoting sustainable and environmentally responsible public procurement procedures for example by introducing appropriate criteria into the tender and contract process, and incorporating life cycle cost considerations where feasible;**

(6) **Ensuring (and demonstrating) compliance with environmental legislation and regulations including in relation to emergency preparedness, thereby reducing pollution risk;**

(7) **Encouraging staff and contractors to embrace sustainable behaviour through improved internal communication, awareness-raising, and training; and**

(8) **Enjoying transparent relations and dialogue with external parties, taking into account and addressing stakeholder expectations;**

(9) **Improving the EMAS system including ensuring consistency with European Union policies.**

Additionally, and though not falling within the EMAS scope, the Commission will ensure through assessments carried out by its services, that in relation to its core business, it will:

(10) **Systematically assess the potential economic, social and environmental impacts of major new policy and legislative initiatives and promote systematic integration of environmental objectives into Community policies;**

(11) **Ensure the effectiveness of environmental legislation and funding in creating environmental benefits;**

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 staff and financial resources in order to ensure that the environmental management system runs efficiently.

This document is effective from the date of signature,

Brussels, 06/10/2020

On Behalf of the EMAS Steering Committee,

Gertrud INGESTAD
President

Some EMAS sites have developed more specific environmental policies.

2 The Commission's environmental performance to 2021

This section presents an overview of the individual results for the eight main sites participating in EMAS, each of which has a separate report in Annexes A to H and where possible aggregated data representing the Commission. The following chapters (and appendices) provide more detailed analyses ([16]). Given the specificities of each site, such as climate or usage (offices, laboratories, etc) the aim of this section is not to compare performance but to show trends over the years.

Although JRC Karlsruhe was not subject to verification audit in 2022, we have retained its data in our reporting so that we can continue to follow Commission level performance.

Table 2.1 summarises the individual sites and Commission performance trends in recent years for selected (and often communicated) core parameters. Having previously reported performance in relation to 2014-20 targets, the table now includes targets for 2023 and 2030 that were initially set before the COVID pandemic. The Commission met 2014-20 targets for all parameters. The absence of nearly 90% of staff for much of 2020 and 2021 has resulted in significantly improved performance, even exceeding targets for 2030 for some parameters

Table 2.1 Summary of performance for selected parameters at EMAS sites

Physical indicators (Number, description , unit)	Historic data values						Performance trend (%) since:		Future targets	
	First EMAS data (1)	2014	2018	2019	2020	2021	First EMAS data (1)	2014	2014-23 Δ % (3)	2014-30 Δ % (3)
1a) Energy bldgs (MWh/p)										
Brussels	19,06	**6,95**	6,75	6,39	5,42	5,27	**-72,3**	**-24,1**	-11	-18
Luxembourg	8,35	**10,74**	11,74	12,24	11,87	10,03	**20,2**	**-6,6**	-30	-55
JRC Petten	37,46	**23,99**	26,41	24,24	19,91	20,89	**-44,2**	**-12,9**	-8	-14
JRC Geel	60,62	**51,21**	53,09	49,81	44,35	47,72	**-21,3**	**-6,8**	48	47
JRC Seville	9,13	9,13	6,87	6,29	5,91	6,55	**-28,2**	**-28,3**	-35	-40
JRC Karlsruhe	78,64	**64,03**	73,06	76,90	66,30	75,34	-4,2	**17,7**	n.a.	n.a.
JRC Ispra	53,13	**44,24**	43,31	41,82	36,59	38,98	**-26,6**	**-11,9**	-10	-16
Grange	10,21	**12,69**	10,75	11,27	9,88	8,57	**-16,1**	**-32,5**	-19	-34
Commission		**11,57**	**10,85**	**10,42**	**9,08**	**8,96**		**-22,6**	**-25**	**-30**
1d) Water use (m^3/person)										
Brussels	28,44	**12,57**	11,22	11,53	7,78	6,28	**6,3**	**-77,9**	0	-5
Luxembourg	12,26	**14,48**	13,63	12,02	7,92	5,59	**-54,4**	**-61,4**	25	0
JRC Petten	11,50	**11,14**	8,00	9,83	8,99	5,60	**-51,4**	**-49,8**	-13	-14
JRC Geel	79,57	**34,75**	28,97	28,61	22,74	23,36	**-70,6**	**-32,8**	28	28
JRC Seville	42,81	**21,73**	14,66	13,18	13,04	11,80	**-72,4**	**-45,7**	-45	-50
JRC Karlsruhe	16,51	**21,03**	19,11	15,22	12,29	16,78	1,6	**-20,2**	-29	-32
JRC Ispra (4)	234,4	**125,3**	163,3	112,1	95,3	87,7	**-62,6**	**-30,0**	-11	-13
Grange	30,66	**27,69**	18,11	16,31	11,50	12,90	**-57,9**	**-53,4**	-45	-50
Commission		**21,68**	**21,48**	**18,01**	**13,44**	**11,47**		**-47,1**	-22	-27
1e) Office paper (sheets/p/day)										
Brussels	77,4	**33,1**	22,7	21,3	7,7	5,3	**5,3**	**-93,1**	-40	-50
Luxembourg	32,1	**24,1**	10,9	9,5	3,6	1,9	**-88,9**	**-92,0**	-50	-55
JRC Petten	40,0	**15,9**	9,6	19,4	4,7	4,5	**-88,7**	**-71,5**	-14	-25
JRC Geel		**20,4**	11,3	12,4	3,6	5,3	0,0	**-74,2**	9	7
JRC Seville	30,6	**12,6**	12,8	9,7	3,2	2,4	**-92,2**	**-81,0**	-22	-24
JRC Karlsruhe		**17,8**	10,8	7,2	0,0	3,7	0,0	**-79,0**	-22	-24
JRC Ispra	22,4	**16,5**	12,2	11,0	4,4	4,3	**-81,0**	**-74,3**	-55	-65
Grange	0,0	**9,9**	18,7	16,5	6,8	6,0	0,0	**-39**	-25	-30
Commission		**30,2**	**20,1**	**18,7**	**6,8**	**4,8**		**-84,2**	-65	-70
2a) CO_2 emissions from buildings (tonnes/person)										
Brussels	4,77	**0,71**	0,68	0,65	0,57	0,62	0,6	**-87,0**	-11	-18
Luxembourg	0,18	1,73	1,35	1,56	1,50	1,29	0,0	**-25,8**	-15	-75
JRC Petten	14,85	**10,00**	3,14	2,88	2,15	2,40	**-83,8**	**-76,0**	-73	-76
JRC Geel	17,57	**14,83**	4,94	4,16	3,88	4,92	**-72,0**	**-66,8**	3	1
JRC Seville	4,54	**3,09**	2,31	1,79	1,30	1,43	**-68,4**	**-53,5**	-39	-70
JRC Karlsruhe	19,37	**18,34**	21,21	20,20	15,79	16,88	**-12,9**	**-8,0**	n.a.	n.a.
JRC Ispra	12,36	**10,25**	9,68	9,39	7,31	7,74	**-37,4**	**-24,5**	-23	-41
Grange	4,18	**4,91**	3,69	3,58	3,20	2,78	**-33,4**	**-43,3**	0	0
Commission		**1,95**	**1,60**	**1,55**	**1,29**	**1,33**		**-31,5**	-37	-51
3a) Non hazardous waste (tonnes/person)										
Brussels	0,300	**0,222**	0,181	0,211	0,094	0,099	0,1	**-66,9**	-20	-25
Luxembourg	0,25	**0,103**	0,14	0,13	0,10	0,06	**-75,9**	**-42,4**	-35	-40
JRC Petten	0,08	**0,105**	0,11	0,10	0,07	0,35	**350,7**	**233,4**	-8	-14
JRC Geel	0,267	**0,479**	0,292	0,249	0,151	0,225	**-15,7**	**-53,0**	0	0
JRC Seville	0,000	**0,022**	0,031	0,044	0,014	0,010	0,0	**-56,8**	-20	-25
JRC Karlsruhe	0,000	**0,333**	0,269	0,246	0,194	0,187	0,0	**-43,8**	-22	-24
JRC Ispra	0,474	**0,491**	0,546	0,508	0,218	0,387	**-18,4**	**-21,2**	-2	-5
Grange	0,000	**0,251**	0,253	0,230	0,088	0,102	0,0	**-59,4**	-10	-12
Commission		**0,237**	**0,197**	**0,217**	**0,102**	**0,113**		**-52,3**	-28	-32

([16]) DG COMM Representations sites are not included (see section 1.1) as they're very small and they'll increase in number year after year, making the corporate comparison of overall performance difficult until figures for all the EC Representations are available

Note: NA - not applicable, (1) Earliest reported data: 2005 -Brussels, Grange; 2008 - Karlsruhe; 2010 - Petten, Seville; 2011 - Geel, Ispra, Luxembourg; NB early data for Brussels and Luxembourg is for a small number of buildings only (2) Compared to 2014; (3) EMAS Annual Action Plan 2022 (4) Indicator modified from 2014 to exclude lake water used in cooling circuits

In Luxembourg, for more representative results, reporting ([17]) for most parameters since 2015 has been for the entire site. Some parameters such as paper supply may be irregular and in large volume particularly in small sites (eg SANTE at Grange), making trends in usage difficult to follow.

The Commission has significantly reduced per capita **buildings' energy consumption ([18])** since 2014, including from 2019 to 2021 during the COVID pandemic. JRC Karlsruhe recorded low consumption in 2014, the baseline year, and is less able to control energy consumption owing to the requirements of the nuclear regulations.

Per capita **water use** has reduced more than a third since 2014, most of this since 2018. Per capita **office paper consumption** has reduced by more than 80%, with the 2021 value more than a third of the 2019 value.

Buildings' energy consumption in 2021 was similar to 2020 as were **CO_2 emissions**. 2020 and 2021 could be considered similar in the pandemic situation, with a small increase due to ventilation as a Covid related measure.

2.1 The COVID pandemic and the impact of teleworking

There is considerable interest and debate on the impact of teleworking on emissions and especially whether this represents a net increase or decrease in the carbon footprint. Overall, working at home does incur some additional energy consumption, but reduces that related to commuting. But this must also be considered in the context of the Commission's evolving buildings policy which seeks to use office space more efficiently.

Caution is required in trying to draw firm conclusions based on current data. There is far greater confidence in the carbon footprint evaluated for the office (with a relatively low number of buildings, all with records in the form of invoices and measurements that are used to identify the main elements of the carbon footprint), compared to teleworking where there are very large number of individual dwellings about which a great many assumptions are required. Further work will be required to improve the understanding of the impact of teleworking on emissions.

Emissions associated with increased energy consumption at home

The Environmental Statement that reported on performance to 2020, described several methods to evaluate teleworking emissions and these resulted in a wide range of results. The work was further developed ([19]) to incorporate more site-specific data for 2021 reporting. A preferred approach was identified that provided the results shown in Table 2.2. Teleworking emissions comprised those related to space heating (or cooling), electricity, embodied emissions of Commission provided IT equipment for the home office, and videoconferencing emissions. ([20])

The breakdown is shown below in Figure 2.1 and Table 2.2 that indicate the relative importance of the components of the teleworking emissions that are described above ([21]), underlining that heating and electricity consumption account for over 90% of the emissions.

([17]) For verification purposes data for EMAS registered buildings only is also available. Reporting only on EMAS registered buildings made it more difficult to discern trends from year to year - particularly when newly registered buildings were very different to existing ones.

([18]) Measured as final energy (ie through meter readings)

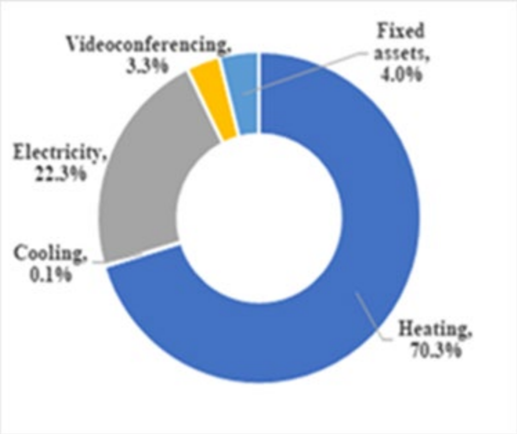
([19]) Ares hr.d.7(2022)4134770

([20]) This is a subset of the categories in the Commission's carbon footprint, and represents those considered the most significant in the teleworking context

([21]) Assuming similar rates of presence for teleworkers at most sites are similar to that for Brussels.

Figure 2.2 illustrates shows that heating and, those from cooling is negligible, (except as indicated in Figure 2.1, in Valletta).

Figure 2.1 Teleworking emissions composition

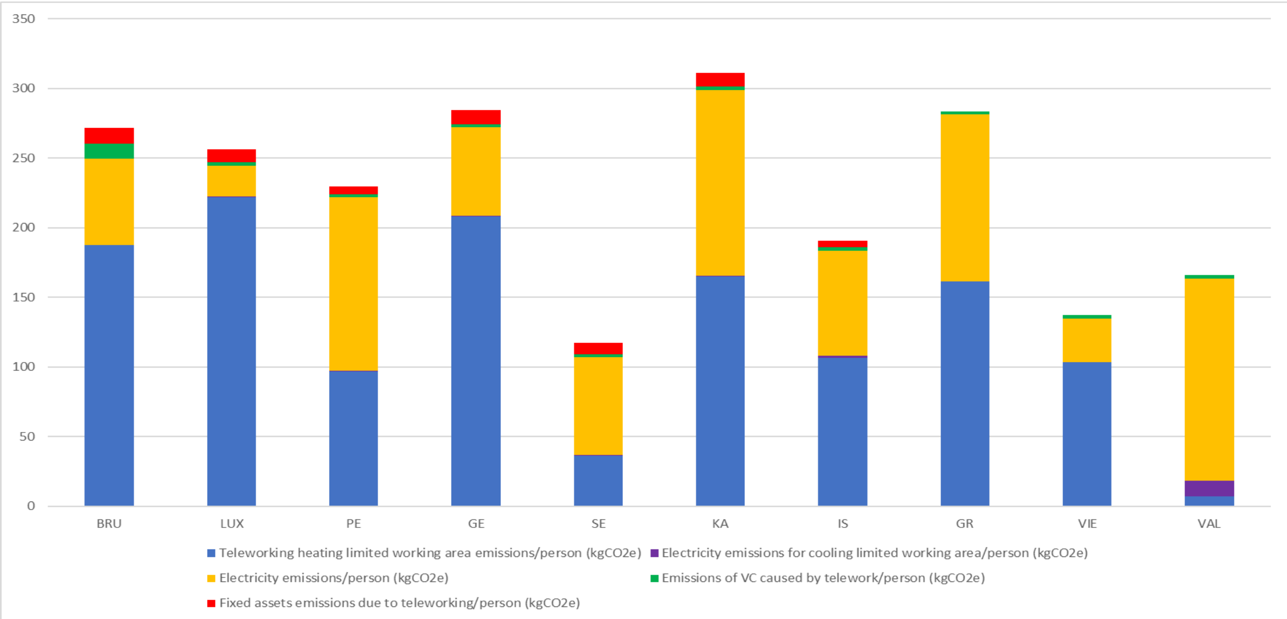


Emissions from teleworking (limited working area approach)	Total (all sites) (tonnes CO_2e)	Per teleworker (kgCO2e)
Space heating	7 591	215
Electricity for space cooling	9,9	0,3
Electricity for equipment use	2 409	68
Videoconferencing	361	10,2
IT equipment fixed assets	429	12,2
Total energy emissions (TCO_2e)	10 800	306

Table 2.2 Teleworking emissions, (Tonnes CO_2e, indicative)

The average extra per capita emissions due to energy consumption for teleworking is 306 kg of CO_2 equivalent, and varies considerably by location, amounting to 327 $kgCO_2e$ in Brussels and only 100 $kgCO_2e$ in JRC-Seville. Figure 2.2 represents total emissions divided by total staff numbers by site, hence lower figures than reported above. Heating emissions dominate teleworking emissions at most sites except the most southern (JRC-Seville and EC Representation in Valletta).

Figure 2.2 Teleworking emissions at EMAS sites in 2021 ($kgCO_2e$/person)



Emissions reductions associated with reduced commuting owing to teleworking

Table 2.3 shows the estimated reduction in commuting emissions in 2020 and 2021. The emissions due to staff commuting reduced by 79% in 2021 compared to 2019.

Table 2.3 Emissions due to staff's commuting, tonnes CO_2e (2018 - 2021)

Year	2018*	2019	2020	2021
Staff commuting (eight Commission EMAS sites)	13 611	19 137	5 269	3 991

* Luxembourg data excluded

2.2 Status of the Global Annual Action Plan

The EMAS Steering Committee adopted the 2022 EMAS Global Annual Action Plan ([22]), prepared in the manner introduced in 2018, and with progress towards the objectives for each site, grouping actions by category. It comprises two main elements, targets under each of the political objectives, and actions to achieve them.

2.2.1 Targets

DG HR requested the sites' contributions to the GAAP in December 2021. The main purpose of this consultation, apart from updating actions, was to confirm targets established in GAAP 2021 for performance on certain indicators up to:

- **2023** – which will be reported in 2024 towards the end of the current Commission (and when a progress update is due on the implementation of the Greening the Commission action plan); and

- **2030** – a long term target, relevant to achieving a climate neutral Commission. (The importance of achieving climate neutrality resulted in sites being asked in 2020 to consider targets for a larger range of parameters relating to the carbon footprint).

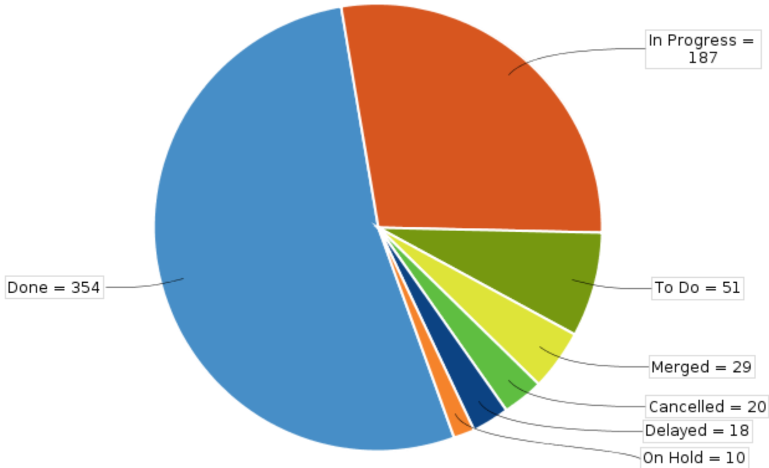
Some parameters, such as emissions from missions, are largely outside the scope of site management, particularly at larger sites containing multiple DGs. Individual DGs will be required to commit, via pledges to reducing these emissions.

2.2.2 Number and status of actions

The EMAS Global Annual Action Plan has at its core a database of over 600 actions, past and present, across all the sites that seek to improve the Commission’s environmental performance. Every January or February the EMAS Steering Committee formally adopts a new plan, and the February 2022 plan included the actions described below.

([22]) Ares hr.d.7(2022)4213282

Figure 2.2 Status of actions in the EMAS Global Annual Action Plan 2022 ([23])



	Issues	%
Done	354	52%
In Progress	187	27%
To Do	51	7%
Merged	29	4%
Cancelled	20	2%
Delayed	18	2%
On Hold	10	1%

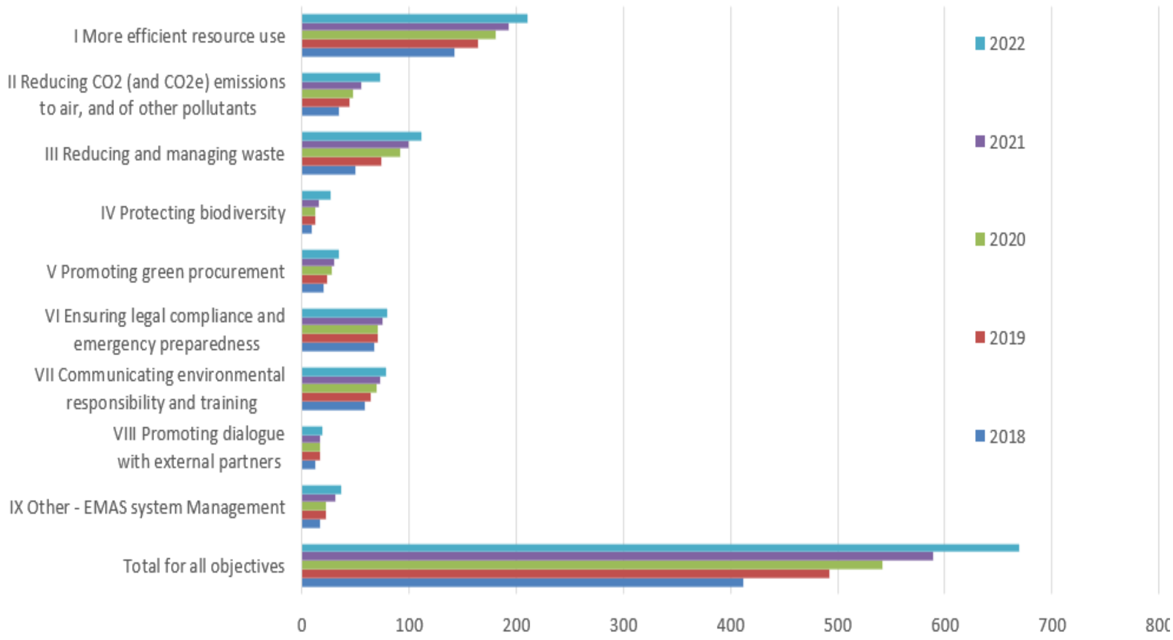
Although roughly half of the actions have been completed, they are retained on the database for reference.

2.2.3 Breakdown of actions by main objective and by site

The actions are distributed across the Commission's main environmental objectives according to Table 2.4 which shows that the Commission continues to add new actions to respond to most environmental objectives.

([23]) Global Annual Action Plan as submitted to the EMAS Steering Committee on 7th February 2022, and subsequently adopted

Table 2.4 Evolution of actions by main objective in the GAAP, 2018-22



Most main objectives recorded an increase in the number of actions particularly in number **I More efficient resource use** (that includes 20% of all actions are for reducing buildings' energy consumption, and 3,4% each for reducing water and office paper consumption). No **III Reducing and managing waste** is also important, together with **II Reducing CO2 (and CO2e) emissions to air, and of other pollutants,** in line with European Commission's top priorities. Reducing buildings' energy consumption is the overwhelming priority, the number of actions representing nearly one quarter of all the actions in the database. Table 2.5 presents the distribution of actions with "active" status, ie those not "cancelled" or "done", or" merged".

Table 2.5 Distribution of active actions by site for main objectives

Main Objective	Brussels	COMM Reps	Grange	JRC Geel	JRC Ispra	JRC Karlsruhe	JRC Petten	JRC Sevilla	Luxembourg	Grand Total
I More efficient resource use	23	6	6	7	16	*2*	8	3	10	**81**
II Reducing CO2 (and CO2e) emissions to air, and of other pollutants	8	5	2	3	6	*2*	4	1	4	**35**
III Reducing and managing waste	12	3	4	4	9		2	2	3	**39**
IV Protecting biodiversity	1		2	3	6		1	2	2	**17**
V Promoting "green" procurement	4	2	1	1	4		1		2	**15**
VI Ensuring legal compliance and emergency preparedness	7			6	1	*2*	1		1	**18**
VII Communicating environmental responsibility and training	17	2	1	2	2		1	1	2	**28**
VIII Promoting dialogue with external partners	6	1	1		1		1			**10**
IX Other - EMAS System Management	17	1					1			**19**
Grand Total	**95**	**20**	**17**	**26**	**45**	*6*	**20**	**9**	**24**	**262**

The largest sites, Brussels, Luxembourg and JRC Ispra have the greatest number of total actions.

Given the relative importance and high number of energy reduction actions (within more efficient resource use), the number of actions that seek to reduce emissions appears relatively low compared to its importance as underlined below. However, this is because most actions that reduce energy consumption also reduce emissions, and these are not counted separately in this this analysis. The data also shows:

- **Resource consumption** dominated the actions at most sites, Luxembourg and JRC Seville being exceptions perhaps owing to a larger proportion of rented accommodation.
- There were also many actions relating to **communication and legal compliance**. Legal compliance actions were a significant proportion of the total at Brussels and Luxembourg because individual buildings in both cities require environmental permits. And JRC Karlsruhe operates under extensive legal operating requirements and is very closely monitored by the German authorities owing to its nuclear activities. The JRC sites and DG Grange at SANTE do nott require registration of individual buildings because their special legal status permits them to be incorporated into EMAS as a single entity.
- The relatively large number of actions for **more efficient resource use, and waste** is in line with important international policy developments. To slow global warming by limiting greenhouse gas emissions, at the United Nations Climate Change Conference in Paris 2015 (COP 21) all 195 countries adopted the first universal climate change agreement aiming to limit temperature rise to well under 2 degrees Celsius by the end of the century. Under the agreement the EU sought to reduce CO2 emissions by 40% in 2030, although the Commission under the Green Deal plans to increase this to 55%.
- The Commission has also called for a climate neutral Europe by 2050, and the Commission has itself declared an ambition to become greenhouse gas neutral by 2030. The Commission for this purpose adopted, on the 5th of April 2022, the Communication and action plan on Greening the Commission. **The Commission committed to reducing its greenhouse gas emissions by at least 60% compared to 2005** (corresponding to approximately 38% compared to 2019, the first year where the Commission has comprehensive CO_2 emission data)**, and compensating for any remaining emissions in 2030 with high quality certified carbon removals.**

The EU also recently adopted the circular economy package to reduce waste generation and under which by 2030 the EU should achieve common municipal waste recycling and reuse target of 65%, with a target of 75% for recycling packaging waste, and an EU wide landfill reduction target of 10%.

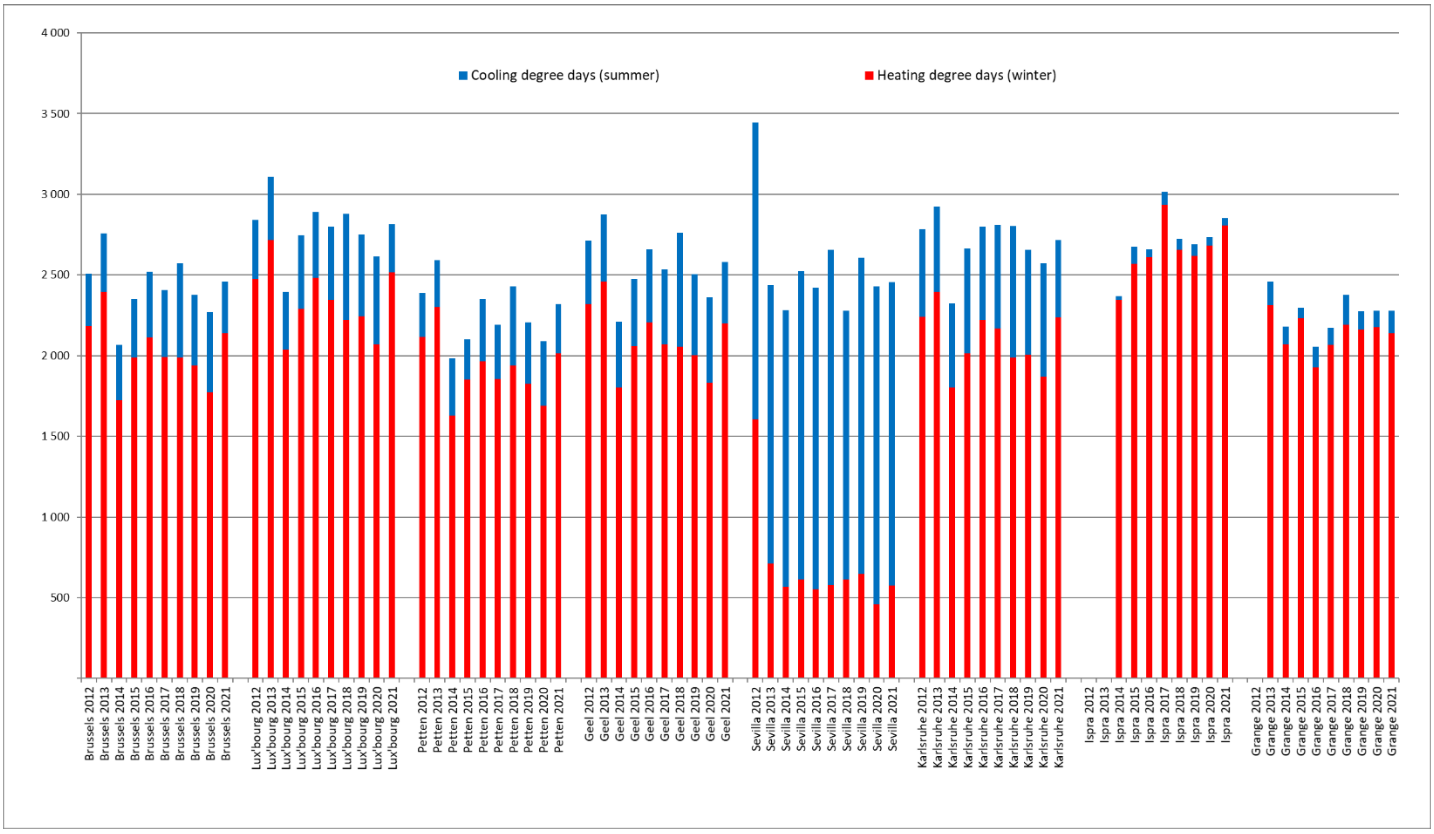
3 Making more efficient use of natural resources

3.1 Energy consumption

3.1.1 Climate influence

Climate influences buildings' energy consumption. One simple means of describing the annual variability in climate is with temperature ([24]). Figure 3.1 shows the annual number of heating degree-days and cooling degree-days ([25]) for meteorological stations near the Commission EMAS sites since 2012.

Figure 3.1 Heating and cooling degree-days for weather stations close to the EMAS sites



Comparing the total number of degree-days from year to year at a site will suggest whether to expect each year, and all other factors being equal, more or less energy consumption than in previous years. Figure 3.1 shows that:

- all sites recorded higher total degree days in 2021 than in 2020
- for most sites the increase is notably in the number of heating degree days, indicating severe winter conditions

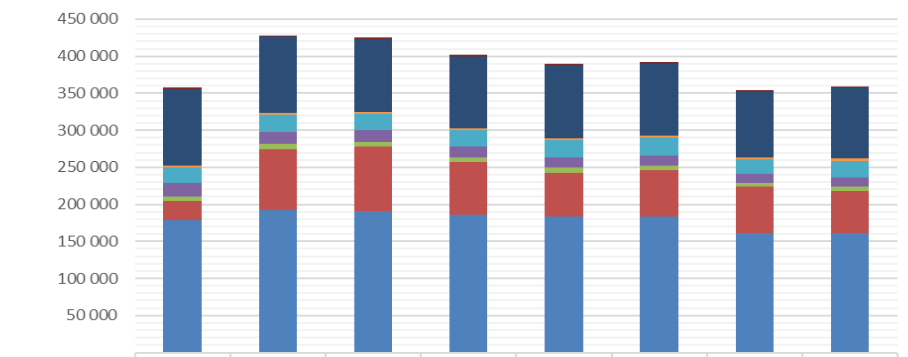
([24]) But factors such as humidity and windspeed are also important.

([25]) Source of monthly degree day data: www.degreedays.net, station references EBBR (Brussels), ELLX (Luxembourg), INHLAKMA1 (JRC Petten), EBBL (JRC Geel), EDSB (JRC Karlsruhe), LEZL (JRC Seville), LIMC (JRC Ipsra), EIDW(DG SANTE at Grange)

- 2014, the baseline year for all longer-term reduction targets, is challenging for energy consumption, as the largest consumers (Brussels, Luxembourg, JRC Ispra and JRC Karlsruhe) all record the lowest number of degree days in that year suggesting lower heating and cooling requirements, and therefore making it difficult to demonstrate improvement in the following years. It is similar situation for the other northern sites

3.1.2 Energy use in buildings, breakdown by site

Figure 3.2 Buildings' energy consumption at EMAS sites, 2014-21 (MWh)



	2014	2015	2016	2017	2018	2019	2020	2021
Total	357 560	428 441	424 809	402 074	389 466	391 733	353 617	359 558
Grange	2 271	2 425	2 378	2 177	1 925	1 983	1 709	1 525
JRC Ispra	103 362	102 942	97 609	97 391	98 962	97 519	88 222	96 486
JRC Seville	2 639	2 542	2 414	2 612	2 351	2 315	2 259	2 555
JRC Karlsruhe	20 489	22 786	21 889	22 104	23 158	24 222	20 486	22 977
JRC Geel	17 719	16 243	15 737	14 777	13 750	13 049	11 797	12 550
JRC Petten	6 766	6 913	6 623	6 298	6 551	6 035	4 918	5 015
Luxembourg	25 988	82 609	87 795	71 232	58 901	62 896	62 210	57 067
Brussels	178 326	191 982	190 364	185 485	183 868	183 712	162 016	161 383

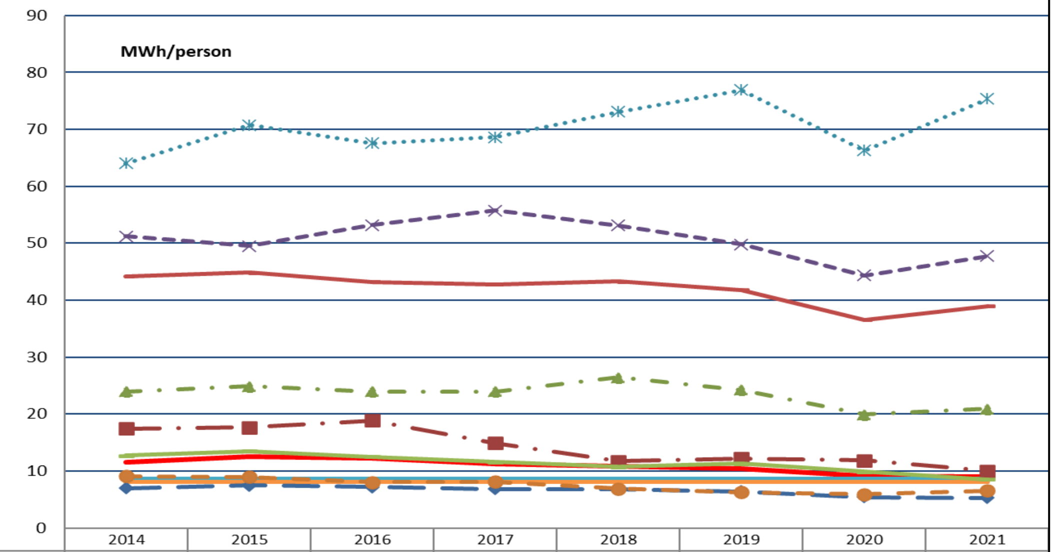
Figure 3.2 shows that Brussels and JRC Ispra ([26]) account for a large proportion of energy consumption at the Commission sites, reflecting that they have the largest amount of infrastructure. Luxembourg is the third highest overall consumer of energy. Luxembourg reporting was restricted to EMAS scope buildings in 2014, hence a lower Commission total than in the following years.

There has been an overall slight increase in 2021 from 353 to 360 GWh resulting from an increase in ventilation due to safety measures during pandemic which demanded more energy for heating.

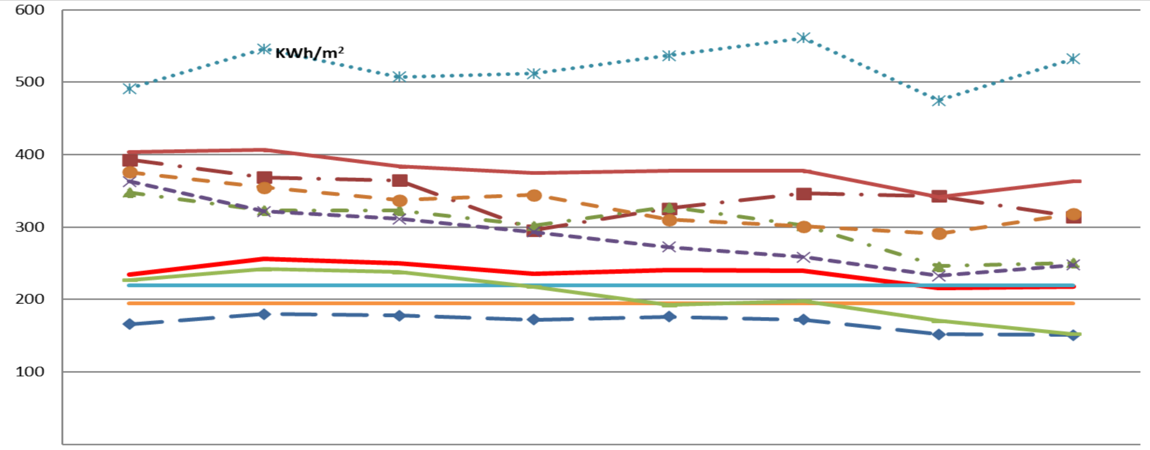
Figure 3.3 shows the evolution in per capita and per square meter buildings energy consumption for the EMAS sites, together with the Commission value obtained by aggregating and the values for individual sites and the targets for the periods 2014-23 and 2014-30.

([26]) JRC Ispra has its own power plant to produce electricity based on gas (methane).

Figure 3.3 Buildings' energy consumption at EMAS sites, 2014-21 (MWh/p, kWh/m²)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	11,6	12,6	12,2	11,3	10,8	10,4	9,1	9,0
Target 2014-23	8,67	8,67	8,67	8,67	8,67	8,67	8,67	8,67
Target 2014-30	8,10	8,10	8,10	8,10	8,10	8,10	8,10	8,10
Brussels	6,95	7,47	7,17	6,83	6,75	6,39	5,42	5,27
Luxembourg	17,4	17,7	18,9	14,9	11,7	12,2	11,9	10,0
JRC Petten	24,0	24,9	24,0	23,9	26,4	24,2	19,9	20,9
JRC Geel	51,2	49,5	53,2	55,8	53,1	49,8	44,3	47,7
JRC Karlsruhe	64,0	70,8	67,6	68,6	73,1	76,9	66,3	75,3
JRC Seville	9,13	8,98	8,05	8,11	6,87	6,29	5,91	6,55
JRC Ispra	44,2	44,8	43,2	42,8	43,3	41,8	36,6	39,0
Grange	12,7	13,5	12,5	11,6	10,8	11,3	9,9	8,6



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	235	256	250	235	241	239	216	218
Target 2014-23	220	220	220	220	220	220	220	220
Target 2014-30	195	195	195	195	195	195	195	195
Brussels	166	180	178	172	176	172	152	151
Luxembourg	393	369	364	296	326	346	343	314
JRC Petten	348	323	323	302	328	302	246	251
JRC Geel	363	321	311	293	272	258	233	248
JRC Karlsruhe	491	546	507	512	536	561	475	532
JRC Seville	376	355	337	345	310	301	291	318
JRC Ispra	404	406	384	375	378	377	341	363
Grange	227	242	238	217	192	198	171	152

The data shows that:

- In 2021, the Commission met its 2014 to 2023 targets for per capita and per square metre emissions with little change from 2020 due to a similar Covid situation and appears 'not far' from the 2030 targets.

- The JRC sites with laboratory or heavy experimental apparatus (Karlsruhe, Geel, Ispra and Petten) have the highest per capita energy consumption from 20 to 75 MWh per annum. The predominantly office dominated sites of Brussels, Luxembourg, Grange and JRC Seville consumed between 6 and 10 MWh per capita. JRCs Seville and Geel experienced a small increase in both indicators, due to an increased use of energy due to additional Covid measures and an increase in heating days for 2021 as shown in the previous Table 3.3. JRC-Karlsruhe (although we remind that JRC Karlsruhe data were not subject to verification audit in 2022) has the highest consumption figures, and this is due to the legal requirement to continue full time flow of air through the nuclear facilities (a permanent flow of around 300 000 m^3 per hour).

Table 3.1 describes the types, and number of actions that the sites have identified to reduce total energy consumption of buildings, whether as a primary or secondary objective. Details of individual actions are available in the Global Annual Action Plan (GAAP) actions database.

Table 3.1 Ongoing actions in the EMAS Global Annual Action Plan to reduce buildings' energy consumption

Action type	Description	BX	LX	PE	GE	*KA*	SE	IS	GR	COM	REP
Studies / awareness	Awareness/ communications campaigns	1					2			1	1
	Energy action plan or audits, studies	10	2	1	1	*1*		2	1		
	Management review, trends analysis	2		1							
Lighting, movement, motion	Lighting	3	1			*2*		1	1		
	Movement sensors	1						1			
IT	PC turnoff (auto)	1					1		1		
	IT cloud strategy	1									
	IT server room consolidation strategy	1						1			
Operational optimisation	Metering and measurement, BMS EMS	2		1	2	*1*		2	1		1
	Comfort hours optimisation	5	1				1				1
	End of year buildings closure	2									1
	Block/ replace thermostatic valves								1		
	Air flow optimisation	1									
	Optimise heating set point temperatures	1									
Building standards	Insulation (roof, pipe or unspecified)	2		1		*1*		1	1		
	New building and standards, or refurbishment, disuse/ demolition of old buildings		1	3				3			
Large investment	Upgrade transformers				1						
	Geothermal energy or heat pumps			1				1			
	HVAC upgrade					*2*		4			
	Heat transfer system (new)					*1*					
Other	Introduce SPS sintering					*1*					

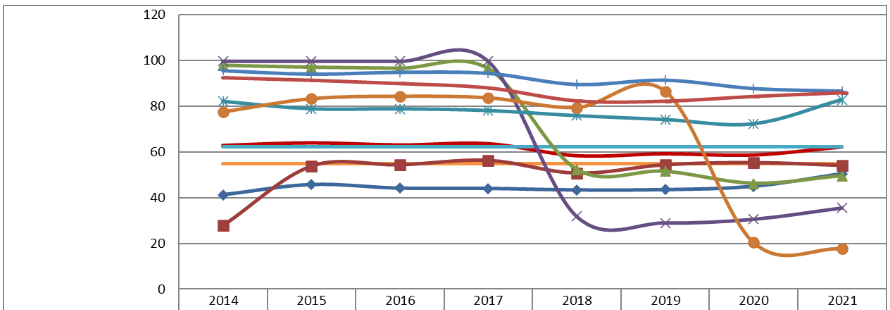
Sites generally have many prioritised actions (too many to list here) and are required to undertake measures with a payback period of less than 5 years. There are a wide variety of actions at most sites, which reflects the significance of the indicator and that many of the actions to reduce buildings energy consumption reduce CO_2 emissions. Studies and audits have been conducted at most sites and actions involving relatively "quick wins" such as relating to lighting and insulation have been widespread. Luxembourg and JRCs Geel, Karlsruhe and Ispra list several actions with larger "investment" projects. (The JRC sites have site development plans for 2030, although these are subject to the availability of funding).

The sites identified the following **key** actions in the 2022 Global Annual Action Plan:

- Brussels: Refurbishing buildings in line with EPB directive; energy audits; optimising comfort hours including holidays; upgrading lighting and sensors; task force energy to analyse return on investment and energy savings; adapting lighting in parking; energy reporting tool; liaising with landlords on high consuming buildings (energy, water); central air optimisation; long term optimisation of heating set point temperatures; identify potential to install voltaic panels; end of year close down, inspection of buildings' lighting or HVC equipment during closing time, Shutting down of buildings, adapting energy consumption to low occupancy and remote inspection of the buildings' management systems
- Luxembourg: construction of JMO2 buildings (BREEAM excellent design rating); reduce temperatures at end of year closure; install LED lighting, optimise energy consumption in buildings and identify problems at an early stage and assess potential to improve energy performance with open space floors
- JRC Ispra: Demolition plan to remove old buildings; apply BREEAM to construction of selected JRC buildings; implement site development plan
- JRC Geel: Buildings management system (BMS) optimisation of air compressors; Technical equipment in specific buildings and Study for potential thermal insulation in B020
- JRC Petten: Assess automated information on energy and water use and Insulation of building
- JRC Seville: Assess electricity consumption, time of use and comfort of users
- DG SANTE at Grange: Tender for electricity from renewable sources.
- DG COMM Reps: Development and operation of a monitoring system to measure use of resources; Staff awareness actions to reduce energy and water use; Closing down Representations' premises during winter and summer holidays and Adjusting comfort hours and settings for heating and ventilation

3.1.3 Buildings energy from renewable sources

Figure 3.4 Percentage of Commission buildings' energy generated from non-renewable sources



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	62,8	63,9	63,0	63,6	58,2	59,1	58,5	62,1
Target 2014-23	62	62	62	62	62	62	62	62
Target 2014-30	55	55	55	55	55	55	55	55
Brussels	41,2	45,7	44,1	44,0	43,3	43,4	44,9	50,4
Luxembourg	27,8	53,7	54,2	56,2	50,6	54,3	55,2	54,0
JRC Petten	97,8	97,0	96,5	96,4	52,3	51,5	46,2	49,5
JRC Geel	99,5	99,5	99,5	99,5	31,8	28,9	30,5	35,4
JRC Karlsruhe	82,0	78,8	78,8	78,0	75,8	74,1	72,2	82,8
JRC Seville	77,4	83,2	84,2	83,6	79,3	86,5	20,4	17,6
JRC Ispra	95,5	94,0	94,8	94,3	89,4	91,4	87,7	86,5
Grange	92,5	91,4	89,9	88,1	82,3	82,2	84,3	85,9

Figure 3.4 shows that the Commission has slightly increased the percentage of buildings metered energy consumption generated from non-renewable sources, but this still is in line with the 2023 target. The most obvious strategic options such as electricity from renewable sources have already been adopted, still there is a need to decarbonise heating at most sites.

Both Brussels and Luxembourg have been purchasing almost all their electricity from renewable sources, the former introducing its renewable energy contract in August 2009. JRCs Geel and Petten followed in 2018, JRC Seville in 2020 and DG SANTE at Grange is planning to sign a contract in 2022.

Several sites have developed photovoltaics capacity to generate energy on site (especially JRCs Petten and Ispra). Both JRCs Ispra (starting in 2015) and Petten use ground source heat pumps, along with Brussels (in building MO15). Urban heating generates part of Luxembourg's heating supply. Three district heading networks are used and one of them, located in the Kirchberg district, is partly powered by wood chip cogeneration.

JRC-Geel is supporting the development of a local energy supply from superheated groundwater at 3km depth that is under development by its supplier VITO. Although the high pressures involved in the reinjection process have triggered small tremors that have required further site investigation prior to authority approval.

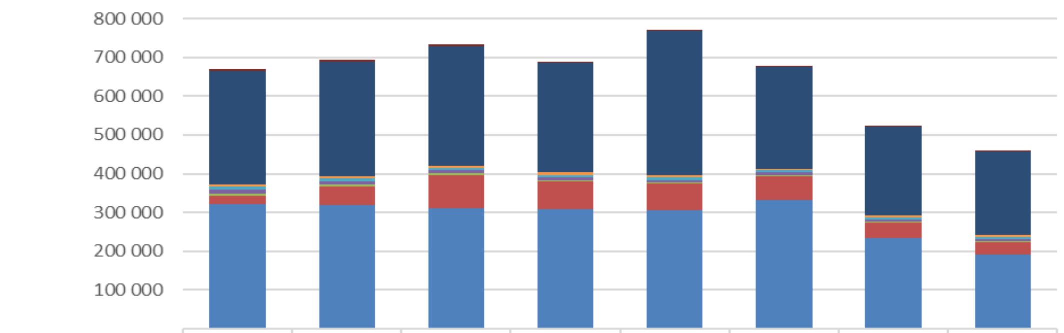
Lake water abstraction reduces JRC Ispra’s requirement for cooling energy, although rising temperatures in Lake Maggiore have been a challenge in recent years. Other examples of actions to increase the proportion of renewable energy include monitoring systems for photovoltaic panels, and geothermal heat pumps.

The sites identified the following **key** actions in the 2022 Global Annual Action Plan:

- Luxembourg: Construction of JMO2 BREEAM design ‘excellent’
- JRC Ispra: Installation of renewable site generated energy heat pumps; photovoltaic panels
- DG SANTE at Grange: Sign contract for electricity from renewable sources.

3.2 Water use

Figure 3.5 Water use at EMAS sites, 2014-21 (m³)



	2014	2015	2016	2017	2018	2019	2020	2021
Total	670 128	694 406	733 072	689 080	771 246	677 152	523 307	460 545
Grange	4 956	5 069	3 754	3 219	3 241	2 870	1 989	2 296
JRC Ispra	292 866	295 838	309 077	282 182	373 192	261 344	229 855	217 181
JRC Seville	6 281	5 963	5 356	6 474	5 013	4 849	4 981	4 603
JRC Karlsruhe	6 730	6 717	6 235	6 005	6 058	4 795	3 797	5 118
JRC Geel	12 023	9 861	7 950	7 142	7 503	7 495	6 049	6 143
JRC Petten	3 141	3 250	3 877	2 950	1 984	2 449	2 221	1 343
Luxembourg	21 604	49 016	86 589	72 669	68 366	61 773	41 524	31 817
Brussels	322 527	318 692	310 234	308 439	305 889	331 577	232 891	192 045

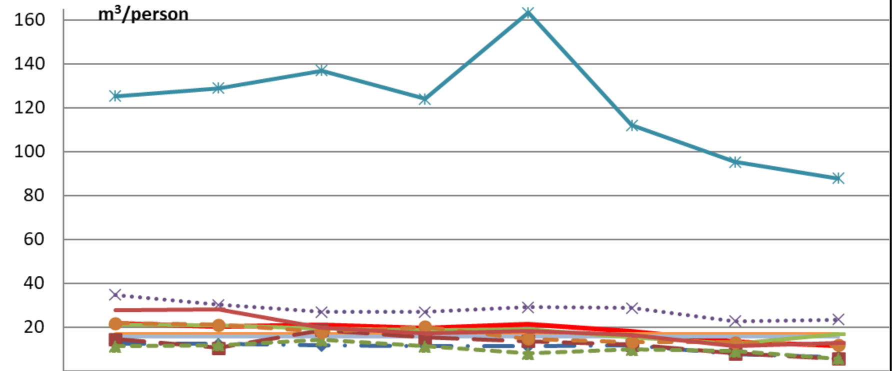
Figure 3.5 shows that Brussels and JRC Ispra are the greatest water users. The Commission reduced its water use by 15% from 523 to 443 m^3 in 2021, due in part to the COVID pandemic.

JRC Ispra’s water use indicator was redefined in 2021 to exclude water used in the extensive cooling circuits across the site, and therefore to provide a more similar usage to the other sites. ([27]) The site contains both a high pressure drinking water circuit (fire extinguishing networks and activities that are further away including social and sport areas, garderie, ALER apartments, etc.); and a low pressure drinking water circuit: mostly for staff use (canteens, toilets, etc.) leading to relatively high per-capita usage.

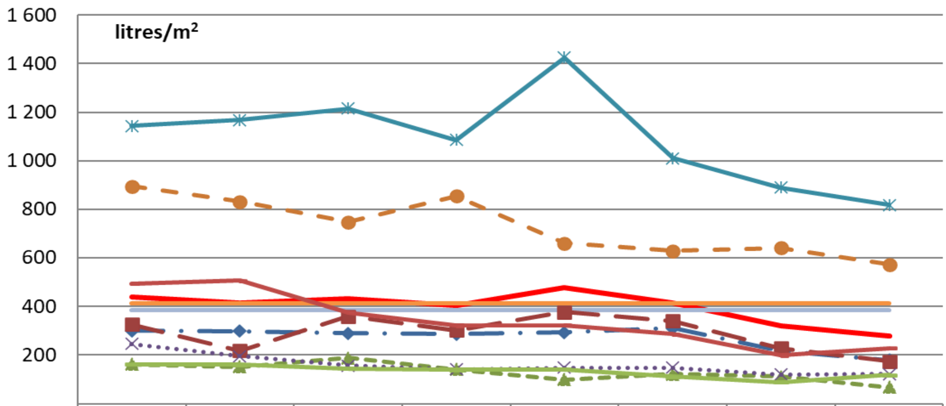
([27]) Unlike other sites, JRC Ispra was designed to use its own intake (from nearby Lake Maggiore). Indeed, this low cost and readily available water supply was one reason to select the site to host EURATOM facilities

Figure 3.6 shows per capita water use measured in cubic meters and litres per square metre for the eight Commission sites.

Figure 3.6 Water use at EMAS sites, 2014 -21 (m^3/p, litres/m^2)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	22	20	21	19	21	18	13	11
Target 2014-23	16,83	16,83	16,83	16,83	16,83	16,83	16,83	16,83
Target 2014-30	15,86	15,86	15,86	15,86	15,86	15,86	15,86	15,86
Brussels	13	12	12	11	11	12	8	6
Luxembourg	14	11	19	15	14	12	8	6
JRC Petten	11	12	14	11	8	10	9	6
JRC Geel	35	30	27	27	29	29	23	23
JRC Karlsruhe	21	21	19	19	19	15	12	17
JRC Seville	22	21	18	20	15	13	13	12
JRC Ispra	125	129	137	124	163	112	95	88
Grange	28	28	20	17	18	16	11	13



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	440	414	432	403	477	413	319	279
Target 2014-23	413	413	413	413	413	413	413	413
Target 2014-30	384	384	384	384	384	384	384	384
Brussels	300	299	290	286	294	311	218	180
Luxembourg	327	219	359	302	378	340	229	175
JRC Petten	161	152	189	142	99	122	111	67
JRC Geel	246	195	157	142	149	148	119	121
JRC Karlsruhe	161	161	144	139	140	111	88	119
JRC Seville	895	832	748	854	661	630	642	573
JRC Ispra	1 144	1 167	1 215	1 086	1 426	1 011	889	818
Grange	495	506	375	322	324	287	199	229

The data show that:

- The Commission reduced per capita water use in Brussels since by half since 2014.
- The JRCs at Seville and Ispra have recorded the largest reductions in use over the last three to four years, with JRC Ispra introducing several infrastructure related initiatives. Improving the network and reducing leaks enabled JRC Ispra to follow a rise in use in 2018 with a larger decrease in 2020 and 2021.

- The Commission's water use in 2021 met the 2014-23 and 2014-30 reduction targets.

Table 3.2 describes the types, and number of actions that the sites have identified to reduce water use whether as a primary or secondary objective. Further details are available in the Global Annual Action Plan

Table 3.2 Site level ongoing actions in the EMAS Global Annual Action Plan to reduce water consumption

Type of action	Description	BX	LX	PE	GE	*KA*	SE	IS	GR	COM	REPs
Studies / awareness	Studies, improve plans, drawings						1		1	1	
Operational optmisation	Improve monitoring system	1		1	3			2	1		1
	Water saving devices on taps or water dispensers	1	1	1			1				
Large investment	Modify, remove or replace cooling towers				1						
	Infrastructure (HVAC) upgrade and optimization							1			
	Install cascade of pumps and variators							1			

Several actions at Luxembourg and Geel involve reducing the number of cooling towers. All sites for which water use is a significant aspect have actions to improve performance. Six of the actions primarily target another indicator (usually 1a, reducing energy consumption of buildings).

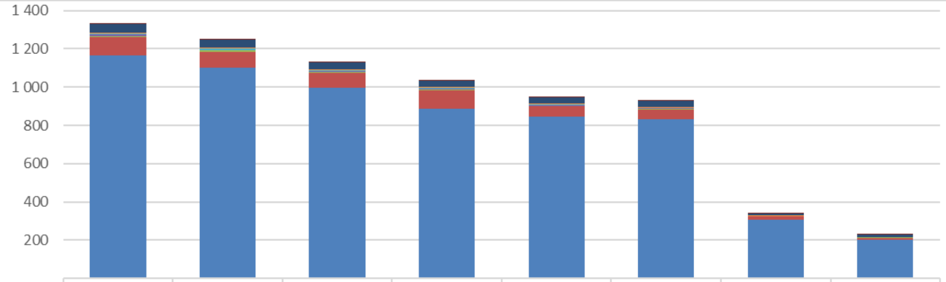
The sites identified the following **key** actions in the 2021 Global Annual Action Plan:

- Brussels: Liaising with landlords on high consuming buildings; installation of water fountains near conference/meeting rooms
- Luxembourg: Construction of JMO2 building
- JRC Ispra: Monitor performance of water dispensers
- JRC Geel: Analyse the feasibility of monitoring water consumption of building air humidifiers; replace cooling towers; Analyse and implement alarms on the water monitoring measurement instruments and Analyse and install an automatic blowdown system for B190 cooling towers
- DG SANTE at Grange: General program including more efficient flushing of toilets and rainwater harvesting
- DG COMM Reps: Development and operation of a monitoring system to measure use of resources and Staff awareness actions to reduce energy and water use

3.3 Paper consumption

Figure 3.7 shows annual total paper consumption at the Commission, which in both Brussels and Luxembourg applies to the whole Commission site, rather than only to EMAS registered buildings.

Figure 3.7 Total paper consumption at the EMAS sites, 2014-21 (tonnes)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	1 333	1 249	1 134	1 039	951	929	340	229
Grange	2	3,5	6,3	3,7	3,3	2,9	1,2	1,1
JRC Ispra	47	40,7	35,3	35,5	33,9	29,2	11,5	11,0
JRC Seville	5	5,0	5,0	5,1	6,4	5,0	2,5	1,5
JRC Karlsruhe	6	4,8	4,8	3,6	3,6	2,1	0,0	1,1
JRC Geel	7	3,6	5,9	3,2	3,1	3,4	1,0	1,4
JRC Petten	5	5,8	2,4	3,0	2,4	4,8	1,2	1,1
Luxembourg	96	85,7	77,0	98,7	54,0	48,4	18,5	11,1
Brussels	1 166	1 100	998	886	845	834	304	201

Total paper consumption comprises:

i) **Office paper** - A3 or A4 typically used for printing in offices and representing about 80% of total paper consumption, and

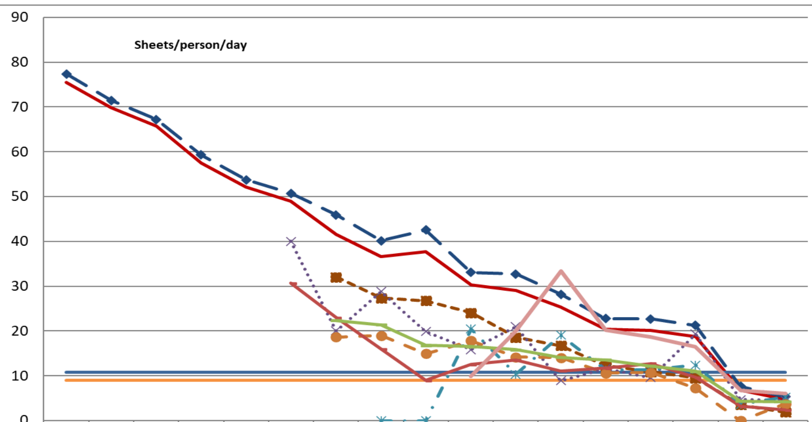
ii) **Print shop paper** - used in high quality or large format printing usually for publications and used at fewer sites.

Brussels is by far the largest consumer of paper, followed by Luxembourg and JRC-Ispra with these three sites responsible for more than 97% of the total in 2021. Largescale homeworking in 2021 resulted in the Commission reducing consumption to below 2020 levels.

The large reduction in 2021 saw the Commission meeting its 2014-23 and 2014-30 targets, as indicated in Figure 3.8, which also demonstrates a very long-term steady decline in paper consumption in Brussels since 2005.

3.3.1 Office paper consumption

Figure 3.8 Office paper consumption at EMAS sites, 2005-21 (sheets/person/day) ([28])



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Commission	76	70	66	57	52	49	42	37	38	30	29	25	20	20	19	7	5
Target 2014-23	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7	10,7
Target 2014-30	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0	9,0
Brussels	77	71	67	59	54	51	46	40	43	33	33	28	23	23	21	8	5
Luxembourg							32	27	27	24	19	17	12	11	10	4	2
JRC Petten						40	20	29	20	16	21	9	12	10	19	5	5
JRC Geel								0	0	20	10	19	11	11	12	4	5
JRC Karlsruhe							19	19	15	18	14	14	11	11	7	0	4
JRC Seville						31	23	16	9	13	13	11	12	13	10	3	2
JRC Ispra							22	21	17	17	16	14	14	12	11	4	4
Grange										10	20	33	20	19	17	7	6

The reduction in office paper consumption shown in Figure 3.8 continued the sharp decrease already started in 2020 due to the Covid pandemic with the number of sheets per day printed representing about a third of the Commission target.

While continual promotion of electronic circuits and communication explain much of the decrease, along with the use of lower density paper, over the years much pre-COVID improvement is also due to the installation of badge operated menu driven network printer system that replaced many individual printers, and drastically reduces the number of documents printed in error.

([28]) 211 days/year; Data from HR Processes and Information systems unit and used since 2014

An increase at the smaller sites can be due to bulk orders, and the reported figures reflect purchase rather than consumption.

Table 3.3 shows the type of actions that are planned at site level to reduce paper consumption.

Table 3.3: Site level ongoing actions in the EMAS Global Annual Action Plan to reduce office paper consumption

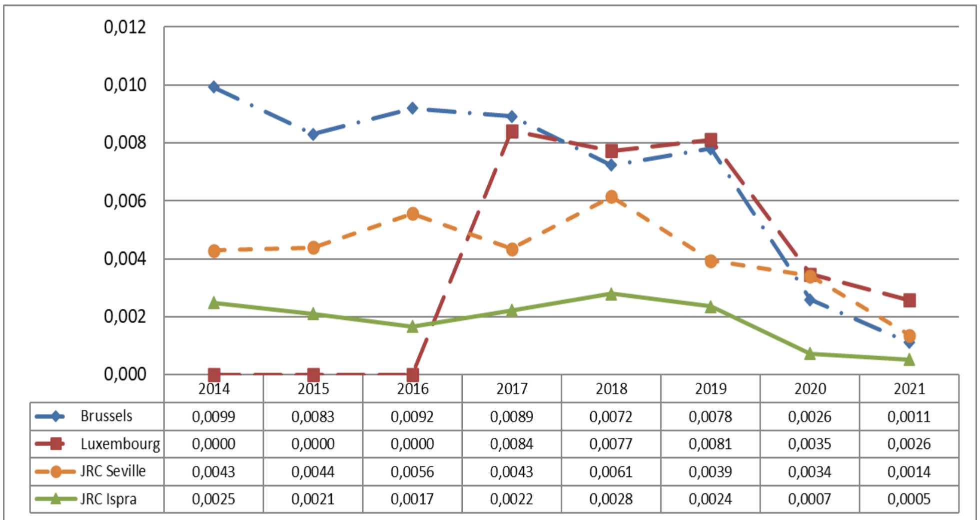
	Description	BX	LX	PE	GE	KA	SE	IS	GR	COM	REPs
Studies / awareness	Raising awareness with communication				1		2				1
	Staff training on multifunctional device						1				
Operational optimisation	Better inventory measurement			1					1		
	Data monitoring analysis						1				
Other	"Paperless working", various	4	3					2	1		1
	Use paper with higher recycled content	1									

The sites identified the following **key** actions in the 2021 Global Annual Action Plan:

- Brussels: Use more recycled paper; favour compulsory purchase of ecological items from office supply catalogue and Future tender for office furniture with the concept of upcycling
- Luxembourg: Receive contractual reports and documents only electronically; electronic conference information for participants
- JRC Ispra: General paper reduction program
- JRC Petten: Plan to better manage the paper inventory
- JRC Seville: General paper reduction campaign
- DG SANTE at Grange: General paper reduction program based on technology
- DG COMM Reps: Implementation of the paperless DG Communication strategy.

3.3.2 Print shop paper consumption

Figure 3.9 Evolution of print shop paper consumption at the EMAS sites, 2014-21 (tonnes/person)



	2014	2015	2016	2017	2018	2019	2020	2021
Brussels	0,0099	0,0083	0,0092	0,0089	0,0072	0,0078	0,0026	0,0011
Luxembourg	0,0000	0,0000	0,0000	0,0084	0,0077	0,0081	0,0035	0,0026
JRC Seville	0,0043	0,0044	0,0056	0,0043	0,0061	0,0039	0,0034	0,0014
JRC Ispra	0,0025	0,0021	0,0017	0,0022	0,0028	0,0024	0,0007	0,0005

JRCs Petten, Geel, Karlsruhe and Grange have no print shop and/or undertake a negligible amount of printing and are therefore not included in Figure 3.9.

Luxembourg started to report separately on paper used in the printshops 2017. JRC Seville contracts a large amount of offset printing per capita compared to other sites, because the lower number of staff in Seville compared to other sites makes that the ratio of offset printing by person is higher than other.

Moreover, a positive trend may be observed due to the policies implemented by JRC Seville's program office. JRC-Ispra prints for other JRC sites. The Commission reduced per capita print shop output in 2021 in all sites.

4 Reducing the carbon footprint, other greenhouse gases and air pollutants

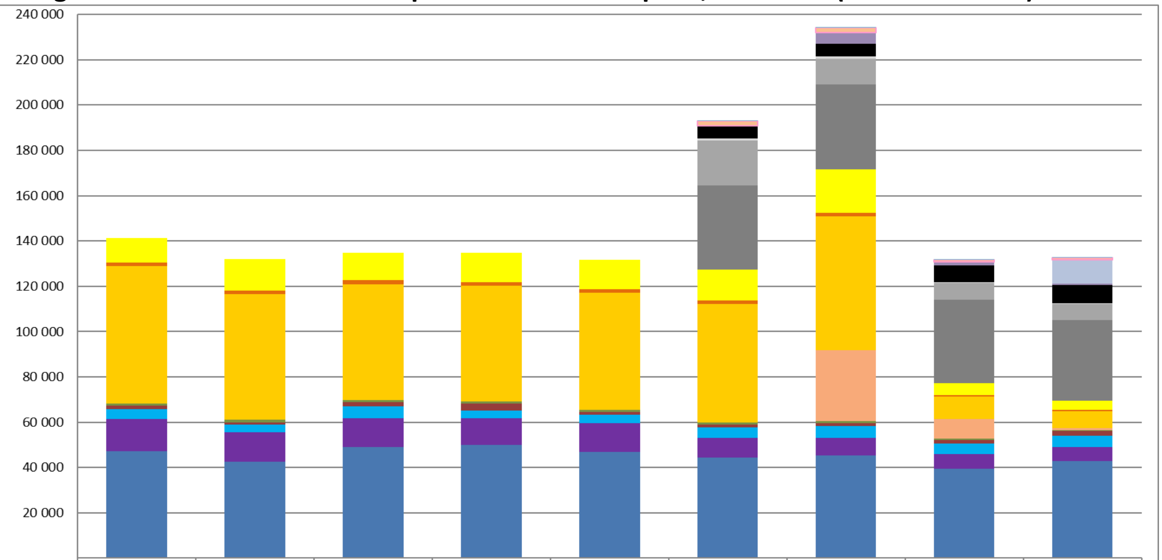
4.1 Overview of total emissions

Figure 4.1 shows the evolution of the main categories of emissions comprising the Commission's carbon footprint. The Commission significantly expanded its reporting in 2018, to include fixed assets (buildings and IT), purchased goods and services, waste and upstream emissions due to energy consumption.

Further additions in 2019 included fixed assets (embodied energy of Commission vehicles and of infrastructure for renewable energy), and a fuller assessment of upstream emissions, for example in relation to green electricity contracts.

Also new in 2021 are the impact of teleworking ([29]), and the emissions attributed to external experts' travel for which the cost is borne by the Commission's administrative budget.

Figure 4.1 The Commission's reported carbon footprint, 2014-21* (tonnes of CO_2e)



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	141.266	131.996	134.686	134.640	131.832	193.103	234.177	131.711	132.731
Other category (Ispra)	0	0	0	0	0	168	143	143	143
Own waste	0	0	0	0	0	2.007	2.181	783	792
Teleworking emissions	0	0	0	0	0	0	0	0	10.766
Catering	0	0	0	0	0	548	4.954	1.444	444
Service contracts	0	0	0	0	0	5.062	5.581	7.438	8.138
Paper supply	0	0	0	0	0	946	923	341	231
Fixed assets - Commission vehicles	0	0	0	0	0	174	173	101	123
Fixed assets - IT	0	0	0	0	0	19.557	11.121	7.423	7.129
Fixed assets -buildings	0	0	0	0	0	37.211	37.561	36.716	35.538
Staff commuting	10.850	13.908	12.103	12.725	13.086	13.611	19.137	5.269	3.991
Missions excluding air	1.566	1.643	1.795	1.814	1.633	1.597	1.635	878	627
Missions air (RFI=2) and air taxi	60.515	55.467	50.870	51.005	51.572	52.286	59.147	9.677	7.469
Experts' travel	0	0	0	0	0	0	31.217	8.730	748
Vehicle fleet fuel consumption	952	967	977	1.002	948	948	944	524	584
Buildings coolant losses	1.544	1.121	1.840	2.958	1.182	1.317	1.188	1.803	2.048
Buildings - district heating/cooling	4.506	3.314	5.329	3.479	3.859	4.562	5.317	4.455	4.896
Buildings - electricity	14.207	13.157	12.672	11.820	12.739	8.743	7.684	6.465	6.248
Buildings - fuel for heating	47.126	42.420	49.100	49.837	46.813	44.365	45.270	39.519	42.815

([29]) As described in Section 2.2

*The scope was significantly increased in 2018, and reporting has improved Reporting revisions in 2020 are where possible back calculated at least to 2018. The 2019 emissions include approximately 10 k tonnes that were estimated as 'unreported' in the 2019 Environmental Statement. Missions' emissions were calculated for the first time in 2021 using the internal mission management system data (MiPs)

The effect of the COVID pandemic on staff missions' emissions is evident with even lower emissions in 2021 following already significant reductions in 2020. The reduction in external experts' travels emissions is more pronounced, with a reduction of 91% compared to 2020 and of 97% compared to 2019.

Emissions from commuting, catering and own waste reduced as expected with increased staff absence in 2021. Buildings related emissions (electricity, heating or cooling) did not decrease mainly because increased ventilation and cooling was mandatory to avoid spreading the coronavirus and as staff work mostly in individual offices it was not possible to concentrate in fewer buildings. An increase in heating and cooling was needed to compensate the ventilations effects. In some sites, such as Brussels this increased energy consumption was partially offset by a reduction for certain periods in the number of buildings that remained open.

Overall, the carbon footprint decreased in 2021 (excluding the teleworking emissions (10,8 ktonnes) that were estimated for 2021 (but not 2019, 2020). Table 4.1 shows the impact of teleworking under the COVID pandemic (2021), and the addition of experts' travel (since 2019), as the two main additional elements to improve reporting of the carbon footprint this year.

Table 4.1 – Main components of the Commission's carbon footprint, tonnes CO_2e ([30]) (2018 - 2021)

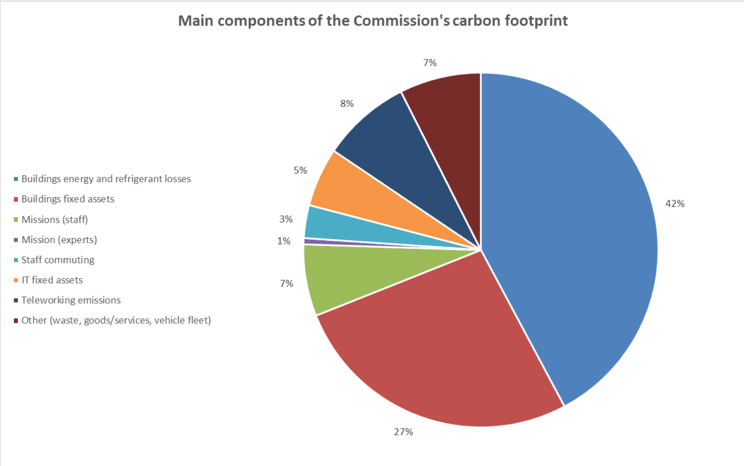
Main contributors	2018	2019	2020	2021	2018	2019	2020	2021
	tonnes CO_2e				% of total			
Buildings energy and refrigerant losses	58 988	59 459	52 242	56 008	31	25	39	42
Buildings fixed assets	37 211	37 561	36 716	35 538	19	16	28	27
Missions (staff)	54 831	61 726	11 079	8 680	28	26	9	7
Mission (experts)		31 217	8 730	748	0	13	7	1
Staff commuting	13 611	19 137	5 269	3 991	7	8	4	3
IT fixed assets	19 557	11 121	7 423	7 129	10	5	6	5
Teleworking emissions				10 766				8
Other (waste, goods/services, vehicle fleet)	8 905	13 957	10 251	9 871	5	6	8	7
Sum	**193 103**	**234 177**	**131 711**	**132 731**	**100**	**100**	**100**	**100**

Note: Staff commuting data for 2018 excludes Luxembourg

Figure 4.2 shows that with reduced travel emissions, buildings account for a much larger proportion of the total.

([30]) All carbon emissions in this chapter are expressed as CO_2e (carbon dioxide equivalent, which allows for warming effects related to combustion and release of refrigerants to be included, as well as other warming gases).

Figure 4.2 Main components of the Commission's carbon footprint, 2021



The data show that in 2021, under COVID conditions, emissions from the Commission's buildings energy emissions and the embodied (fixed energy) decrease a little, from 73% to 69% of the carbon footprint.

IT fixed assets represented a smaller proportion in 2022 as several coefficients used in the calculation have been revised downwards, and the rollout of laptops has continued, along with the phasing out of desktops and individual printers.

4.2 Scope and detailed per capita emissions by site in 2021

The Commission chairs the Inter-institutional environment group (GIME) and in November 2017 adopted a common methodology for calculating carbon emissions in response to the European Court of Auditor (ECA) 2014/14 special report on the subject.

Appendix 2 describes the different components, and conversion factors used when calculating the Commission's footprint for 2021. For coherence (and simplicity), the central coordination team recommends that EMAS sites use these values, but the sites can (exceptionally) choose different values, for example at the request or under guidance of national authorities.

4.2.1 Scopes defined

For the purposes of Greenhouse Gas (GHG) reporting, emissions fall under different "scopes" ([31]):

- Scope 1: "Direct" emissions typically arising from own fuels combustion (e.g. boilers, furnaces), owned transport (Commission owned or operated vehicles), process emissions and fugitive emissions (refrigeration and air conditioning leaks);
- Scope 2: "Indirect" emissions from energy consumed but produced by others (purchased electricity, heat, and steam cooling); and
- Scope 3: Other "indirect" emissions including, transport related activities (commuting and business travel, distribution), fixed assets, purchased goods and services, waste disposal (waste, recycling), purchased materials and fuels (e.g. extraction, processing and production), fixed assets, teleworking.

([31]) http://www.ghgprotocol.org/calculation-tools/faq

More than one scope may be associated with a particular type of energy use. When the Commission consumes gas for heating, or either petrol or diesel for its vehicle fleet, the reported emissions result from not only combusting the fuel (scope 1) but also from the extraction and supply (scope 3).

The additional parameters added for reporting in 2018/9 permit the embodied emissions of renewable energy supply infrastructure to be considered, as well as the emissions used to produce Commission fleet vehicles – although in both cases, the contribution to the carbon footprint is relatively small.

4.2.2 Uncertainty

The breakdown of the carbon footprint in the following section illustrates that it is very data intensive and relies on many conversion factors. Both the data and factors have associated degrees of uncertainty, and these increase with scope, especially for factors. Energy invoices provide consumption data with a high level of precision (considered +/-5% accuracy), as they are based on calibrated meter readings. The factors used to convert the consumption to emissions are based on physical/chemical properties that are well known, and similarly have low uncertainty.

While input data is from invoices, or databases (eg IT equipment), the uncertainty remains low. But estimating the Global Warming Potential of refrigerants over 100 years, which may be composed of two or more substances leads to factors considered to have around 30% uncertainty. The factors used to estimate emissions from the construction of buildings, IT equipment, and food that all have very complex supply chains are subject to (frequently updated) research and uncertainties of 50%. A few conversion factors have 80% or more uncertainty as shown in Table 2 (Annex 2 page 91).

Therefore, adding additional elements, beyond scope 1 and 2 necessarily involves considerable additional resources while providing answers that are more uncertain. It is important therefore to use a consistent approach year to year.

Total uncertainties have been calculated per each factor in the master datasheet in order to have an idea of the magnitude of the uncertainty for every data.

4.2.3 Per capita emissions by site – detailed summary for 2021

Table 4.3 presents the categories of the Commission's footprint, as calculated for each site in 2021.

Table 4.3 Per capita equivalent (CO_2e) emissions by scope and site 2021 (tonnes)

	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Sevilla	JRC Karlsruhe	JRC Ispra	Grange
Scope 1: Own fuel use and direct loss	**0,53**	**0,83**	**2,06**	**2,19**	**0,21**	**0,06**	**6,48**	**1,50**
Fuel for bldgs: mains gas	0,485	0,738	1,914	1,412	0,213	0,000	6,331	0,000
Fuel for bldgs: tanked gas (1) (biogas)	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	0,000
Fuel for bldgs: diesel	Ne	Ne	Ne	0,028	Ne	0,009	0,008	1,432
Biomass	N.a.	0,002	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.
Commission vehicle fleet	0,011	0,014	0,028	0,012	0,000	0,048	0,011	N.a.
Refrigerants (2)	0,037	0,071	0,118	0,741	0,000	0,000	0,127	0,070
Scope 2: Purchased energy	**0,01**	**0,49**	**0,00**	**2,45**	**1,08**	**16,15**	**0,00**	**0,96**
External electricity supply (grey),	0,010	0,264	N.a.	N.a.	1,080	8,045	N.a.	0,952
External electricity supply contract (renewables), combusti	0,000	0,000	0,004	0,004	0,003	0,003	0,000	0,006
District heating (combustion)	N.a.	0,225	N.a.	2,450	N.a.	8,106	N.a.	0,000
Scope 3: Other indirect sources	**1,63**	**1,99**	**2,93**	**5,35**	**1,02**	**3,49**	**3,28**	**2,54**
Fuel for bldgs: mains gas (upstream)	0,102	0,155	0,402	0,297	0,045	0,000	1,331	N.a.
Fuel for bldgs: tanked gas (upstream) (1)	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	Ne
Fuel for bldgs: diesel (upstream)	Ne	Ne	Ne	0,006	Ne	0,002	0,002	0,312
Commission vehicle fleet (upstream)	0,003	0,004	0,007	0,003	Ne	0,012	0,003	N.a.
Site generated renewables (upstream) (3)	0,000	0,002	0,043	0,000	0,000	0,000	0,028	Ne
External grey electricity supply, line losses	0,001	0,024	N.a.	N.a.	0,096	0,716	N.a.	0,085
Ext. 'renewables' electricity contract (upstream + line loss)	0,023	0,034	0,043	0,341	0,000	0,000	0,043	0,000
District heating (upstream)	N.a.	0,036	N.a.	0,387	N.a.	1,281	N.a.	N.a.
Business travel: air (combustion) + (including air taxi)	0,225	0,041	0,024	0,019	0,065	0,030	0,035	0,211
Business travel: rail (combustion)	0,004	0,002	0,002	0,006	0,004	0,017	0,001	0,006
Business travel: hire car (combustion)	0,001	0,015	0,000	0,000	0,000	0,022	0,001	0,007
Business travel: private car (combustion)	0,006	0,019	0,004	0,024	0,003	0,062	0,007	0,037
Commuting (combustion) (4)	0,063	0,207	0,308	0,220	0,076	0,256	0,243	0,022
Fixed assets - buildings	0,864	0,756	0,793	2,052	0,391	0,362	1,145	1,452
Fixed assets - IT	0,155	0,204	0,249	0,673	0,257	0,635	0,225	0,127
Fixed assests - Commission vehicles	0,003	0,004	0,008	0,001	Ne	N.a.	0,003	N.a.
Paper supply	0,006	0,002	0,012	0,006	0,005	0,003	0,004	0,006
Service contracts	0,155	0,438	1,018	1,192	0,073	0,089	0,052	0,160
Catering (5)	0,004	0,023	0,000	0,043	0,001	0,000	0,073	0,021
Own waste	0,016	0,029	0,019	0,078	0,003	0,000	0,030	0,094
(Other category) - Ispra	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	0,058	N.a.
Sum	**2,47**	**3,57**	**5,22**	**10,27**	**2,42**	**20,01**	**9,95**	**5,29**

Notes: N.a – Not applicable, Ne - Negligible

(1) Grange is the only site with tanked gas rather than mains gas; **(2)** refrigerant losses reported as zero at Seville (maintenance register), Karlsruhe (according to protocol - less than 3%)**; (3)** Geothermal, biomass, PVs, (for JRC Geel electricity supply for heat pumps includes upstream emissions) **(4)** Can include Commission bus service when appropriate **(5)** JRCs Petten, Karlsruhe and Seville use restaurants outside the site boundary. A small cafe within the Karlsruhe boundary was closed for for 2021.

The main observations arising from Table 4.3, are:

- Carbon footprints ranged from less than 5 tonnes/person (Brussels, Luxembourg, Petten, Seville the sites; other than JRC Petten) with a high proportion of offices) to 10-20 tonnes/person (Ispra and Karlsruhe) sites with extensive experimental facilities.
- Scope 1 emissions (own fuels use and direct losses) usually represent a small proportion of the total emissions. JRC Ispra is the exception with its gas fired tri-generation plant that accounts for over half of the total.
- Scope 2 emissions (purchased energy) is particularly high for JRC Karlsruhe, which relies on electricity and district heating for almost all of its buildings' energy requirements. The combination of high energy consumption and relatively low proportion of renewables in the energy mix generates considerable per capita emissions, The site cannot select the suppliers, and is dependent on arrangements made by the KIT campus.
- Scope 3 emissions (other indirect sources) represent the greatest proportion of the carbon footprint for sites other than Karlsruhe and JRC Ispra. In 2021 they were nearly three times the combined total for Scopes 1 and 2. By definition Scope 3 emissions are more difficult to manage with management having "indirect" control. (This means that particular attention is required in the tendering process to ensure that contracts include the measures necessary to reduce emissions).

There are Commission targets for both Scope 1 and 2 emissions. **Further discussion of different categories of emissions are presented in Appendix 3, as follows**

3.1 Emissions due to buildings' energy consumption

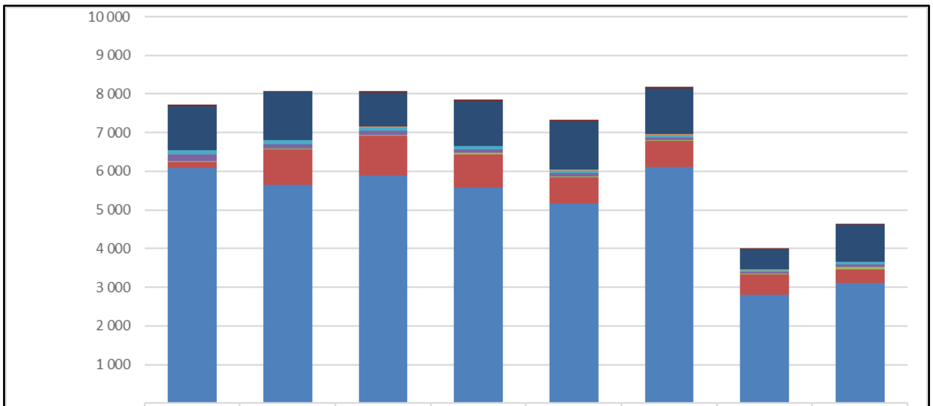
5 Improving waste management and sorting

Waste management practices vary from site to site. Some, such as JRC Geel, consider all waste generated on site to be the Commission's direct responsibility and therefore include all contractors' waste in their waste reporting system, and JRC Karlsruhe, that due to its nuclear status must ensure that all site waste generated is disposed of by very tightly controlled channels. In other sites, the quantity of waste directly disposed by contractors may not be included in the site's figures. As indicated in Appendix 3.12, only 0.4 to 0.5% of emissions due to waste disposal arise from landfilling, underlining the importance of the circular economy.

5.1 Reducing non-hazardous waste generation ([32])

Figure 5.1 data indicate that in 2021 the Commission, assisted by the COVID pandemic, reduced its non-hazardous ([33]) waste generation by nearly half from 2019 to 2020 before increasing by over 10% in 2021.

Figure 5.1 Generation of non-hazardous waste at EMAS, 2014-21 (tonnes)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	7 735	8 084	8 082	7 857	7 332	8 183	3 993	4 632
Grange	45,0	40,5	50,2	38,7	45,2	40,4	15,2	18,2
JRC Ispra	1 148	1 235	878	1 155	1 247	1 185	525	958
JRC Seville	6,41	5,48	18,1	11,3	10,7	16,1	5,2	3,7
JRC Karlsruhe	107	102	82	80	85	78	60	57
JRC Geel	166	115	108	95	76	65	40	59
JRC Petten	29,6	27,8	32,2	35,9	28,4	24,2	16,3	83,9
Luxembourg	153	904	1 032	860	681	671	521	336
Brussels	6 081	5 654	5 882	5 580	5 158	6 103	2 810	3 116

While the overall tendency in 2021 was an increase in non-hazardous waste generation, several sites including most notably Luxembourg, and JRC-Karlsruhe generated less hazardous waste.

The decrease for Luxembourg was due to additional staff members and to the low presence at the office due to the pandemic.

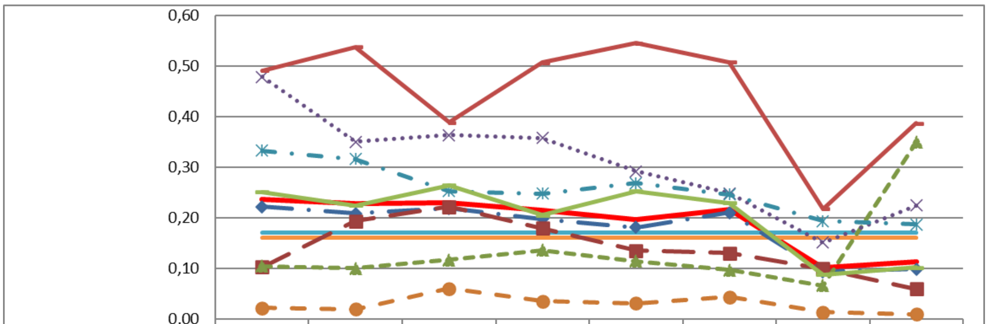
JRC Karlsruhe has developed their policy of waste partitioning and recycling which constantly seeks to reduce overall waste production.

Figure 5.2 shows the evolution of per capita waste generation at Commission sites and Commission level targets.

([32]) Definition of non-hazardous and hazardous waste according to the EU Waste Directive 2008/98/EC

([33]) It should be noted that at some sites contractors' construction and demolition waste is included in the total (JRCs Petten, Geel) and this can give rise to significant year-to-year fluctuations. Works at JRC-Ispra contribute to significant year on year variation

Figure 5.2 Evolution of non-hazardous waste generation at EMAS sites, 2014-21 (tonnes/person)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	0,24	0,23	0,23	0,21	0,20	0,22	0,10	0,11
Target 2014-23	0,17	0,17	0,17	0,17	0,17	0,17	0,17	0,17
Target 2014-30	0,16	0,16	0,16	0,16	0,16	0,16	0,16	0,16
Brussels	0,22	0,21	0,22	0,20	0,18	0,21	0,09	0,10
Luxembourg	0,10	0,19	0,22	0,18	0,14	0,13	0,10	0,06
JRC Petten	0,10	0,10	0,12	0,14	0,11	0,10	0,07	0,35
JRC Geel	0,48	0,35	0,36	0,36	0,29	0,25	0,15	0,23
JRC Karlsruhe	0,33	0,32	0,25	0,25	0,27	0,25	0,19	0,19
JRC Seville	0,02	0,02	0,06	0,03	0,03	0,04	0,01	0,01
JRC Ispra	0,49	0,54	0,39	0,51	0,55	0,51	0,22	0,39
Grange	0,25	0,23	0,26	0,21	0,25	0,23	0,09	0,10

The Commission reduced non-hazardous waste generation from nearly 300 kg/person in 2005 ([34]) to less than 200 kg/person in 2019. It halved between 2019 and 2020 and increased a little in 2021 because, in the case of Brussels, figures related to waste produced by refurbishment works have been included in this year's reporting.

At JRC-Ispra, the increase is due both to the resumption of normal activities on site and to a greater presence of staff compared to 2020. At Petten 2021 recorded a significant rise due to the removal of two cranes and therefore a remarkable increase of metal waste.

The 2014-23 and 2014-30 targets have been already met. There is some fluctuation in recent years particularly of sites newer to EMAS implementation.

JRC-Seville cooperated with the cleaning company to implement a new waste management plan. In Luxembourg the relocation of staff from the Jean Monnet (JMO) building generated considerably more waste in 2016 and 2017. JRC Ispra site's rate of waste generation has fluctuated in recent years owing to variable infrastructure works across the site but reduced by 7% in 2019 before more than halving in 2020 and in 2021, owing largely to the impact of the COVID pandemic.

The Commission has sought particularly since 2018 to reduce the use of single-use plastics (SUP) in its vending machines and catering facilities, and part of this involved replacing non-recyclable cups and installing water fountains. The corporate EMAS Coordination team was initially able to identify and report on 56 actions across the eight EMAS sites plus the corporate actions and the actions foreseen at EC representations in Member States, demonstrating progress in this initiative, and these have progressed considerably.

The sites identified the following types (and numbers) of actions to reduce non-hazardous waste in the 2022 EMAS Global Action Plan.

Table 5.1: EMAS Global Annual Action Plan – Ongoing site level ongoing actions to reduce non-hazardous waste generation

	Description	BX	LX	PE	GE	*KA*	SE	IS	GR	COM	REPs
Studies / awareness	Raise awareness	1	1	2	1			1		1	1
	Improve waste management procedures, GPP	2	1	1			2		1		

([34]) Commission performance from 2005 to 2009 is based heavily on Brussels data

Operational optmisation	Contractor to report on their own waste		1								
	Improve demand management in self restaurants	1									
	Improve demand management for children's facilities	1									
	Improve demand management for printed publications or improve publication process						2				
	Reduce number of bins	1									
	Replace plastic cups with alternatives, or other reusable crockery	2							2		1
	Reduction of single-use plastic (SUP)	6	1				3	8	3		
	Replace disposable cups with porcelain	1	1								
	Reuse (unused) office supply		1								
	Organic waste recycling						1				
Large investment	Install water fountains or dispensers	2						1	1		
IT	Replace printing devices (JRC policy)						1				

Brussels has the greatest number of actions, and several are to reduce SUP. Brussels and JRC Ispra have moved towards installing water fountains. JRC Karlsruhe implemented many waste sorting and reducing activities also associated with plastic many years ago. JRC-Geel reduced SUP generation by introducing glass bottles and drinking water fountains in 2019, while JRC-Ispra has also continued its commitment to avoid the use of SUP, and encouraging staff to do so, through awareness campaigns.

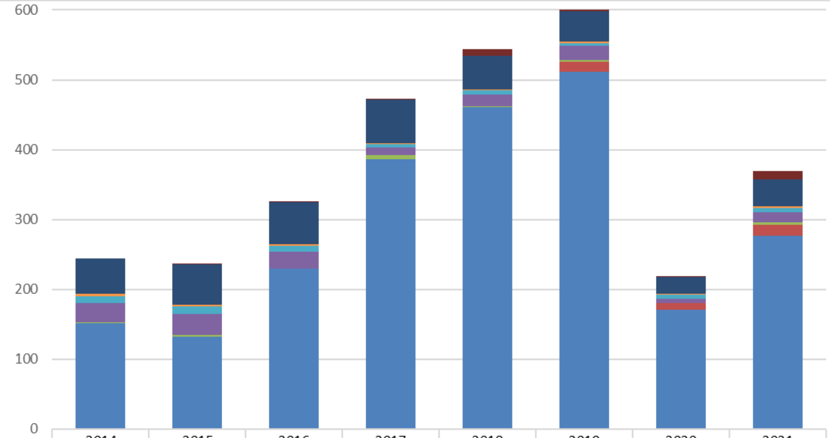
The sites identified the following **key** actions for reducing non-hazardous waste generation in the 2021 Global Annual Action Plan:

- Brussels: Raise waste contractor's awareness; centralised waste sorting stations pilot project extended to additional buildings; create waste working group; replace offset printing technology; tender for digital press using water based inks; ecological supplies in office supply contract; tenders for upcycling and recycling of office furniture; inter-institutional tender for collection and recycling of bulky items; avoid SUP by promoting green events; pilot project to collect and recycle paper cups and paper towels; replace paper cups by porcelain cups; replace chemical based cleaning products by bio based products; pilot project for the use of washable diapers, producing less waste and requiring less water in the diapers' fabrication process; installation of water fountains at the afterschool care facilities, replacing the use of plastic bottles, using paper cups
- Luxembourg: General waste reduction campaign including for educators and children; extend pilot for common waste points to additional buildings; include in tenders the obligation for contractors to deal with and report on the waste they produce linked to activities in the Commission; reduction of single use plastic items; receive contractual reports and documents only electronically; electronic conference information for participants; analyse possibility to reuse declassified furniture and replacing paper cups with porcelain cups
- JRC-Ispra: Improve waste indicators; promote waste reduction and separation; increase percentage of recycled urban waste; optimise control of the new storage facility for special waste; optimise the operational control of the waste coming from construction/demolition sites
- JRC-Geel: set up waste segregation islands to replace individual bins; organise eco workshops in waste reduction campaigns; recruit a nuclear waste manager
- JRC-Petten: general awareness campaign
- JRC-Seville: Waste sorting station in new conference centre

- DG SANTE at Grange: Reduce waste to landfill
- DG COMM Reps: Staff awareness actions about waste reduction and sorting and staff awareness actions on organising green meetings and events

5.2 Reducing hazardous waste generation ([35])

Figure 5.3 Hazardous waste generation at EMAS sites, 2014-21 (tonnes)

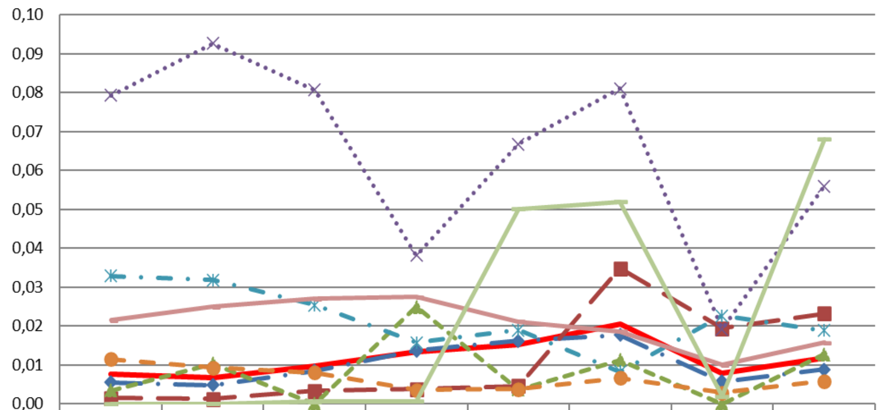


	2014	2015	2016	2017	2018	2019	2020	2021
Commission	244	235	326	472	544	607	219	370
Grange	0,00	0,0	0,1	0,1	9,0	9,1	0,3	12,1
JRC Ispra	50	57	61	63	48	43	24	39
JRC Seville	3,33	2,6	2,4	1,1	1,3	2,4	1,1	2,3
JRC Karlsruhe	10,51	10,3	8,2	5,1	6,0	2,6	7,0	5,8
JRC Geel	27,4	30,4	23,9	10,1	17,3	21,2	5,1	14,7
JRC Petten	0,96	2,9	0,0	6,5	0,9	2,8	0,0	3,1
Luxembourg	0,00	0,00	0,0	0,0	0,0	13,8	9,7	16,2
Brussels	152	132	230	386	461	512	171	277

The Commission generates far less hazardous than non-hazardous waste. Figure 5.3 shows again that, largely owing to the COVID pandemic, the Commission reduction in hazardous waste generation in 2020 was remarkable, although in 2021 it increased slightly due to a gradual return to the office.

Year to year comparisons for the research sites may not always be appropriate because some hazardous wastes are stockpiled prior to disposal, and the type and quantity of waste will vary with the experimental program. For this reason, the EMAS Steering Committee decided to discontinue the hazardous waste generation target.

Figure 5.4 Evolution in hazardous waste generation at EMAS sites, 2014-21 (tonnes/person)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	0,008	0,007	0,010	0,013	0,015	0,020	0,008	0,012
Brussels	0,006	0,005	0,009	0,014	0,016	0,018	0,006	0,009
Luxembourg	0,001	0,001	0,003	0,004	0,005	0,035	0,019	0,023
JRC Petten	0,003	0,010	0,000	0,025	0,004	0,011	0,000	0,013
JRC Geel	0,079	0,093	0,081	0,038	0,067	0,081	0,019	0,056
JRC Karlsruhe	0,033	0,032	0,025	0,016	0,019	0,008	0,023	0,019
JRC Seville	0,012	0,009	0,008	0,004	0,004	0,007	0,003	0,006
JRC Ispra	0,021	0,025	0,027	0,027	0,021	0,019	0,010	0,016
Grange	0,000	0,000	0,001	0,001	0,050	0,052	0,002	0,068

Some of the actions included in the EMAS Annual Action Plan to reduce hazardous waste included:

- JRC Geel: Recruitment of a new nuclear waste manager and build a new hazardous waste storage facility
- JRC Ispra: new hazardous waste storage facility and daily presence of an onsite waste operator
- Brussels: replace offset printing technology

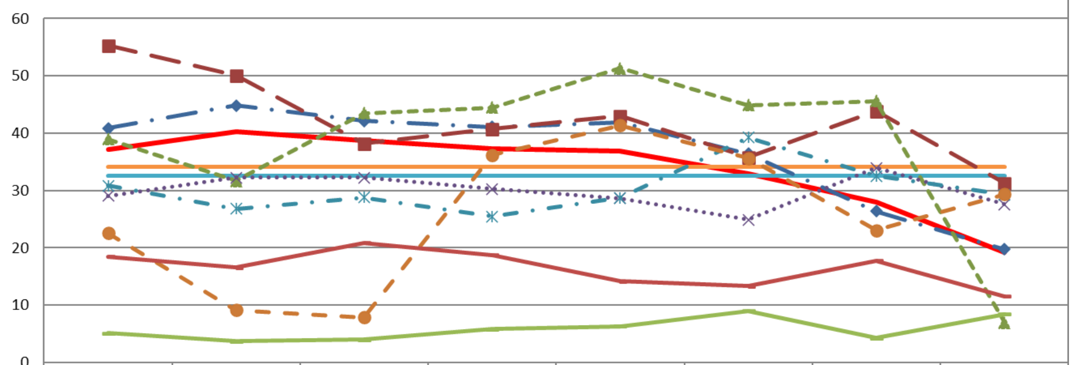
Ispra Operational Nuclear Decommissioning and Waste Management has signed a Material Transfer Agreement with Radiopharmaceutical Chemistry Unit of Czech Technical University of Prague about the donation, and indeed the re-use, of the Cyclotron lab, an amazing example of circular economy. Several shipments have occurred since the signature of the agreement with the last one planned for September 2022.

5.3 Sorting waste into reusable waste streams

Figure 5.5 shows a decrease in the unsorted waste mainly due to sites' efforts to maximise the sorting of waste into potentially useful recycling streams and minimise the amount of unsorted "general" waste.

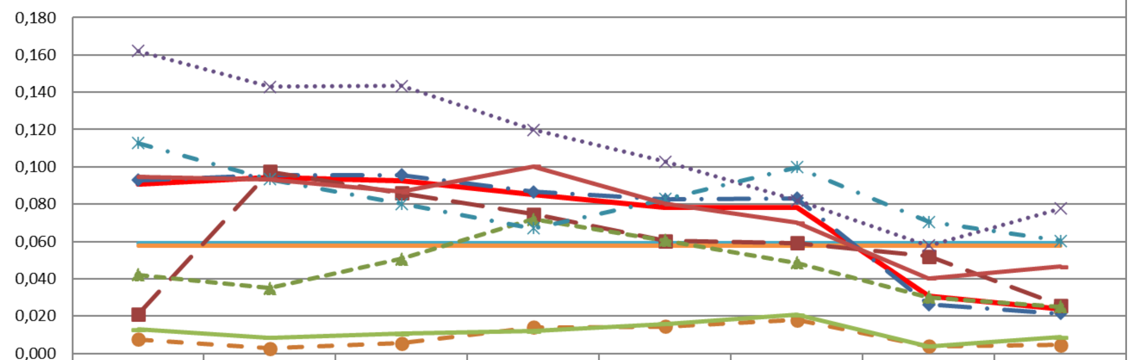
2020 and 2021 figures may not be representative, due to the low buildings' occupancy. But indeed, the percentage of unsorted waste decreased substantially, from 40 to 25%.

Figure 5.5 Unsorted waste as proportion of total waste at EMAS sites, 2014-21 (%)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	37,1	40,3	38,7	37,3	36,9	32,9	28,0	19,1
Target 2014-23	32,55	32,55	32,55	32,55	32,55	32,55	32,55	32,55
Target 2014-30	34,07	34,07	34,07	34,07	34,07	34,07	34,07	34,07
Brussels	40,8	44,8	42,2	41,0	41,8	36,4	26,4	19,8
Luxembourg	55,3	50,1	38,2	40,7	43,0	35,8	43,8	31,3
JRC Petten	39,0	31,7	43,5	44,5	51,3	44,9	45,6	6,9
JRC Geel	29,0	32,2	32,3	30,2	28,6	24,9	33,9	27,6
JRC Karlsruhe	30,8	26,8	28,8	25,4	28,7	39,2	32,5	29,3
JRC Seville	22,6	9,2	7,8	36,2	41,4	35,6	23,1	29,3
JRC Ispra	18,5	16,6	20,9	18,7	14,2	13,3	17,7	11,5
Grange	5,1	3,7	4,0	5,8	6,3	9,0	4,3	8,4

Figure 5.6 Unsorted waste at EMAS sites, 2014-21 (tonnes/person)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	0,091	0,095	0,093	0,085	0,078	0,078	0,031	0,024
Target 2014-23	0,06	0,06	0,06	0,06	0,06	0,06	0,06	0,06
Target 2014-30	0,06	0,06	0,06	0,06	0,06	0,06	0,06	0,06
Brussels	0,09	0,10	0,10	0,09	0,08	0,08	0,03	0,02
Luxembourg	0,02	0,10	0,09	0,07	0,06	0,06	0,05	0,03
JRC Petten	0,04	0,03	0,05	0,07	0,06	0,05	0,03	0,03
JRC Geel	0,16	0,14	0,14	0,12	0,10	0,08	0,06	0,08
JRC Karlsruhe	0,11	0,09	0,08	0,07	0,08	0,10	0,07	0,06
JRC Seville	0,01	0,00	0,01	0,01	0,01	0,02	0,00	0,00
JRC Ispra	0,09	0,09	0,09	0,10	0,08	0,07	0,04	0,05
Grange	0,01	0,01	0,01	0,01	0,02	0,02	0,00	0,01

JRCs Petten and Ispra have the lowest proportion of unsorted waste, and Grange has achieved less than 10% in recent years. This low value is in part due to Grange's waste contractors undertaking additional sorting post collection. Brussels had improved waste sorted through improved awareness and the successful introduction of new waste sorting stations, initially installed as pilot trials in several DGs. JRC-Karlsruhe's figures are indicative as German legislation has a different definition for sorting.

Figure 5.6 shows that per capita unsorted waste reduced by 34% from 2020 to 2021, the Commission having already met the 2023 and 2030 targets. Approximately 0.6% of waste goes to landfill with JRC Ispra and Grange sites reporting this mode of disposal.

Table 5.2 summarises the types of initiatives of actions included in the 2022 Global Action Plan to reduce waste sorting, and the number of actions per site.

Table 5.2 EMAS Global Annual Action Plan - Types and number of ongoing site level actions to improve waste sorting

Type of action	Description	BX	LX	PE	GE	*KA*	SE	IS	GR	CO	REP
Studies / awareness	Staff awareness							2	1		1
	Documentation and procedures	1					1	1			1
	Contractor awareness	1									
	New tender for waste management contract	2					1				
Operational optimisation	Contractor to manage own waste		1								
	Standardise waste contractors' management		1								
	Signing and distribution of bins	2									
	Introduce waste sorting stations, or new storage areas	2			1		1				
	Replace plastic cups be biodegradable ones	1									
	Collect coffee grounds								1		

There are several actions seeking to improve waste sorting in most of the sites. Involving contractors is an important element of several actions.

5.3.1 Recycling obsolete IT and office equipment:

DG DIGIT has a contract with Oxfam Solidarity (Oxfam) since 2006 (and since 2017 with Close the Gap), for the “removal and recycling, for humanitarian purposes", of goods no longer used by the Commission but still useful beyond their economic life, and thus providing a useful social outcome. The sales fund these charities’ humanitarian and welfare activities. Through the agreements, DG DIGIT aims to reuse on average at least 70% of units collected from the Commission.

Table 5.3 shows actual recycling rates for IT collected in Brussels (and Luxembourg), indicating that far higher rates were achieved until 2017. The data includes material collected in Luxembourg which is transferred to processing facilities in Belgium.

Table 5.3 Number of IT and telephony items collected and recycled in Brussels and Luxembourg

	Year of collection											
Parameter	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Collected items	15 462	12 531	19 360	24 744	27 513	30 918	23 969	18 133	15 988	30 001	31 483	16 763
Processed items [1]	15 301	12 531	19 251	19 935	27 375	30 918	23 554	18 088	15 988	28 893	31 483	16 763
Items for second hand use	12 509	10 960	17 469	17 298	24 759	27 952	21 736	14 287	10 549	14 357	12 935	15 851
Second hand use (%)	82	87	91	87	90	90	92	79	66	49	41	95
Recycled or dismantled (%)	18	13	9	13	10	10	8	21	34	51	59	5
Weight of collected items (tonnes)	45,81	33,03	57,36	73,32	76,02	72,33	45,00	67,50	55,54	215,92	150,60	152,82

Note 1 - processing could take place in following years, (source DG DIGIT)

Left over equipment is transferred to authorised operators on behalf of Recupel, the non-profit organisation responsible for recycling electrical and electronic waste in Belgium. During the annual audit of Oxfam Solidarity under its EMAS registration, the auditor verified that its recycling measures complied with environmental regulations and noted the generally good progress it had made in relation to legal requirements.

The data reported are for IT and telephony, with the split between the two available since 2017. Although recycling of combined IT and telephony has fallen below 70% in 2018 and 2019, IT alone has remained above 70% according to Oxfam and Close the Gap data. If docking stations are excluded, re-use of IT was 85% in 2018 and 84% in 2019. Charities report that they cannot sell docking stations as they are generally not used in homes. Since the Commission has implemented telephony through its IT equipment it has disposed of most of its fixed phone sets. But the charities send these to Recupel for dismantling as there is no market for them, recycling rate of telephony was 23% in 2018 and 0% in 2019.

The high re-use rates for IT equipment were achieved despite the falling cost of new goods, which make older IT equipment less attractive. This is due to the generally good quality of the collected items, and systematic recycling effort made by Oxfam in the context of its EMAS registration and by Close the Gap through the ISO9001, ISO14001, OHSAS18001, R2 and WEEELABEX certificates of its partners.

Oxfam reports the weight of IT material collected and this is incorporated into the Brussels waste reporting. The quantity of waste that Oxfam collected (including donations to Close the Gap) increased from less than 100 tonnes prior to 2019 to over

200 tonnes, and decreased but still exceeded 100 tonnes in 2020/1 . Similar donations of IT were organised in the JRC's sites of Brussels, Ispra and Petten. With a global amount of 342 items in 2020, 498 in 2021. ([36])

ICT strategies such as replacing desktops by laptops, removing of personal printers, splitting computer and screen life cycles ([37]), replacing fixed line phones with Voice over Internet Protocol (VoIP) software solutions explains the variation in terms of volume and weight. Recycled office equipment (excluding ICT) under the same contract amounted to over 500 tonnes in 2016 and 2017, but reduced to 256 and 247 tonnes respectively in 2018 and 2019. Table 5.4 shows the evolution for different categories of IT equipment.

Table 5.4 Evolution of reported IT inventory from 2018 to 2021 at Commission sites*

Table 5.5 Evolution of reported IT inventory from 2018 to 2021 at Commission sites*					
Category of equipment	**2018**	**2019**	**2020 data**	**2021 data**	**% change 2018-21**
Computers and screens					
Desktop PCs	23908	14590	13534	10238	-57,2
Laptops	28267	35890	43939	43590	54,2
Docking stations	26074	35311	42133	43100	65,3
Flatscreens	61041	63714	72691	71283	16,8
Printers and scanners					
Individual printers	7361	3505	2637	1869	-74,6
Network printers and copiers	5911	5452	5407	4665	-21,1
Scanners	495	387	357	343	-30,7
Fax machines	242	168	145	129	-46,7
Telephones and faxes					
Simple (portable) phones	160	150	201	124	-22,5
Smartphones	9062	9314	7444	6973	-23,1
Fixed line telephones	43376	30884	17556	18487	-57,4
Servers and swtiches					
Informatics server	6160	5684	5855	5447	-11,6
Firewall router switch	2392	2490	7268	7029	193,9
Video equipment					
Projectors	845	673	656	554	-34,4
Videoconference installations	1418	1194	1273	1174	-17,2
Televisions	437	523	588	649	48,5

* All sites, although JRCs Seville and Karlsruhe data included from 2020

([36]) 2020: https://webgate.ec.europa.eu/connected/docs/DOC-250318 2021: report not published yet, data by JRC

([37]) CRT monitors and Desktop computers had roughly the same life expectancy. Since LCD screens were introduced, computers are replaced more frequently than the standalone screens which have a higher life expectancy.

6 Protecting biodiversity

Table 6.1 summarises the required EMAS biodiversity indicators including "nature-oriented areas" both onsite and offsite ([38]).

Table 6.1 Biodiversity indicators in 2021

Site	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Seville	JRC Ispra	Grange
Total use of land (m2)	285 928	138 339	332 500	380 316	72 000	12 094	1602 965	90 000
Per capita	9	24	1 385	1 446	236	31	648	513
Total sealed area (m2)	181 864	104 029	59 909	72 110	72 000	23 487	654 157	18 000
Per capita	6	18	250	274	236	60	264	102
nature oriented area onsite (m2)	104 064	34 310	75 591	308 206	162 000	4 994	948 808	18 250
Per capita	3	6	315	1 172	531	13	383	104
Nature oriented area offsite (m2)			197 000					18 000
Per capita			821					102

The data shows that JRCs Petten and Geel are the most sparsely populated sites, with JRC Ispra and DG SANTE at Grange also occupying several hundred square meters of land per person. The experimental JRC sites have relatively extensive sealed areas, due to the widespread presence of experimental apparatus. There is also plenty of room for nature at the experimental JRC sites. JRC Petten is involved in managing natural areas outside the site perimeter.

Volunteer groups organise occasional activities in Brussels and these have included incorporating potted plant areas at locations in front, or inside buildings' open courtyards. The OIB started a study with the University of Liège to develop an approach to incorporating biodiversity indicators in several urban areas at or between office buildings. This involved a participatory approach considering both input and output-based measurement criteria.

Activities at JRC Petten, JRC Geel and DG SANTE at Grange are discussed below. **Key actions** in the 2022 Global Action Plan included:

- Brussels, Luxembourg and DG SANTE Grange: Preparing a forest management plan or ecological enhancement plan or biodiversity plan
- JRC Geel: Preparing an updated biodiversity assessment and action plan for the forested areas and setting up priorities based on the 2020 biodiversity study
- JRC Ispra: Developing a multi-annual plan in line with the EU Biodiversity Strategy
- JRC Petten: Developing and updating the NATURA 2000 Control Plan with the Dutch authorities and creating new habitat, including insect hotels
- JRC Seville: Identification of specific biodiversity actions for the JRC Seville site.

6.1 Brussels

The OIB has launched a new project in 2021, with the aim of elaborating a strategy for the improvement of conditions for biodiversity in the external green areas of the buildings occupied / managed by the Commission in Brussels (action 505 in the

([38]) Where an organisation participates in the management of an area outside its perimeter

Global Annual Action Plan). The project is carried out in collaboration with the University of Liège, Agro-bio Tech department Gembloux, and with the involvement and consultation of a broad spectrum of stakeholders:

- OIB departments and other Commission DGs (ENV, JRC, HR), including the network of EMAS Correspondents across the Commission
- Local and regional authorities
- Other European Institutions; and
- NGOs involved in the fields of environment and sustainability.

This strategy, as main deliverable, is scheduled to be presented in the first semester 2022.

6.2 Natura 2000 site at JRC Petten

Staff from an external company analyzing the nature in the Natura-2000 dune area adjacent to the JRC Petten premises

In 2019 an external company was asked to perform a nature management plan for the Nature oriented area, a Natura-2000 dune area adjacent the JRC-Petten premises.
The results were delivered in 2020 and three different scenarios to improve the biodiversity and protect endangered species and habitats were suggested. In 2021 JRC Petten received a budget to implement the advanced scenario for nature preservation and restoration to achieve the goal to sustain biodiversity on site.

In 2021 JRC-Petten invited the responsible forester from the National Forestry (Staatsbosbeheer) to show the Natura 2000 area so addresses lessons-learned from the COV19 lockdown that will contribute to the "new normal" and efforts to reach Commission's climate neutrality objective by 2030.

6.3 JRC Geel's forestry management

To further enhance its biodiversity on its premises, JRC-Geel has hired an external company specialised in biodiversity to develop a biodiversity plan. This study, completed in 2020, assessed the existing status of the biodiversity and proposed complementary actions to increase it further.

A prioritisation of the actions was made in 2021. As a result, two main actions were carried out to improve both the fauna and flora:

- The first action has been the purchase of various bird nests of different types (owl, as well as bats) and, insect hotels to improve the fauna habitats.
- The second action set up was taken to increase the flora in the green areas of the JRC-Geel.

An additional action was initiated under the bumble bee nest project managed by unit R.6. Old wooden pallets were collected and sawed for the construction of bumble bee nests.

6.4 JRC Ispra's habitat mapping and species protection

JRC-Ispra site features 33 hectares of natural habitats of conservation covered by the Habitats Directive. A 3 years' monitoring plan of habitat surfaces is in place, the next habitat survey is foreseen in 2022.

Habitat	EU Habitat Directive code	2019
Grasslands: high-diversity plant communities Acidophilous meadows, Dry meadows, Wet meadows	6230*: Species-rich Nardus grasslands	3.73 ha
	6150: Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	3.48 ha
	6510: Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	3.02 ha
	Total	10.23 ha
Wetlands Surface waters and swamp	3150: Natural euthrophic lakes with Magnopotamion or Hydrocharition-type vegetation	1.30 ha
Wet woodlands Alder woodland and mixed alder-oak woodland	91E0*: Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	17.11 ha
Dry woodlands Oak woodland	9190: Old acidophilous oak woods with Quercus robur on sandy plains	4.67 ha

JRC-Ispra has established a biodiversity monitoring approach that adopts scores to reflect both the quantity and quality of site biodiversity. This way forward allows defining objectives and evaluating progress in time.

A field survey recorded the population of different species of amphibians, including a protected species of frog.

Deadwood (coarse woody debris) is also a proxy indicator for biodiversity, since it is a habitat for a wide array of organisms including vertebrates, invertebrates, lichens, bryophytes and fungi. In 2021, a "**dead wood garden**" has been developed along a popular footpath to inform the staff about the biodiversity on site.

As a symbolic gesture to preserve the site's green areas and to engage staff, a yearly JRC Tree day was established as a recurring event on 21st November and in 2021 101 trees and shrubs were planted on site in activities involving management.

Moreover, to improve the perimeter of a wooded area during 2021, exotic forest species have been eliminated to prevent dead branches (or the trees) from falling and 658 native trees and 927 shrubs have been planted with the aim of recovering forest habitats of community interest "Alluvial forests of Alnus glutinosa and Fraxinus excelsior.

In addition, JRC-Ispra is planning to reduce the number of invasive alien species by removing American pokeweed and cutting the Pygmy Bamboo, removing 9 invasive species such as *Pinus nigra* (black pine), *Quercus rubra* (northern-red oak), *Pinus strobus* (white pine) and girdling of *Robinia pseudoacacia* (black locust) and *Prunus serotina* (black cherry): 200 plants which will be removed in 2022.

JRC Ispra habitat map, and zoning for forest works

6.5 Ecological enhancement at Grange

DG SANTE at Grange projected landscape enhancement

Several activities listed in the Global Annual Action Plan are for ecological enhancement.

Such activities have included the planting of native trees, the creation of meadowlands, and allotments for staff.

More recently, DG Grange committed to a five-year bio-diversity project that will conserve and restore indigenous flora and fauna. In addition to the net biodiversity gain, an increased carbon adsorption is expected as the landscaping scheme establishes and matures. In 2021, owing to the COVID epidemic, it was not possible to put in place other parts of the plan (e.g. creation of two pollinators sections). However, meadows have grown and their harvesting has been quite successful and productive

DG SANTE at Grange, Meadows cut

7 Promoting Green Public Procurement (GPP)

7.1 Incorporating GPP into procurement contracts

The EMAS sites have been recording the proportion of procurement procedures that include environmental criteria, beyond the requirements of the financial procedures, as shown in Table 7.1. Alternative approaches are being considered, as described in Section 7.2, to provide more information on the strength of the measures adopted, and to support the Greening the Commission Communication.

Table 7.1 Contracts greater than 60k EUR with additional "eco" criteria (%)

Site	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Brussels	0	94	80	100	82	93	100	100	100	100
Luxembourg	65	92	100	100	94	83	100	71	93	100
JRC Petten	NR	NR	NR	NR	NR	NR	76	76	76	76
JRC Geel	NR	NR	NR	NR	22	33	35	29	29	29
JRC Karlsruhe	NR	NR	8	8	8	28	26	36	27	54
JRC Sevilla*	NR	NR	1	2	1	1	2	13	15	7
JRC Ispra	NR	17	32	9	9	10	17	64	53	40
Grange	0	0	2	4	100	100	100	100	100	100

NR - Not Recorded; *Total number, not % reported prior to 2019

In recent years both Brussels and Luxembourg have increased the number of their procurement contracts, managed by the Infrastructure Offices OIB and OIL respectively, that include some form of "green" criteria in the contract or award process, in addition to the standard clauses. The JRC sites and Grange have also started to incorporate such criteria.

In addition to the infrastructure and logistics contracts, JRC also manages many contracts related to research that do not fall under the current GPP guidelines.

DG ENV chairs an inter-service working group on developing and promoting GPP criteria as part of the Commission's response to its obligations under the Circular Economy Package.

7.2 Rating the level of sustainability achieved in contracts through GPP

The Commission started, in 2018, to use the European Court of Auditor’s recommended grading scale ([39]) to show the degree to which tenders incorporate sustainability, as follows:

- **Not green**: Tender documents without environmental considerations or have clauses without impact on purchasing approach
- **For light green to very green** a main difference is in the weighting of the environmental criteria as a share of the total (for price and quality), as follows:
  - **Light green**: <10%;

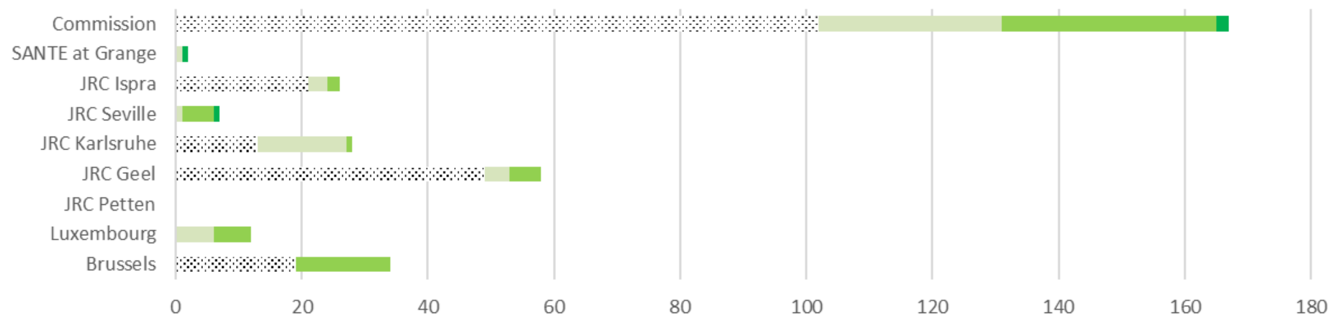
([39]) Scale recommended in P41 Annex to the European Court of Auditors Special Report 2014/14 - How do the EU institutions and bodies calculate, reduce and offset their greenhouse gas emissions? This approach may eventually supersede that described in Section 7.1

- ❖ **Green 10% to 25%,** and
- ❖ **Very green** >25%

- **Green by nature**: Where the primary purpose is "green", for example construction of a green roof, or consultancy services to improve environmental performance

Figure 7.1 presents the results at site level for the five categories:

Figure 7.1 Breakdown of the extent of incorporating GPP criteria in 2021



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Seville	JRC Ispra	SANTE at Grange	Commission
Not green	19	0	0	49	13	0	21	0	102
Light green	0	6	0	4	14	1	3	1	29
Green	15	6	0	5	1	5	2	0	34
Very green	0	0	0	0	0	1	0	1	2
Green by nature	0	0	0	0	0	0	0	0	0

Note: (1) 'Green' total includes light 'green' and very 'green'

Under this approach, 68% of contracts were 'not green' in 2018, but this increased to 74% in 2019 before decreasing to 64% in 2021. A relatively small proportion of contracts at the larger experimental sites JRC-Ispra had any degree of greening. JRC Petten has yet to adopt the new GPP criteria.

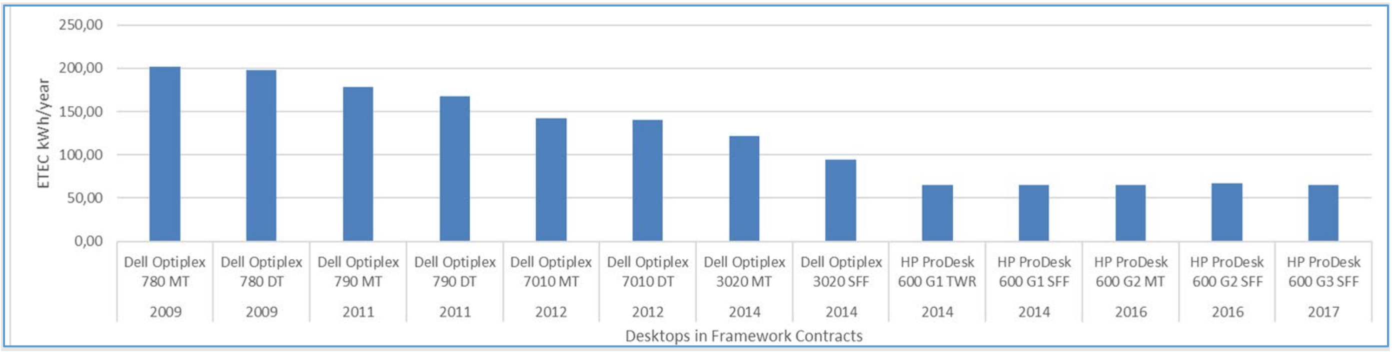
7.3 IT procurement – computers

DG DIGIT is responsible for IT across the Commission sites. It uses environmental criteria in the technical evaluation of all invitations to tender for the purchase of IT hardware and incorporates these criteria into the financial evaluation. Where pertinent the financial evaluation includes the cost of energy consumed by the equipment during its lifecycle.

The Commission's desktop computers improved performance while reducing power consumption, as shown by the evolution of the E.TEC ([40]) value in Figure 7.2, reducing to around 65 kWh/year by 2017.

([40]) A standard measure of annual total energy consumption

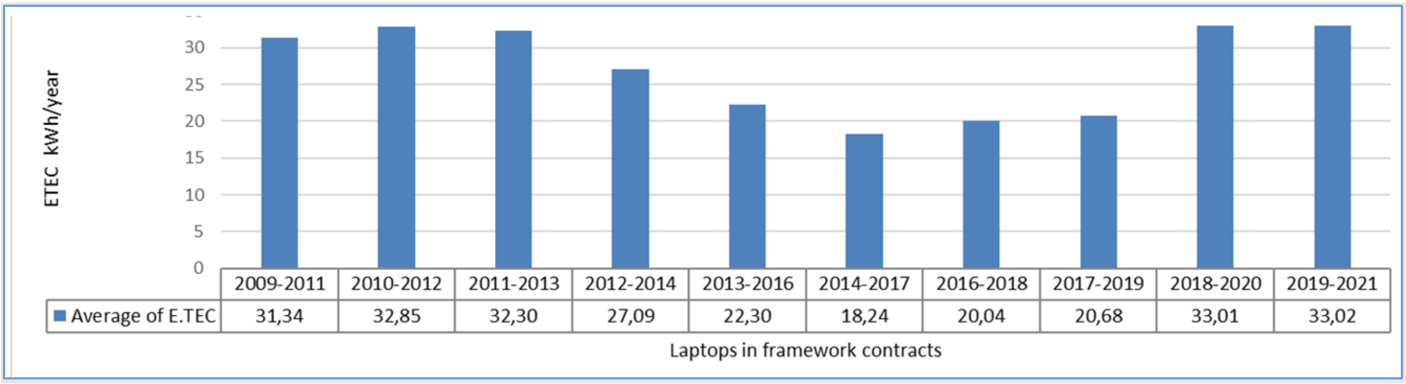
Figure 7.2 Reducing power consumption in Commission desktop computers, 2009-17



Since 2015, laptops have been replacing desktops with an eventual Commission target of 100% mobile computers by 2021 although in 2021 there remained 4070 desktops in Brussels, Luxembourg and Grange.

The efficiency of laptops improved quickly (Figure 7.3 ([41])) after they were introduced because at first, they were usually a portable accessory supplementing a desktop. But since 2015 they started replacing desktops (and therefore needed to be more powerful) E.TEC values increased from a low of around 20 kwh/year to over 30 kWh/year. Averaging 33 kWh/year, the Commission's laptops currently use about 15% of the energy the desktops consumed in 2009 (200 kwh/year).

Figure 7.3 Reducing power consumption in Commission laptop computers, 2009 to 2021



Other operational activities serve to reduce the Commission's IT consumption, including consolidating servers in fewer locations, and insisting on high performance levels for IT data centres in Luxembourg.

7.4 Purchasing through the office supply catalogues

Data in Table 7.4 shows that Brussels and Luxembourg have reduced the percentage of non "green" products in the standard office supply catalogue. Since 2012, at both Brussels and Luxembourg the percentage of "green" items has roughly doubled. JRC-Ispra has a smaller proportion of "green" products in the catalogue, but many items.

([41]) Presenting 3 years averages makes it easier to show trends. There are 40 models of laptops in framework contracts.

Table 7.4 Proportion and number of items in the office supply catalogue that are not “green”

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Percentage of items that are not "green"										
Brussels	73	64	64	54	53	52	52	53	53	46
Luxembourg	82	77	74	77	74	64	65	46	45	45
JRC Ispra	74	74	76	76	68	70	72	71	72	74
Number of items that are not 'green'										
Brussels	464	328	328	385	416	392	386	124	125	48
Luxembourg	438	303	263	302	244	206	201	83	82	89
JRC Ispra	433	433	517	529	500	475	532	506	517	478

7.5 Specialist advice on Green Public Procurement

The Commission supports an inter-institutional consultancy contract coordinated by the European Parliament through which a helpdesk can provide tailored advice on how to incorporate more sustainable elements into individual contracts. Under the Green Deal initiative, the Commission hopes to improve the procedures and guidance available in the tendering process to ensure that GPP is considered in a systematic way.

8 Demonstrating legal compliance and emergency preparedness

8.1 Prevention and risk management

Sites have their own standard operating procedures including internal and external audits that are required to demonstrate compliance with operating licenses and legislation. Sometimes environmental and health and safety compliance are integrated. The approach is described in the site annexes to this report and depends on the site, who retains overall responsibility.

The corporate EMAS coordination team (HR.D7) organises an annual internal auditing exercise for all the eight sites plus the Representations which is conducted on the Commission's behalf (and participation), by an external consultant. This is an EMAS system requirement.

The sites are also subject to annual EMAS external verification audits, the successful completion of which is a prerequisite for EMAS registration. In 2021 the verification audit took place mainly in June. The consulting company used 14 auditors to visit the eight sites over 23 days, with usually two or three per site.

HR.D7 encourages the external auditors to consider the resources available to Commission staff when formulating their findings, and prioritise accordingly. The audits identify, in increasing order of urgency of response:

- Good practices
- Scopes for improvement (SFI) – which can be considered as professional advice with no obligation
- Observations – findings which if not addressed, could become non-conformities
- Minor non-conformities – findings to be addressed immediately but not a systems threat
- Major non-conformities – serious findings that put the system at risk and address immediately.

The Commission records and follows up all audit findings using workflow software (JIRA). The external verifiers must immediately approve auditees' actions to address both minor and major conformities. The Commission monitors the number of EMAS non-conformities each year as shown in Table 8.1.

Table 8.1 Non-conformities from EMAS verification audits at Commission sites

Site	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Brussels system coordination	6	0	2	2	0	0	1	0	0	1	0
Brussels (OIB and other)	15	5	1	1	3	1	0	1	0	0	0
Luxembourg	19	3	0	0	2	4	6	4	0	0	1
Petten			1	1	1	1	4	4	1	4	2
Geel				3	3	2	4	4	0	0	1
Sevilla				1	0	0	0	2	5	3	0
Karlsruhe					5	4	1	0	3	2	3
Ispra					0	0	0	1	1	0	0
Grange					4	3	4	3	3	0	0
Total	**40**	**8**	**4**	**8**	**18**	**15**	**20**	**19**	**13**	**10**	**7**

The total number of non-conformities has been decreasing since 2017, and is a sign of a maturing system. The 2021 verification exercise highlighted:

- Good practices (42) for all the sites
- Observations and scopes for improvements on several horizontal themes including the need to measure training effectiveness, and better incorporate the checking of data prior to verification audits.

8.2 Improving compliance (and performance) by registering more buildings under EMAS)

All buildings in Brussels and Luxembourg have their own environmental permits issued by the local authorities. Registering individual Commission buildings in Brussels and Luxembourg under EMAS helps to ensure that the Commission complies with the permits, of which up to 20 or 30 could be undergoing modifications at any one time, and in so doing delivering ever-improving environmental performance.

It also ensures the Commission adheres to additional local regulatory requirements, such as COBRACE in Brussels that are mandatory targets for reducing energy consumption. Owing to the administrative workload associated with incorporating new buildings in EMAS (including system implementation, data preparation and reporting internal and external audits), the scope of the Commission's system has expanded gradually by adding a "manageable" number of buildings every year.

EMAS reporting for Brussels in 2015 reached a milestone with all occupied buildings (62) included for the first time. However, the real estate portfolio changes from year to year, with typically either one or two buildings entering or leaving the estate. In 2018 three buildings were not included in the scope, but in 2019 both MO15 and MERO buildings underwent successful audits were added to the Brussels registration, and in 2022 the registration will include 60 of 61 buildings.

In Luxembourg, reporting on environmental performance has included all buildings and 15 out of 18 are EMAS registered representing 84% of useful floor space. As indicated in Table 1.3, 482 of 488 building structures (99 %) are registered in the Commission's EMAS scope in 2020, representing 98 % of useful floor space).

The JRC experimental sites, JRC-Seville and DG SANTE at Grange are self-contained, and each wholly registered under EMAS, therefore it is not necessary to register building by building as in Brussels and Luxembourg where the Commission's premises are spread across the cities. As the EC representations in Member States are progressively included in EMAS, each location will be registered separately, starting with Valletta and Vienna.

8.3 Emergency preparedness

Each Commission site has structures and procedures for responding to emergencies. A page on the EMAS intranet corporate portal (MyIntracomm) explains the different emergencies in Brussels and Luxembourg with links to all pages related to the follow-up of incidents and emergencies. This was necessary because for these large centres multiple services share responsibility for emergency preparedness and response making it sometimes difficult to see exactly where responsibilities lie between the Security Office, Health and Safety services, infrastructure services, etc.

([42]) Including JRC Ispra's annual external stakeholder initiative "EMAS Round Table" with national, regional and local authorities, which resulted in signing a Sustainable Development Agreement with the Lombardy Region in 2019, when it also achieved a record participation.

In addition, summary sheets of emergency contact numbers are circulated to offices, and HR.D7 also prepared an intranet page to relay air quality alerts from the local authorities in Brussels. Automatic SMS to staff can also convey emergency information, for example, when buildings evacuations enter into force and when they are lifted.

9 Communication and training

9.1 Internal communication and training

This section describes the corporate communication and training actions common for all the Commission sites. Every year, HR.D.7 prepares detailed corporate communication and training action plans, sets up corporate internal communication campaigns, supports individual services in setting up local staff awareness campaigns, updates EMAS training material and delivers training and technical support to the EMAS Site Coordinators and to the EMAS Correspondents Network (Brussels and Luxembourg). The more important actions are outlined below.

9.1.1 Leadership and commitment

During 2021, the Commission's senior management took an active role demonstrating leadership and commitment in relation to the environmental management system and environmental issues in general. Specifically:

9.1.1.1 *"Building" the Greening Communication together*

The consolidation of the "Greening Communication and action plan" during 2021 followed a unique participatory approach, with regular steering from **Commissioner Hahn** and his team, in constant liaison with the **President Van Der Leyen** and her Cabinet. Specifically, Directorate HR. D: Workplace & Wellbeing with the support of its **Director Christian Roques**[i] set up a focus group bringing together about 18 services, represented at various levels. We have had six meetings since October, many bilateral and trilateral talks, and received many contributions. This focus group has acted like a platform for all the ideas to be presented, going beyond the traditional representation of each service's positions. It has proven to be an efficient tool: we have dived into the complexity of the issues at stake, looking at the technicalities of energy efficiency, the specificities of each site, and ways to integrate constraints arising from local environmental legislations. The main aim was that the Communication emerging from this process to be both ambitious and anchored in reality. The first draft was also presented to the Corporate Management Board, and the broad outlines to the Group of Resource Directors and the HR business correspondent network. A preliminary consultation with all Commission services took place in late 2021, generating several local staff consultations in several services. Lastly, a series of articles as part of the Simpler.Smarter.Together. campaign, were published, exploring the key themes of the greening of the Commission in greater detail.

9.1.1.2 *VeloWalk: record number of institutions participate*

During spring 2021, the first-ever VeloWalk campaign combined two successful fit@work initiatives, supported by **DG HR Director-General Gertrud Ingestad,** the Walking challenge and the Velomai biking competition – the former took place in April, the latter, as usual, in May. Its goal was not only to encourage staff to exercise on a regular basis but also to help colleagues and students connect during lockdown and stay fit both physically and mentally. Altogether, nine institutions, nine agencies, 14 European schools and 35 delegations participated in the campaign, with many showing impressive results. Pupils from the European Schools were especially active: while in December 2020 only 60 students took part in the walking challenge, in April over 700 did – with the European School in Uccle boasting the most numerous team.

People who participated could register their steps and rides and browse the full VeloWalk programme in the dedicated web-based and mobile apps developed by colleagues in HaDEA. In the walking challenge, 2 500 people participated actively and registered a total of 436 million steps. The Velomai competition mobilised 1 512 cyclists who cycled 303 000 kilometres during 36 140 rides – equivalent to more than seven times the distance around the Earth! All these walks and rides meant emission savings of more than 39.5 tonnes of CO_2. In order to make the challenge more fun, local and corporate actions related to walking and cycling were organised. More than 25 actions – including EMAS activities specifically promoting greener, sustainable mobility – took place during the campaign period, significantly more than in previous years.

Furthermore, many volunteers organised activities such as guided walks and biking tours. Another new component in this edition was the 'fundraiser for cancer' action. Participants were encouraged to donate directly to a selected group of organisations, offering a certain amount based on a target they set for themselves (such as €1 per 10 000 steps).

9.1.1.3 *EU Green Week 2021 puts the spotlight on zero pollution*

From 31 May to 4 June 2021, EU Green Week (43) - Europe's biggest annual event on environmental policy - explored possibilities to make the EU's zero pollution ambition a reality. It also allowed citizens across the EU to discuss zero pollution from its many angles at the virtual conference, and at almost 600 partner events taking place all over Europe. Register for free for the high-level virtual conference which includes dozens of virtual sessions, exhibitions and more taking place all over Europe. **Virginijus Sinkevičius, European Commissioner for Environment, Oceans and Fisheries**, open the event by

(43) https://www.eugreenweek.eu/

noting: "Environmental *pollution negatively affects our health, especially of the most vulnerable and socially deprived groups, and is also one of the main drivers of biodiversity loss. We see that pollution is an issue that Europeans care very deeply about, as an unprecedented number of partner events are taking place across Europe this year. I am convinced that this year's Green Week will be an inspiring and mobilising success and it will show the EU's ambition to lead global action against pollution. Moreover*, **Ursula von der Leyen, President of the European Commission,** said opening the conference: *"It is painfully clear that human activity has negative impacts on other forms of life. Pollution is threatening the survival of more than one million plant and animal species, on land and at sea. It is one of the five leading causes of biodiversity loss. We cannot be negligent any longer. Thus, we are determined to tackle this challenge through our European Green Deal."*

9.1.1.4 *#EUBeachCleanup in Zeebrugge*

On 12 September 2021, **Virginijus Sinkevičius, European Commissioner for Environment, Oceans and Fisheries,** travelled to Zeebrugge, Belgium, to participate in the ENECO Clean Beach Cup, an annual clean-up event organised since 2010 in Belgium to raise awareness on the problem of plastic and waste in our seas and ocean. The gathering in Zeebrugge of around 100 EU and UN colleagues has been organised by the Representation of the Commission in Belgium as part of the #EUBeachCleanUp campaign. After a number of years, where events have mainly been organised by Delegations and Representations, the wave is really rolling now. As the Commissioner said: *"EUBeachCleanup is no longer just a campaign. It is becoming a citizens' movement".* Preparing for the UN conference on biological diversity, the 2021 campaign was dedicated to protecting and celebrating the rich life of the ocean. The campaign is jointly organised by the European Union and the United Nations (Act Now – SDGs), in partnership with the Smurfs.

9.1.1.5 *EU Mobility Week: safe and healthy with sustainable mobility*

EUROPEAN**MOBILITY**WEEK 2021 ([44]), the European Commission's awareness-raising campaign promoting clean and sustainable urban transport, celebrated its 20th edition between 16-22 September. Around 3 000 towns and cities from approximately 50 countries participated by hosting events on the theme "*Safe and healthy with sustainable mobility*," giving people the opportunity to explore the role of mobility in their daily lives by experimenting with clean transport modes. Importantly, the campaign supports the use of public transport as a safe, efficient, affordable, and low-emission mobility solution for everyone. It culminated as every year in the popular car-free day, which sees streets closed to motorised traffic and open to people. To celebrate its 20th anniversary, EUROPEAN**MOBILITY**WEEK launched in 2021 a

([44]) https://us20.campaign-archive.com/?e=__test_email__&u=b8f6852a133a22b2480ccb532&id=09df00f500

virtual museum, which showcased the history of the campaign, the impact it has achieved, and its links to the European Commission's broader sustainability priorities, such as the EU Green Deal. **EU Transport Commissioner Adina Vălean** in a video ([45]) reflected on this year's campaign theme - *Safe and Healthy with Sustainable Mobility* - and how it relates to the European Commission's ambitious target of a carbon-neutral continent by 2050, as laid out in the European Green Deal, which highlighted the history of the campaign, the impact it has achieved, and its links to the European Commission's broader sustainability priorities, such as the EU Green Deal.

9.1.1.6 *Second award ceremony rewards innovative, green Commission events*

On 8 October 2021, precisely a year after the first ever edition took place, the award ceremony of the 2nd corporate competition on sustainable conferences and events was held, in the presence of **Commissioner Hahn and the Directors General of DG Human Resources and Security (DG HR), Gertrud Ingestad and DG Interpretation (DG SCIC), Genoveva Ruiz Calavera.** The event was full of interesting insights and inspiring thoughts on the topic of sustainable conferences and events! Apart from getting to know the winning projects, the audience had the opportunity to learn more about EMAS/Greening the Commission and the future vision for conference organisation. Commissioner Hahn noted during the award ceremony: "*We need to make smart choices and combine the best of both worlds. It is imperative that we use this opportunity to demonstrate that as Commission, we care about the environment and apply the ambition and commitment of the Green Deal also to our events."*

9.1.2 Communication to staff

9.1.2.1 Corporate seasonal communication campaigns:

There were three main corporate communication campaigns during 2021:

([45]) https://www.youtube.com/watch?v=pKyMDSqimCA

- The *EMAS spring campaign* initiative (March-April);
- The award ceremony of the first corporate competition on sustainable conferences and events (October);
- The *Less Waste, More Action* - Waste Reduction campaign (November-December)

01 The EMAS spring campaign

Launched in March, the campaign has given staff the chance to get a deeper understanding of the new and even more ambitious environmental commitments of the Commission through a series of events, including hands-on webinars, panel discussions and a variety of local environmental actions across Commission sites. More specifically: (a) **The promotion of the New Commission's Environmental Policy** (2020), including a flash-animation ([46]) and new posters, including Commission's main environmental commitments and its 2030 climate neutrality goal; (b) **The organisation of 5 green@work webinars**, where in-house experts offered valuable insights on how to get greener@work through various thematic webinars. As for other virtual events, nearly 400 participants have taken part in vivid online discussions and exchanged best practices on how to organise greener events and on how to make our professional trips even greener. Colleagues could also listen to practical tips and tricks on how to be greener working from home, zero-waste lifestyles, composting and cooking with leftovers, sustainable food choices, as well as advice on purchasing and producing renewable energy. In addition, the EMAS site coordinators from Brussels, Luxembourg, JRC-sites, Grange and EC Representations joined their voices for an interesting panel discussion on "Lessons-learnt during the CoviD-19 lockdown that can help us reach climate neutrality in 2030" (20/04/202) and (c) At the same time, **several local environmental actions** are organised by the EMAS teams across Commission's services/sites, as for example the Plogging initiative (walking/running and picking up litter) organised by DG AGRI: DG Agriculture and Rural Development in collaboration with the Swedish Embassy in Brussels, the "Green Photo Challenge" in the European Personnel Selection Office (EPSO), the Countdown Earth Day initiative by the European Research Council Executive Agency (ERCEA), Greening, the webinar on sustainable food in European Research Executive Agency (REA), the walking and picking-up litter action in DG Translation (DG DGT).

([46]) https://ec.europa.eu/environment/emas/pdf/Emas-2021-Animation-720p-29032021.mp4

02 The award ceremony of the second corporate competition on sustainable conferences and events

The second corporate competition on sustainable conferences and events focused on virtual events and conferences held in 2020, the lessons learnt from the pandemic, and preparing the ground for the way forward and the 'new normal' for Commission events and conferences. The 2021 EMAS Sustainable Events Awards were held virtually, like the first award ceremony, and boasted the participation of **Commissioner Hahn** as well as the **Directors-General of DG HR, Gertrud Ingestad, and DG SCIC, Genoveva Ruiz Calavera.** In total, the jury got over 30 applications vying for the recognition of environmentally friendly events, and it welcomed the fact that more DGs joined the initiative. The awards were divided into three categories: internal events, external small events, and external large events. The winners were:

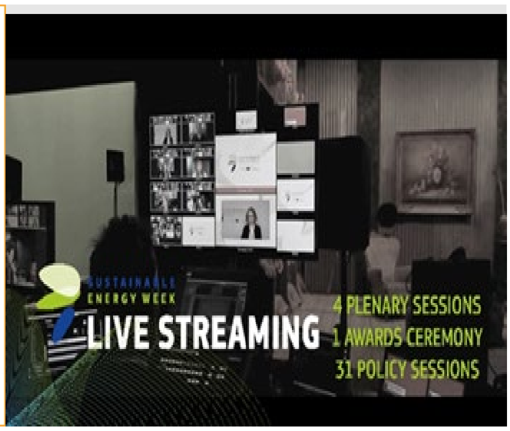
- JRC's 'SQuare series' won the first prize for internal events, on behalf of Joint Research Centre (JRC). The Square series is a unique virtual space with a human touch to meet and talk with the Director-General, Stephen Quest, and inter-connect with the more than 3 000 JRC staff spread over various sites in a dynamic and very participatory format. The second prize went to the Publications Office for their EU DataViz webinars, a series of online training sessions dedicated to data visualisation. Still in category 1, European School of Administration (EUSA) and European Research Council Executive Agency (ERCEA) got a special award for innovation; the former for their 13 inter-institutional 'Leadership walks' for managers, focussing on nature and collective intelligence, and the latter for their ERC online talks held between October and December 2020.

- There were 15 nominees in category 2 (external small events), and the jury bestowed the first prize upon REA for its 'Virtual H2020 Coordinators' Day'. The jury rewarded the organisers for having been able to re-design an event completely and successfully using different IT tools not yet known enough one year ago. A special 'more with less' award went to JRC, and more specifically JRC's final technical working group meeting in Seville. The Commission's Representation in Berlin and DG DG Education, Youth, Sport and Culture (DG EAC) both got a special award in the same category. DG COMM-Berlin for their 16 virtual Councils of Ministers at which youth could role-play online, and EAC for transferring their 'Gifted jumpers' event from a physical to a virtual format.

- As for category 3 (external large events), EASME – since April 2021 Executive Agency for Small and Medium-sized Enterprises (EISMEA) – won the first prize for their EU Sustainable Energy Week and its live streaming that attracted 11 000 viewers over 120 countries. The organisers succeeded in successfully transferring an established conventional event into an online conference within extremely tight deadlines (seven weeks!), whilst boasting over 70 million impressions on Twitter. In addition, all this, whilst being inclusive and truly sustainable. DGs Regional and Urban Policy (DG REGIO) and DG Research and Innovation (DG RTD) won the second prize in that category. REGIO for the 2020 Week of Regions and Cities: three weeks of online events bringing together 12 000 participants and 40 000 unique viewers; and RTD for the European Research and

Innovation Days: by creating an interactive platform rather than having a filmed conference, the organisers managed to attract a high number of attendees.

- Finally, DG Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) got a **special award for innovation**; the jury praised them for the way the European Social Economic Summit was held, and DG Financial Stability, Financial Services and Capital Markets Union (DG FISMA) was rewarded with a special 'less is more' award for the Stakeholder dialogue on sustainable finance.



Further innovations of this year's event included an **e-brochure with all winning projects** of the 2nd edition of the sustainable events competition (October 2021) and to benefit from the expertise gained in these events, DG SCIC organised a workshop on how to organise more sustainable virtual/hybrid events: Lessons-learnt from the winners of the second corporate competition on sustainable events with the winning teams from European Sustainable Energy Week (EUSEW) organising team and DG FISMA (November 2021).

03 "Less Waste, More Action TOGETHER": Waste Reduction Campaign

This ***"Less waste, More action TOGETHER" campaign*** (22/11 – 3/12) in the framework of the European Week for Waste Reduction, focused on forming collaborations and acting together to shape circular communities aimed to prevent the waste production and transition towards sustainable consumption and production patterns.

The novelties of this year's campaign included:

- **Digital mindfulness tips and tricks** in collaboration with DG Informatics (DIGIT), launched via the Practical information section on My Intracomm and **e-brochure** "Digital tips on how to cool down the planet.
- Promotion of the **GOAL: Give your Objects other Life Action,** for the collection and reuse/donation to charities of old office supplies, furniture and decorative items during the internal moves, in collaboration with Office for Infrastructures and Logistics in Brussels (OIB).
- **Walking challenge - autumn cleaning trail,** initiated by DG DGT – went corporate! A perfect opportunity to combine walking with waste fighting. Participating colleagues could post a photo or a comment at the relevant forum and the also all team members' walking steps could be counted via the Walking Challenge App, available all year round.
- **Zero waste lifestyle workshops,** in collaboration with DG DGT, Eurostat (ESTAT) and DG AGRI, specifically:
  - 24/11: The EcoMatters Group of DGT Unit EN03 hosted an online lunchtime presentation by Kasia Krzyzanowski, the "dreamer" behind Neighbour Magazine, a brand new quarterly focusing on sustainable living here in Luxembourg.

  - 26/11: Zero-waste experts from the ESTAT EMAS eco-team are organising a free online workshop addressed at EU institution staff in Luxembourg, where they provided information on shopping with less packaging and organic composting practices; offering quite easy alternatives to reduce the environmental impact in everyday life. In this year's workshop, sustainable fashion will be also addressed.
  - 3/12: Effortless ways to live a greener life, where information on waste is provided, in particular plastics, but also food, textile, and digital waste, etc.; offering quite easy alternatives to reduce the environmental impact in everyday life.

- **Sustainable events' organisation online seminar** (30/11/2021) in collaboration with DG SCIC, based on lessons-learnt for the 2nd corporate competition on virtual/hybrid events. More specifically: (a) Less in more – best value for money – quick adaptation to the new normal - Interview with the team from DG FISMA – winner of "Less is more" award and (b) Reusable material – waste reduction - Focus on Refuse out of the 5 Rs - Interview with team from European Sustainable Energy Week (EUSEW) – winner of 1st prize for "Large conferences with more than 1 000 participants" category.

Lastly, following an initiative by DG Maritime Affairs and Fisheries (DG MARE) a **collection of small electrical appliances and IT equipment** was organised in several DGs/services between 24 January 2022 and 2 February 2022. These items will be donated to a local charity, Cyreo.be, who repairs and sells second-hand electrical items. This activity prolongs the life of electrical appliances, whilst allowing unemployed people to be trained and to reintegrate the workplace.

Other actions included **three latest videos** by Office for Infrastructures and Logistics in Luxembourg (OIL) presenting the fields of activity, the functioning, and the philosophy of three organizations that treat or reuse waste. Each of them has a unique way of working, but their common goal is to give a new life or a second life to waste. These organisations are: Valorlux, who has the mission to collect and process bottles and other plastic products, SIVEC, an inter-municipal association with an ecological vocation located in Schifflange, which put actions into place to give a second life to goods that would otherwise be thrown away, and BENU, an ecological village in Esch-sur-Alzette based on circular economy. The village is built only with material that is no longer useful elsewhere.

9.1.2.2 Additional campaigns

Additional corporate environmental campaigns have been conducted in relation to:

- The **5th edition of the inter-institutional VéloMai challenge,** this year combined with the Walking Challenge as **VeloWalk** (April-May 2021): The action resulted from successful collaboration among several actors: HR units, the fit@work programme ([47]), EMAS Site Coordinators and EU Cycling Group (EUCG). Several local events were also organised at site level (as described in the site Annexes).

- The **World Ocean Day (8/6),** colleagues from DG RTD and DG MARE, but also external experts were invited to explain about coral reefs functioning and importance.
- The **greening your summer** - *"The art of sustainable holidays"* campaign before the summer holidays in June-early July;
- Communication to staff on the **EMAS highlights** in relation to the EMAS Steering Committee's meetings, especially in relation to the upcoming Greening the Commission Communication and action plan highlighting the roadmap to climate neutral by 2030 and the extension of EMAS scope to the Executive Agencies and the EC Representations across member states.
- **Two sessions of a Together-Ensemble participatory workshops** on 27 and 28 October, to provide another staff engagement opportunity, but without connecting them directly to a specific draft of the Communication on the Greening of the Commission:
    - "creating the energy for more sustainability at work and at home"- focusing on behavioural changes;
    - "mobilising our collective energy on a more sustainable world" - focusing on staff advocacy in the context of COP26.
- The **EMAS staff survey 2021 on environmental awareness and behaviour** (November 2021).
- The **publication of the Environmental Statement 2021** (data 2020) and an **on-line promotional brochure** highlighted the main results.
- The **"Keep it Green this Christmas"** campaign before the end of the year holidays.

HR.D.7 also promoted the **Inter-institutional Green Public Procurement (GPP) helpdesk**, coordinated by the European Parliament. It is open to all Commission services since 2017, as well as to 7 other EU Institutions. There has been one GPP Helpdesk's event on 12/10 on *Eco labels and verification of environmental criteria.* This Green Public Procurement (GPP) Helpdesk presentation introduced participants to the efficient use environmental criteria and guide you through the eco label jungle. Over 200 persons connected to the GPP Helpdesk event on Ecolabels.. On 17 November 2021, the EMAS team in REA organised an especially interesting introductory training on GPP, in collaboration with DG HR, DG Environment (DG ENV), DG GROW and JRC-Ispra. At the end of this course, participants were able to understand the basic principles and application of GPP in the different procurement procedures implemented in the EC services (including executive agencies). The main contents included: introduction, procurement role in the context of EMAS and promotion of the inter-institutional GPP helpdesk, Introduction to GPP and available tools, legal aspects of green and strategic public procurement, GPP in the procurement life-cycle and Public Procurement Management Tool (PPMT). Lastly, articles were published on the electronic newsletter of the Network of Commission's Financial Officers and Procurers (RUF), managed by DG Budget (DG BUDG).

([47])fit@work is the Commission's cross-cutting, multi-annual health and wellbeing programme.

9.1.2.3 Other corporate communication

In addition, the Commission:

- Published six articles in the Commission’s on-line news portal “Commission en Direct”;
- Published four articles on the new Simpler.Smarter.Together section on Commission’s intranet (My IntraComm);
- Made several announcements on the Commission’s intranet under “Practical Information” and “Events;
- Revised the overall structure and further improved the internal EMAS webpages.

9.1.2.4 Communication actions initiated by the EMAS Correspondents

EMAS Correspondents organised local environmental actions in the **20 DGs/services**, compared with 19 services in 2020 (and 26 in 2019) and **5 Executive Agencies,** despite the constraints imposed by the physical lockdown on all EC-sites since March 2020. Characteristic examples included:

(a) **Events/conferences addressing EU Green Deal topics and the upcoming Greening Communication and action plan**: Brainstorming sessions and staff surveys sessions on the pillars of Greening the Commission Communication (involving senior management), sessions on how climate change is interconnected with digital transformation and the principles of Green public procurement (GPP), on how to pursue a sustainable and healthy plant-based/seafood-based diet, sustainable living/zero waste lifestyle webinars.

(b) **Waste reduction actions:** Promote the cancelling of newspaper print editions, art auctions to encourage waste reduction and the recycling of discarded paintings and photos that were left behind following internal moves, “plogging” activities and spring/autumn cleaning trails: strolling while picking up trash, special awareness-raising activities on how to sort waste at the workplace, organization of the Less waste, more action info-fairs and quiz games, collection of old electrical items and giving them a second life as charity donations.

(c) **Sustainable mobility initiatives:** Targeted communication actions on sustainable commuting during EU mobility week (September 2021) and VéloMai corporate events (May 2021), e.g. Conference on ‘how to buy an e-bike’, videos to promote sustainable commuting, installation of plugs for electric bikes and additional electric car parking, bike tours combined with visits to urban farms.

(d) **Staff awareness actions:** Green and eco-tips included in e-Newsletters, a ‘digital mindfulness’ campaign, a ‘New year’s resolution project’: Staff invited to fill in a specially designated carbon footprint survey online and benchmark against average citizen consumption, a ‘Count down to Earth Calendar: advent-calendar style daily tips on initiatives and actions addressed to preserve the Earth, Green coffee for the newcomers and the creation of formal and structured Green Committees with regular meetings among volunteers.

Moreover, **all EMAS site coordinators** set up local staff awareness actions across EC-sites and EC Representations, in line with the corporate EMAS campaigns, for further information please refer to the relevant Annexes.

In 2022, the Commission will organise its main communication campaigns around the EU Green Deal and the upcoming Greening the Commission Communication and action plan and focus on what the Commission and its staff will do to meet the 2030 climate neutrality challenge. New initiatives will include:

- The Greening the Commission staff awareness raising campaign will focus on both EC corporate actions (EMAS in EC), as well as individual climate action countering rebound effects of teleworking, in reference to the **European Climate Pact ([48]):** an EU-wide initiative inviting people, communities and organisations to participate in climate action and build a greener Europe; and providing a space also for individuals to connect, debate and collectively develop and implement climate solutions, big and small, for example via individual pledges.
- HR.D.7 will contribute, support and promote EMAS actions in the **EC Executive Agencies and EC Representations** across member states;
- HR.D.7 will contribute, support and promote EMAS / Greening the Commission actions as part of the **Modernisation communication campaign: Simpler, Smarter, Together** with success stories concerning "EMAS in EC" during 2020-2022, as well as the **internal corporate communication relevant to the EU Green Deal** during 2020-2024.

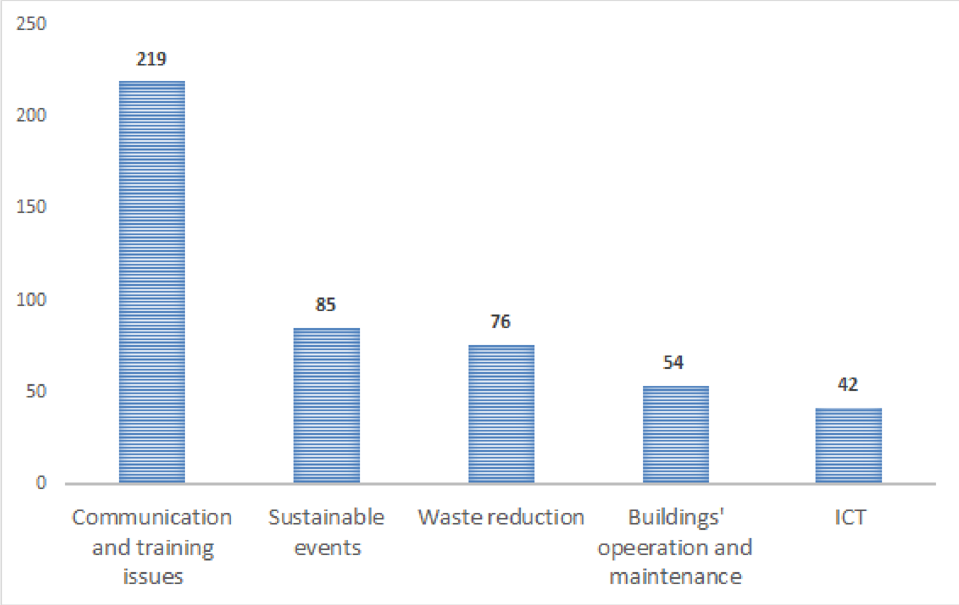
9.1.3 Dialogue with internal stakeholders

The Commission has a corporate register of internal questions and suggestions submitted via the EMAS in EC functional mailbox and Staff Fora, which recorded **537** entries (the highest ever in relation to 158 entries in 2020, 328 in 2019, 185 in 2018, 188 in 2017 and an average of 40-60 entries during the previous years), all of which received responses. This impressive increase during 2021 may be attributed to the success of the EMAS communication campaigns and the high anticipation of EC-staff in view of the upcoming Greening the Commission Communication and action plan, following the “COV19 pandemic shock-effect” that shifted the interest of staff to practical issues on how to deal with the new lockdown /teleworking reality after March 2020.

The three most popular environmental topics for Commission’s staff are i) communication and training issues, as a direct reaction to the successful EMAS corporate staff awareness and training initiatives (e.g., EMAS staff survey, EMAS spring campaign and waste reduction campaign), ii) organisation of sustainable events issues (especially in relation to the 2nd edition of the corporate sustainable conferences and events competition, focused on virtual/hybrid events), and iii) waste reduction (in relation to the corporate *Less waste, more action TOGETHER* campaign).

(48) https://europa.eu/climate-pact/index_en

Figure 9.1 The main topics of interest of internal stakeholders' inquiries/suggestions in 2021



In addition, at a local level, EMAS Site Coordinators and EMAS Correspondents keep records of questions and suggestions from staff along with responses.

The Commission conducted a two-yearly on-line survey on staff environmental behaviour and awareness in October 2021, also covering topics related to the environmental impact of teleworking. For the first time, all Commission staff members were invited to take part in the assessment (in the previous surveys only a sub-set of staff members were invited), resulting in 7 693 staff members filling out the survey representing a response rate of 18%.

The most important findings of the staff environmental behaviour and awareness survey during 2021 are the following:

- General awareness of Commission staff members about environmentally responsible behaviour at work is currently at an all-time high, with **85%** of staff feeling well or reasonably well informed about (vs. 84% in 2019).
- The share of staff members taking regular actions to reduce environmental impact increased since the last survey (from 68% in 2019 to **72%** in 2021). Considering the profound changes in the workplace dynamics caused by the pandemic, these are strongly positive results and should be celebrated!
- **64%** of Commission staff is aware that the Commission implements a management system to evaluate, report on and improve its environmental performance (EMAS) showing a 7% points improvement compared with 2019.
- Involvement of senior management (selected by 23% of staff members as the top choice), electronic newsletter (14%) and news/story on My IntraComm (14%) are considered the most appropriate means to increase staff environmental awareness at work.
- Among the high-impact environmental actions to be prioritized by the Commission considering the new HR Strategy and the Greening Commission action plan, majority of staff opted for **optimising the energy of EC building** (54% mentioned it as the first priority), followed by **reducing the environmental impact of missions** (32%) and **better use of office space** (12%).
- Overall, **43%** of respondents provided qualitative suggestions on how to make improvements mainly in the areas such as mobility – commuting and local travel (13%) and buildings - energy consumption /emissions (10%).

Lastly, additional useful findings contributed in the fine-tuning the environmental impact of teleworking, for example: the typical size of the dwelling for the EC staff members, the size of the space physically occupied when teleworking. Working from home led to significant increase of energy use at home, relevant primarily for heating the household during the winter. The main type of energy used for heating when working from home is natural gas (68%), followed by electricity (14%) and light fuel oil (9%). Energy comes primarily from the grid as normal mix, however green mix coming from renewable sources is also quite popular (reported by 27% of staff members)

9.1.4 Communication among EMAS Correspondents and Site Coordinators

As shown in the table below the annual survey demonstrated a further enhancement in the performance of the Commission's EMAS teams in relation to 2020, despite the difficulties created by the COV19 lockdown since March 2020 and the fact that we experienced the highest ever turn-over in the EMAS teams (with 36 new members). This has been achieved only due to the high commitment and enthusiasm of the new EMAS team members and strong support by their senior management. Overall, **33 out of 46** EMAS teams demonstrated a performance above average, representing **77.5%** of the total population (in relation to 88% in 2020). This is mainly the result of (i) the noteworthy environmental awareness support by the local volunteer groups (currently active in 4 out of the 8 sites and in **20 DGs/services**), (ii) the increased number of local EMAS action plans in **26 DGs/services** (in relation to 24 in 2020), (iii) the setting up of local environmental actions in **20 DGs/services** (in relation to 19 in 2019), (iv) the contacts of the EMAS teams with senior management (currently in all 8 sites and EC Representations and **27 DGs/services,** in relation to 31 in 2020).

Survey year ([49])	**2013** *(max. 10)*	**2014** *(max. 10)*	**2015** *(max. 10)*	**2016** *(max. 10)*	**2017** *(max. 9)*	**2018** *(max. 10)*	**2019** *(max. 9)*	**2020** *(max. 9)*	**2021** *(max. 10)*
Average EMAS team score	5,3	5,5	4,4	4,3	3,6	4,6	6,5	6,1	6,9

In 2021, there was no service without an assigned EMAS Correspondent, and nearly all new EMAS teams had attended a relevant introductory training. HR.D.7 planned several steps to strengthen the EMAS correspondent (ECOR) role. These included: (i) provision of additional hands-on trainings and practical toolboxes, (ii) enhanced role of the EMAS Correspondents as the contact-points for the compilation of the "Sound Environmental Management" section in their DGs/services' Management plans 2021 and Annual Activity Reports 2021 and (iii) the setting up regular monthly virtual meetings (e.g. EMAS virtual coffee) and regular communication/announcements among the EMAS Network via the newly created EMAS Network MS Teams Channel (also included e-library for sharing documents and promotional material) and (iv) creating a corporate group of environmental volunteers across the Commission to be shared among the EMAS network, as well as promotion of additional synergies among ECORs/site coordinators.

Moreover, all six (6) EU Executives Agencies participated in corporate EMAS campaigns (REA, ERCEA, EACEA, EISMEA, CINEA and HaDEA) ([50]) and took part in the annual EMAS Network Survey, with an exceptional average performance of **8** (out of 10).

Lastly, REA, ERCEA, EACEA and EISMEA participated with great success in the EMAS verification exercise during June 2021 and CINEA and HaDEA in the EMAS internal audit exercise in November 2021, due to (i) the high commitment of all Executive

([49]) The criteria are: participation in the annual survey, presence at the network meetings and training sessions, presence of local volunteers, local action plans, evidence of direct contact with top management, implementation of centrally prepared campaigns and local actions.

([50]) European Education and Culture Executive Agency (EACEA), Executive Agency for Small and Medium-sized Enterprises (EISMEA), European Health and Digital Executive Agency (HaDEA), European Research Council Executive Agency (ERCEA), European Research Executive Agency (REA) and European Climate, Infrastructure and Environment Executive Agency (CINEA).

Agencies' EMAS Correspondents and eco-teams and (ii) their senior management's leadership and engagement in their respective "greening agenda".

In 2021, HR.D.7 will work to improve the EMAS network's efficiency via synergies with the local Logistics Proximity teams ([51]), the Account Management Centres (AMCs) ([52]), as well as local groups of environmental volunteers shared among the EMAS Network.

9.1.5 Training

Corporate level EMAS training organised during 2021 included:

9.1.5.1 EMAS training for all staff

EMAS training for newcomers: In Brussels, since November 2016, this has consisted of an interactive 1hr 45 min session held every 2-3 months entitled *"EMAS basics for EC Newcomers"*. A similar session was introduced in Luxembourg in 2018. As part of the COV19 lockdown measures, all physical training has been cancelled since end of March 2020. HR.D.7 has designed an online *"EMAS basics for all"* training offered to all staff across EC-sites since October 2020 on a monthly basis with approx. 100 participants/session. This online version received incredibly positive feed-back and received several interesting environmental suggestions by the participants across EC-sites, including Representations in member states. In total **517 colleagues** attended an EMAS basics training in 2020 (in relation to 432 colleagues in 2020 and 269 participants in 2019). The most common topics of interest included the upcoming *Greening the Commission Communication*, the Commission's carbon footprint from teleworking and the reduction of GHG emissions related to missions and sustainable commuting.

The efficiency of the corporate EMAS trainings is monitored via the biannual EMAS staff surveys, as well as the standard evaluation surveys conducted via the EC training IT tool (EU Learn). According to the 2021 EMAS staff survey, general awareness of Commission staff members about environmentally responsible behaviour at work reached an all-time high, with **85%** of staff feeling well or reasonably well informed about it. This represents 1% points increase since 2019.

In addition, a 10–15-minute presentation is included in the introductory program for Commission newcomers in the JRC-sites and Grange ([53]) and in few other DGs/services e.g. 'ERCEA Green coffee for the newcomer' – a 'coffee break', during which ERCEA EMAS file and the Greening Group initiatives were presented to newcomers.

Lastly, the EMAS section in the new Commission's Training Portal (including a variety of training material from e-books to documentaries, videos, and cartoon animations) was updated and further enriched.

In 2022 (i) the online *"EMAS basics for all"* sessions will be intensified in periodicity, aiming to reach out to at least 600 participants and extend the scope to include the environmental impact of teleworking, and (ii) HR.D.02 will define ad-hoc tools

([51]) The new Logistics Proximity Teams (LPTs), coordinated by the Office for Logistics and Infrastructure in Brussels (OIB), took over the tasks carried out by the Building Managers, Inventoried Items Managers (GBIs) and Office Supplies Managers (GDFs).

([52]) The Account Management Centre in DG HR is a new Directorate, which takes over responsibility for the local HR services which were previously delivered by HR units in each DG. (From 16 February 2017, the Account Management Centre is your??? first point of contact for all your??? personal HR issues.)

([53]) The periodicity of the newcomers' presentations depends on the number of new staff. Information relevant to JRC and Grange newcomers' trainings are provided in the relevant annexes.

to monitor the efficiency of EMAS-related trainings offered to EC-staff (e.g. via EMAS staff survey 2021) and adapt the EMAS documentation accordingly.

9.1.5.2 Environmental Management System (EMS) Training

There have been four (4) training sessions for new EMAS Correspondents (ECORs) and EMAS site coordination teams, i) one online training on 12th January (23 participants), ii) a second online session on 8th of March (26 participants), iii) a third online session on 22nd June (29 participants) and iv) a fourth online training on 13th October (15 participants). In total, **93 members of the EMAS teams** (in relation to 31 in 2020 and 24 in 2019) have attended an introductory EMAS training. An interesting feature of this year was that many older and more experienced EMAS team members decided to refresh their knowledge by attending an introductory training session and profit with the interesting exchanges among the network. It should be noted during 2021, nearly all new EMAS Correspondents (besides tow ECORs) have attended an EMAS training despite the extremely high turn-over rate (36 new members in relation to 25 in 2020).

Following the suggestion of the EMAS Site Coordinators, there have been two sets of Site Coordinators' workshops during 2021 (approx. **15 participants/workshop**): (i) Three virtual half-day workshops during March 2021 focused on EMS improvements and (ii) three (3) virtual half-day workshops on 20/11, 24/11 and 27/11 that focused mainly of EU Green Deal implications on the Global EMAS Action Plan, communication and training actions. This brought together the EMAS Site Coordinators for all EC sites. These gatherings are essential to ensure mutual learning and to harmonise local EMAS implementation.

In addition, there have been two preparatory training as part of EMAS verification exercise for the 4 Executive Agencies: REA, EASME, EACEA and ERCEA during May 2021 (9 participants). The efficiency of the corporate EMAS trainings addressed to the EMAS Network is monitored via the annual EMAS Network survey and the subsequent benchmarking exercise (see paragraph 9.1.4). The 2021 EMAS Network survey revealed a continuing high average of **6.9** for the network of EMAS Correspondents/Site Coordinators (and an impressive average of **8** among the Executive Agencies), demonstrating that the network has been performing exceptionally well despite the COV19 lockdown strain. Concerning the EMAS teams in EC Representations in Vienna and Valetta, a GAP analysis was successfully performed during 2021 internal audit, in order to prepare the ground for their gradual inclusion to the EMAS scope.

In 2022, HR.D.7 will (i) also host EMAS site coordinators' workshops, introducing a new approach: instead of two main workshops, opt for several shorter online workshops during the year, (ii) Introduce monthly virtual coffee meeting among the network and exploit the full potential of new collaborative tools available (e.g. MS Teams) and (iii) define ad-hoc tools to monitor the efficiency of EMAS-related trainings offered to EMAS Network (e.g. via the annual EMAS Network benchmarking exercise, GAP analysis for EC Representations) and adapt the EMAS documentation accordingly.

9.1.5.3 Specialised courses

Selected staff whose activities may have potentially significant environmental impacts may benefit from externally provided environmental training sessions. Examples are the energy counsellor's course by Brussels Environment (IBGE) and eco-driving training for Commission drivers. External suppliers provide these training sessions. HR.D.7 as a system requirement, has however established a register of training needs for such staff and is seeking to map the current offer of specialist trainings arranged by the sites. During 2021, the majority of the EMAS Site Coordinators updated this register.

In 2022, the Commission will design and offer GPP trainings for EC Financial Officers/Procurers/Project Managers, in collaboration with GPP experts from JRC-Ispra, DG BUDG and DG ENV, in the framework of the Greening of the Commissions and the Interinstitutional GPP Helpdesk thematic conferences/events.

9.2 External communication

9.2.1 Environmental Statement and websites

- This document is the "go to" document for most responses to questions on the subject. It contains information from the all the EMAS sites (as annexes) and is subject to external verification. It is published on DG ENV's EMAS website ([54]). Since 2019, two pages of infographics have been added as part of the Executive Summary, demonstrating visually the main EMAS highlights and achievements. Additional "EMAS in EC" webpages have been created at the Commissions Europa homepage under: "Organisational structure" / "Modernising the European Commission" at: [People first – Greening the European Commission | European Commission (europa.eu)]

In 2021, the "EMAS in EU Institutions" section at the official EMAS website (approx. 3 000 hits/year) was updated including overall environmental results and best-practices and success stories by the 12 EMAS-registered EU Institutions and bodies, as part of an inter-institutional communication project in the framework of the Inter-institutional Group on Environmental Management (GIME).

In 2022, in the framework of the EU Green Deal, the EMAS logo and information about "EMAS in EC" will have a more prominent position at the Commission's official Europa homepage.

9.2.2 Press announcements

The participation of the European Commission and other EU Institutions and agencies in the social media #WeforEMAS campaign, promoted by the EMAS Helpdesk and the German EMAS Advisory Board (Umweltgutachterausschuss, UGA), as well

([54]) http://ec.europa.eu/environment/emas/emas_registrations/emas_in_the_european_institutions_en.htm as the highlights of the Commission's environmental performance have been promoted via EMAS in EU Institutions section of the official EMAS website on Europa managed by DG ENV.

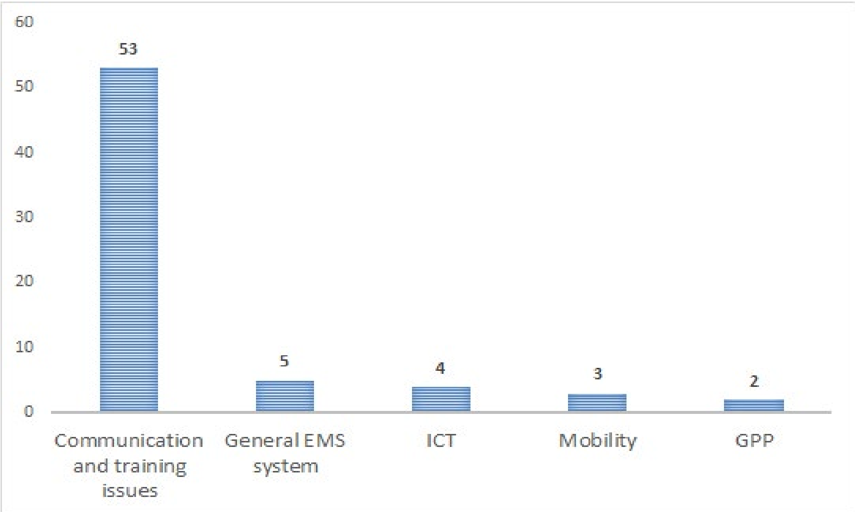
9.2.3 Parliamentary questions

HR.D.7 responded to four parliamentary questions in 2021, in relevance to Green-house Gas (GHG) emissions' reduction and paperless working approaches in the framework of the EU Green Deal, paper consumption, the Pollinator Park' project and sources of energy used in Commission premises.

9.2.4 Communication with external stakeholders

HR.D.7 responded to all **69** external queries recorded during 2021 (in relation to 20 in 2020, 58 in 2019, 45 in 2018 and 30 in 2017 and significantly increased from 8 in 2016). The significant increase in the Commission's EMAS team outreach is due its more visible role as coordinator the interinstitutional EMAS communication workgroup, in the framework of the *Group Interinstitutionnel de Management Environnemental* (GIME). The three most popular topics of interest for external stakeholders were EMAS communication/training issues in relation to specific successful Commission's actions and the preparation of the Interinstitutional EMAS Days 2022, the "EMAS in EC" operational procedures and documentation (especially in relation to the upcoming *Greening the Commission Communication*) and topics related to the environmental impact of teleworking and digital footprint.

Figure 9.2 The main topics of interest of external stakeholders' inquiries/suggestions in 2021



Inter-institutional collaboration was established on specific themes on a regular basis with EU or international organisations. These include the European Parliament, the General Secretariat of the Council, the European Economic and Social Committee, the European Committee of the Regions, the European Central Bank, the European Court of Auditors, the European Court of Justice, the European Investment Bank, the European Decentralised Agencies, Inter-agency Greening Network and other EU bodies.

The 29th edition of the EU Institutions' Open Day was 100% virtual. The EU institutions opened their 'virtual' doors to celebrate Europe Day on 9 May. People across the EU and beyond will be able to find out more about the European Union and what it does via the Europe Day portal and virtual visits to the European Parliament, the Commission's Berlaymont headquarters, and other EU institutions. An interactive online space allowed visitors to play games, watch videos and test their EU general knowledge, as well as what they know about issues like a green and digital Europe. With one click, users could join online debates on EU topics and explore online events. There was also the multilingual Conference on the Future of Europe platform, where citizens could share your ideas for shaping the EU's future.

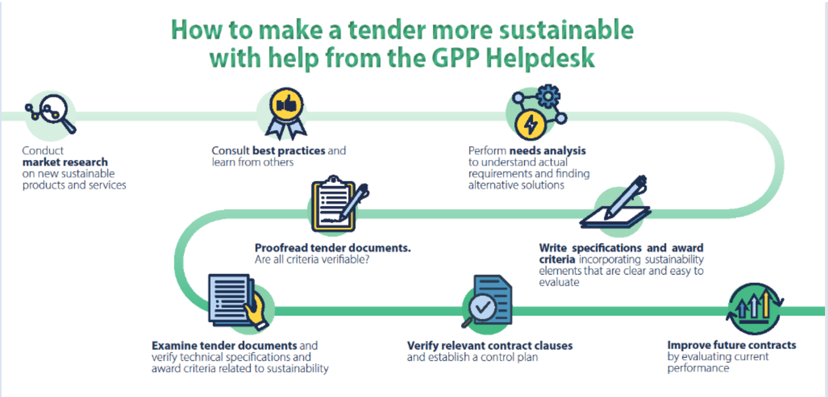
Lastly, during 2021 the following external communication initiatives were organised:

- Design and coordination of the **Interinstitutional EMAS Days 2022,** which run during February 2022, first time-ever with the participation of all twelve EMAS-registered EU institutions and agencies, dedicated to climate neutrality strategies and action plans, sustainability of EU buildings, mobilizing the EMAS networks and groups of volunteers, gamifications for environmental sustainability, organisation of sustainable conferences and events, and common projects and joint surveys.
- Collaboration with the **UN Sustainability Group** – *UN Greening the Blue*, exchanging best-practices on EMAS /Greening the Commission practices. Specifically, presentation about EMAS/Greening the Commission at the 36th Meeting of the Issue Management Group on Environmental Sustainability Management (16/06).
- HR.D.7 participated in the virtual **Inter-agency Greening Network** on 13 October 2021.

In 2022, the Commission will continue to play a leading role among EU Institutions and bodies, in promoting EMAS implementation, as well as in green public procurement (GPP) via the re-launching of the **GIME meetings**. Moreover, HR.D.7 will coordinate the organisation of **Interinstitutional EMAS Days 2022** in the February 2022.

9.2.5 Information for suppliers and sub-contractors

The Register on EMAS information sessions for EC suppliers and sub-contractors was considered obsolete and withdrawn, since the annual follow-up of the common template (Annex 2 to EMS-PRO-001) concerning the needs and expectations of external stakeholders both at corporate and site level, already covers all the additional requirements of the revised Annexes of EMAS Regulation III.



In 2022, the Commission will (i) continue to disseminate information about its environmental management system (EMAS) and its climate neutrality objective to its main suppliers and sub-contractors; (ii) as well as promote and implement the main principles of Green Public Procurement (GPP) in its own tenders/contracts via the support of the **Inter-institutional Green Public Procurement Helpdesk** coordinated by the European Parliament.

10 Costs of implementation and resource reductions

The Commission estimates costs of implementing EMAS and savings that can be associated with reduced resource consumption (for some parameters). The availability of data varies from site to site and by year.

10.1 Costs of staff and contracts for implementing EMAS

Table 10.1 summarises the estimated direct cost of human resources of Commission staff ([55]) along with those of consultancy, and other contracts directly linked with coordinating EMAS implementation.

Table 10.1 Direct total and per capita costs of implementing EMAS for each site (EUR)

Site							Change in	Per person costs in:						Change in
	2014	2017	2018	2019	2020	2021	2020-21	2014	2017	2018	2019	2020	2021	2020-21
HR.D7+ECOR network[1]	1 007 252	1 049 252	1 119 252	1 133 252	1 147 252	1 182 252	35 000	30,7	30,5	32,1	32,0	31,4	30,7	-0,7
Brussels	132 000	138 000	148 000	150 000	152 000	157 000	5 000	4,82	4,89	5,19	5,18	5,08	4,99	-0,1
Luxembourg	462 000	483 000	370 000	375 000	380 000	392 500	12 500	114	100,9	73,8	73,0	72,5	69,0	-3,5
JRC Petten	66 000	69 000	74 000	75 000	76 000	78 500	2 500	234	262	298	301	308	327	19,4
JRC Geel	66 000	69 000	74 000	75 000	76 000	78 500	2 500	191	260	286	286	286	298	12,8
JRC Karlsruhe [1]	71 000	74 000	79 000	80 000	81 000	83 500	2 500	222	230	249	254	262	274	11,6
JRC Sevilla	132 000	138 000	148 000	150 000	152 000	157 000	5 000	457	429	433	408	398	403	4,7
JRC Ispra [1]	383 760	486 945	491 928	473 595	476 515	475 175	- 1 340	164	214	215	203	198	192	-5,7
Grange [1]	47 400	49 356	51 856	56 100	56 600	57 850	1 250	265	263	290	319	327	325	-2,2
Commission	**2 367 411**	**2 556 553**	**2 556 035**	**2 567 947**	**2 597 367**	**2 662 277**	**64 910**	**67,3**	**69,8**	**68,8**	**68,0**	**66,7**	**65,0**	**-1,7**
of which % contracts	10,2	13,1	12,6	11,8	11,6	0,0								

Note: Includes all staff at Luxembourg and Brussels sites, based on sites participating in verification

1 – Cost includes contracts

The size of the teams supporting the EMAS system at the sites has been relatively stable for several years, and consequently the cost per staff member has fluctuated between 65 and 70 EUR. JRCs Petten, Geel, Karlsruhe and DG SANTE at Grange report the equivalent of less than one employee (as Full Time Equivalent). A slight cost reduction was recorded in 2020-21.

10.2 Savings from reduced energy consumption in buildings

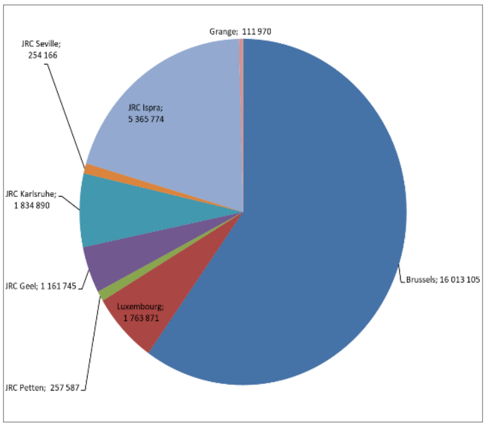
Energy consumption represents the greatest single resource cost recorded under the environmental system. Figure 10.1 shows energy costs in 2021 along with the evolution of per capita expenditure in recent years.

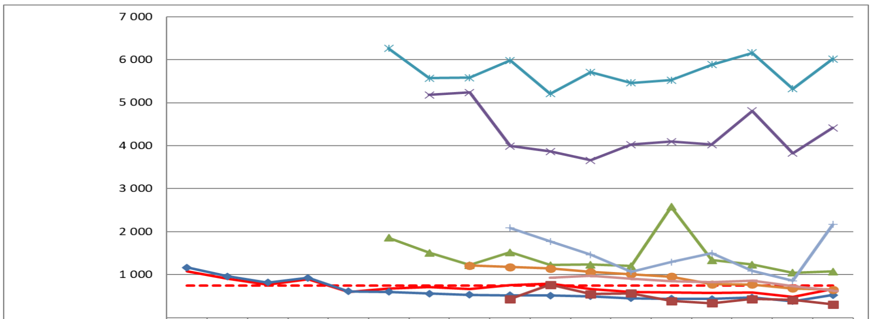
Per capita costs varied widely between the sites in pre-COVID years with those comprising mostly office buildings, (Brussels and Luxembourg) both below 500 EUR and JRC sites with their more energy intensive experimental and/or nuclear activities such as JRCs Geel and Karlsruhe close to 5 000 and 6 000 EUR respectively. The COVID pandemic resulted in significantly reduced costs in 2020 but increased significantly in 2021, (especially at JRC-Ispra). The Commission is still

([55]) Using standard average cost of administrators published by DG BUDG for the Financial units, 157 000 EUR in 2021.

meeting its 2014-20 target value ([56]) of 750 EUR/p for per capita energy consumption, although it increased by 38%. Financial targets for resource consumption no longer apply.

Figure 10.1 Building energy costs in 2021 (EUR) and evolution of per capita costs (EUR/p)





	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Commission	1 083	905	770	894	597	681	716	670	758	786	662	595	581	574	590	485	667
Target 2014-20	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
Brussels	1 168	961	815	924	611	600	557	530	521	515	497	449	437	435	469	380	523
Luxembourg									434	765	549	567	386	336	431	408	310
JRC Petten						1 858	1 510	1 221	1 520	1 225	1 237	1 199	2 580	1 335	1 232	1 043	1 073
JRC Geel							5 181	5 241	3 995	3 866	3 659	4 029	4 095	4 029	4 811	3 826	4 417
JRC Karlsruhe						6 263	5 572	5 583	5 981	5 210	5 711	5 461	5 528	5 885	6 161	5 328	6 016
JRC Seville								1 211	1 177	1 142	1 062	1 014	956	779	769	677	652
JRC Ispra									2 089	1 772	1 464	1 070	1 292	1 496	1 087	858	2 168
Grange										931	971	901	853	829	864	734	629

Note: Brussels data in 2005 applied to 8 buildings, but since 2014 most buildings are included

Brussels reduced in 2020 its per capita costs but in 2021 it increased due to an increase in energy use. Luxembourg's costs nearly doubled in 2014 because two data centres were included in EMAS reporting but since then they decreased apart from in 2019 and 2020 which reflects higher energy prices. Energy prices which vary significantly between sites, as shown for selected sites where changes have been recorded (Table 10.2).

Table 10.2 Evolution of energy prices at selected EMAS sites, 2020-21 (% change in Eur/MWh)

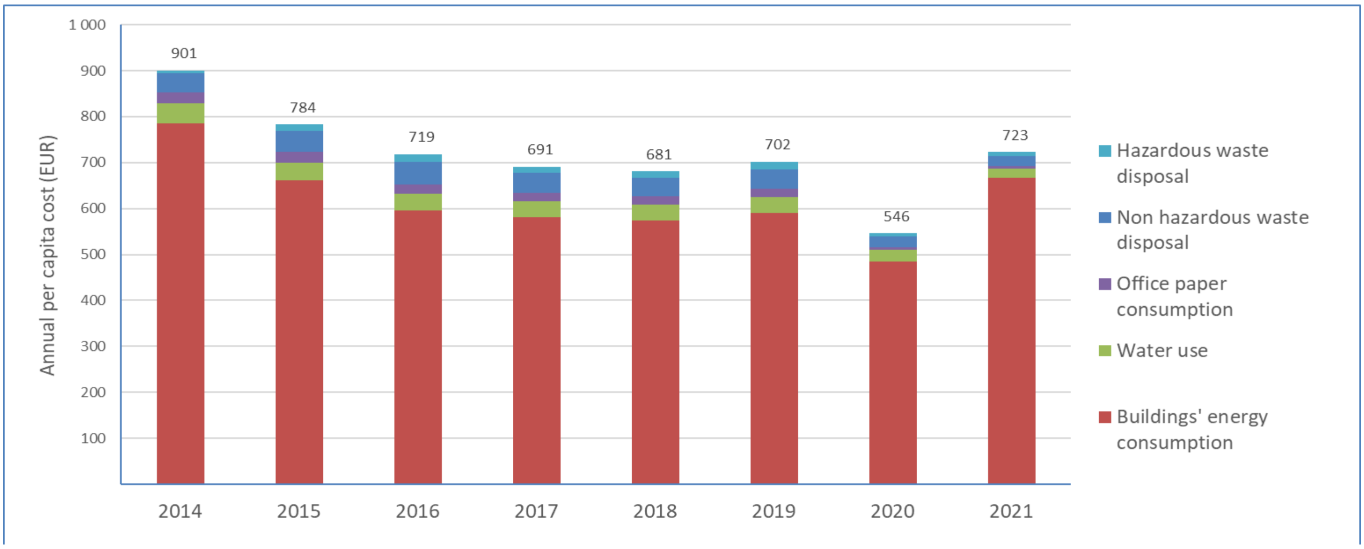
Site	Electricity	Gas
Brussels	14	246
Luxembourg	-15	-2
JRC Geel	-11	166
JRC Seville	-16	-4
JRC Ispra	53	196

10.3 Costs of energy, water, paper and waste disposal

The per capita costs for non-energy resource consumption parameters and for waste disposal, at typically 20 to 50 EUR, is far lower than for buildings energy consumption as demonstrated in Figure 10.2. Resource costs reduced considerably in 2020 owing to the COVID pandemic for all the parameters, but increased again in 2021.

([56]) The EMAS Steering Committee has discontinued targets for resource consumption costs, as resource consumption is itself subject to targets

Figure 10.2 Evolution of Commission per capita costs for energy, water, paper and waste disposal, 2014-21



While the unit cost for disposal of hazardous waste is greater than that for non-hazardous waste, the much smaller volumes of the former lead to overall costs that are typically one third to one quarter for the latter. The data suggest cumulative savings of approximately 17,5 Mio EUR since 2014 based on per capita costs applied to the EMAS population.

11 Lessons learned and the way forward

This report summarises the Commission's overall performance using data from the eight largest Commission sites. In addition, annex I reports on the first two of the Commission's representations in Member States to register. It represents consolidation of an EMAS system that started with Brussels in 2005, incorporated Luxembourg in 2012, and then the five experimental JRC sites and DG SANTE at Grange in Ireland by 2014 and the pilot Representations (Vienna and Valletta) in 2021.

11.1 Conclusions

1. The COVID pandemic that resulted in teleworking for almost all staff for most of 2020 and 2021 resulted in a reduction in the Commission's environmental impact indicated by lower values for the core environmental performance indicators compared to 2019. The carbon footprint reduced considerably in this period, even considering the carbon footprint of teleworking, owing to very significantly reduced missions' emissions. Having already met its 2020 targets, the Commission, owing to the pandemic situation had also sometimes in 2021 met the 2023 and 2030 targets.
2. The EMAS site coordinators reviewed previously defined site level targets for core environmental performance parameters for 2023 and 2030 for the Global Annual Action Plan. This continues to be subject to considerable uncertainty particularly under existing 'non-normal' conditions it is not yet evident how the working environment will change. Integrating the Greening the Commission communication's action plans with the Global Annual Action Plan has commenced.
3. To improve the Commission's carbon footprint, the Corporate coordination team added two components. In consultation with several site coordinators and emissions experts, it estimated the most significant aspects of teleworking of which emissions from heating energy was the most important. The Corporate Coordination team also calculated the CO_2 emissions for external experts' travels for that are paid for by the Commission using the approach formerly adopted by experts during DG CLIMA's study for data in 2019. Furthermore, it integrated missions emissions data for 2021 from the

internal missions database, which will simplify analysis of such information at DG level, particularly important for reducing the Commission's carbon footprint.

4. In 2021, buildings emissions represented 69% of the carbon footprint (42% operation, 27% construction). This was a far greater percentage than in 2018 and 2019, because of much reduced mission travel, which represented 7% even considering the experts' missions.

5. The first year of starting to include EC representations in Member States (an exercise conducted with the European Parliament) has been important in extending the reach of the Commission's management system to Member States, starting with Vienna and Malta.

6. The Executive Agencies are now fully incorporated within EMAS.

11.2 Going forward

In order to continue to improve environmental performance, and meet stakeholder expectations, we need to:

7. Incorporate under EMAS the operational requirements resulting from the Commission's own Green Deal communication.

8. Improve the Carbon Footprint calculation. The following are required to have a more robust system

    - Further develop the calculation of homeworking impacts using as much real data as possible from specific staff survey and estimating the teleworking contribution in 2019 and 2020

    - Develop a Commission wide survey incorporating, besides teleworking emissions, information to estimate emissions from staff commuting across the EMAS sites.

    - Work with internal partners (including and especially the PayMaster's Office (PMO) to ensure that the basis for reporting of missions' emissions, within MIPs is as broad as possible. Ideally missions data for external experts' (whose travel is funded by the administrative budget) should be recorded in a similar manner as for staff.

9. Continue discussions with DG COMM and the European Parliament to improve the procedure for incorporating the Commission Representations and Parliament Houses of Europe in Member States within the EMAS Registration.

10. Continue efforts to **improve on the data collection and reporting** tool that currently uses spreadsheets and has recently moved online to TEAMS. This will build on steps taken internally and externally to identify a more robust alternative.

11. Determine the feasibility of delivering a simpler reporting format.

APPENDICES

1 EMAS implementation in the Commission

1.1 Who implements EMAS in the Commission?

A College of Commissioners Decision ([57]) ensures EMAS implementation at a high level. DG.HR's Director General chairs the **EMAS Steering Committee ([58])** (ESC) which meets twice yearly. It defines environmental policy, adopts the annual global action plan, sets environmental objectives and monitors progress. In addition, and due to the Commission's decentralised organisation, management and line managers not directly involved in the ESC or without formally defined EMAS roles also participate in the system. The Commission's Management Board established a working group to encourage closer links particularly between DG HR, SG and BUDG.

A team based in Brussels within **HR.D7,** the Greening, Safety & Buildings Unit of DG HR, assumes day to day coordination. The **EMAS Management Representative** is responsible to Management for EMAS implementation and is the contact point for external organisations such as IGBE (Brussels Environment) and other EU Institutions. Four full time staff members work predominantly on system coordination including communication and training and are assisted occasionally by a trainee.

The Commission's size and geographic spread, requires that HR.D7 works with a network of over 40 staff across the Commission services whose job descriptions include their EMAS responsibilities. The network includes:

1. **EMAS site coordinators** at each of the eight sites are HR.D7's main contacts and responsible for implementing EMAS at the site level. They report on performance, contribute to the Environmental Statement and participate in preparing site level objectives and actions
2. **EMAS correspondents** (Brussels only) provide a link between their directorate-general/department and HR.D7, particularly for communication; and are nominated by their services. They participate in formal meetings on average three times a year, usually before the start of information campaigns.

Other staff contribute to EMAS, particularly those in facilities management, for example by providing data for reporting on resource consumption or waste generation, or when participating in internal and verification audits. Communication campaigns and training target all staff to improve environmental behaviour, and whose attitudes are gauged every two years by surveys.

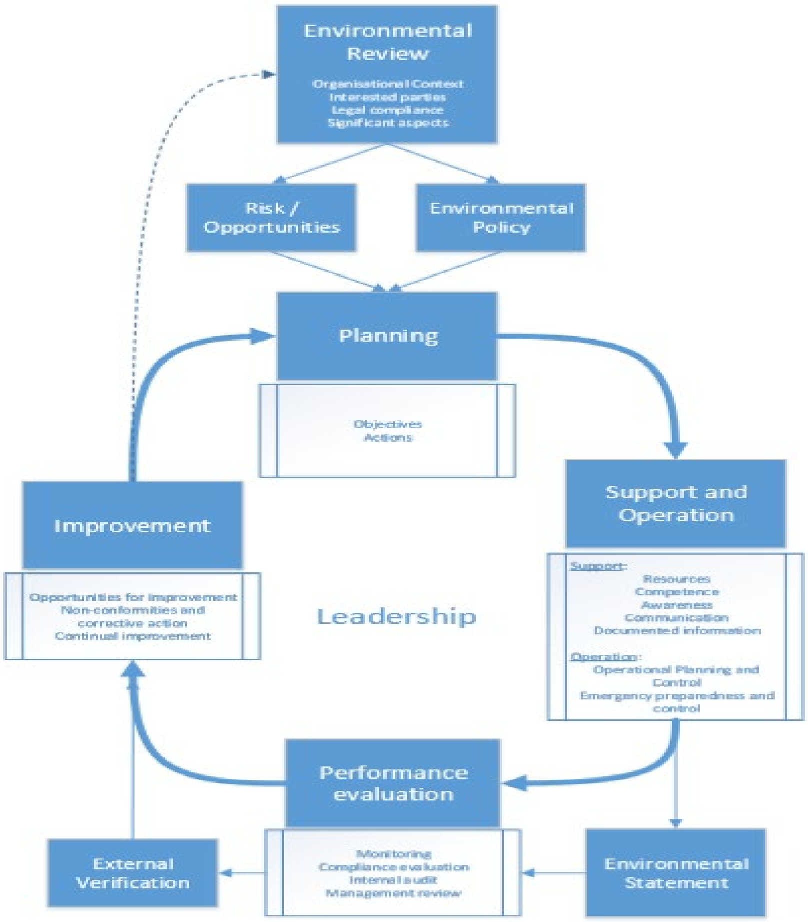
([57]) COMMISSION DECISION C(2013) 7708 of 18.11.2013 on the application by the Commission services of the Community eco-management and audit scheme (EMAS).

([58]) The Steering Committee is made up of the following directorates-general and services: BUDG, CLIMA, DIGIT, ENER, ENV, HR, JRC, MOVE, SG, SANTE, MARE, RTD, SCIC, OIB and OIL (and several Executive Agencies are in the process of applying).

1.2 Key components of the EMAS system

Figure 1 shows the main elements of the EMAS system with the steps required to achieve and maintain an EMAS registration.

Figure 1 The EMAS Cycle



Further description of some of the elements are defined below. Most of the activities occur annually, but the whole cycle is completed in three years for practical purposes. The size and spread of the Commission's premises across Europe dictates that activities such as auditing are phased over the three year cycle.

1.2.1 Environmental review

The Environmental Review provides a global overview of environmental considerations and a basis for defining strategy and objectives. The Commission defines its operational context, legal obligations and determines which environmental aspects ([59]) related to its activities, products and services have (or may have) a significant impact on the environment and on the environmental management system (EMAS).

([59]) Aspects evaluation undertaken according to Annex 4 of EMAS PRO 001 and considers for each aspect considering frequency, severity, breach of law, magnitude, applicable legislation, stakeholders concern, previous incidents and the possibility of taking action

It also considers the needs and expectations of interested parties and decides which of these can become obligations in the management system. The EMAS sites each considers these elements although context and interested parties are also defined at corporate level. This helps define actions considering risk and opportunity.

1.2.2 System documentation

HR.D7 maintains the system documentation of which the most important elements are the EMAS Handbook, which provides a system overview and defines roles and responsibilities. Sites must apply the three "central" procedures (i) EMAS environmental review; ii) Monitoring, reporting, and planning and iii) Management of audits and verifications findings) or equivalent alternatives, and may develop their own standard operating procedures to cover local conditions.

1.2.3 Monitoring of indicators and setting of objectives

EMAS requires organisations to continually improve their environmental performance, so they must identify indicators to measure and set objectives. While indicator and objective definition logically follows the environmental review conducted at each site and may therefore vary from site to site, Annex IV of the EMAS Regulation nevertheless defines "core" indicators for which data is expected to be collected, including energy efficiency, material efficiency, water consumption, waste generation, biodiversity, and emissions.

According to the Regulation, and as an administrative organisation, the Commission expresses the core indicators first as output per person. The total number of employees within the EMAS area, is therefore a common denominator of most indicator measurements. In addition, in facilities managers use indicators, such as energy consumption and gas emissions that are commonly expressed per square metre.

Every year the Commission updates its Global Annual Action Plan. This comprises:

- a review of the evolution of indicators against targets, and the setting or future targets; and
- an update in the status of existing actions and the identification of new actions to improve environmental performance and meet targets.

The EMAS Steering Committee approves the Global Action Plan annually. After consultation with the sites the ESC adopted medium- and long-term objectives for the periods 2014-23 and 2030.

Data tables contained in the individual reports for each site in Annexes A to H include indicators that can be grouped under eight main headings encompassing the political objectives set out in the Environmental Policy and as shown below. Not all sites report on all parameters:

Table 1 Summary of main policy objectives and associated indicators

No	Environmental Policy Objective	Indicators
		Physically based parameters ([60])

([60]) Usually requiring invoices and/or measurements for their definition. For several resource consumption parameters, technical staff may also report results per square metre. This applies to "useful surface" areas which are often defined in lease or service contracts.

No	Environmental Policy Objective	Indicators
I	More efficient use of natural resources	a) Total energy consumption (buildings), b) total energy consumption (fleet vehicles, c) renewable energy use (%), d) water consumption, e) paper consumption
II	Reducing CO_2 emissions, (including CO_2 equivalent of other gases) and other air pollutants	a) CO_2 emissions from buildings energy consumption, b), other greenhouse gas emissions (as CO_2 equivalent from buildings (ie refrigerants), c) vehicle CO_2 emissions (manufacturer (and actual), e) actual total air emissions including SO_2, NOx, PM. (Also evaluated for the Commission's carbon footprint are emissions from other business travel, commuting, and additional criteria adopted in 2018 and 2019 (fixed assets for buildings, IT, Commission vehicle fleet, goods and service contracts, and waste disposal). Teleworking emissions and experts travel were adopted in 2021.
III	Improving waste management and sorting	a) Non-hazardous waste, b) hazardous waste and c) unseparated waste (% of total, tonnes/person).
IV	Protecting biodiversity	a) Total use of land, b) sealed area, c) nature-oriented area on/off site
		Communication/training "soft" parameters ([61])
V	Promoting "greener" procurement	a) Percentage of contracts over 60.000 EUR incorporating additional "green" criteria and, b) degree of greening achieved in contracts according to criteria adopted ([62])c) percentage, fraction and value of "green" products in the office supply catalogue,
VI	Ensuring legal compliance and emergency preparedness	a) Risk prevention and management, b) progress in registering for EMAS, c) non-compliance in external EMAS audits and d) emergency preparedness.
VII	Improving communication (sustainable behaviour of staff; suppliers, and training)	a) Centralised formalised EMAS campaigns, b) environmental training for new colleagues, d) staff awareness (through two yearly external survey), e) register of training needs and f) response to internal questions.
VIII	Enjoying transparent relations with external partners	a) Response to external questions, b) register of local and regional stakeholders (needs and expectations) and c) dialogue with external partners.

This document summarises results for each site along with a Commission wide summary presented in the order in the above table and consistent with the Global Annual Action Plan.

1.2.4 Legal compliance

The Commission maintains European, National and, where relevant, Regional registers of applicable legislation for its sites. It applies host country legislation, and requires its contractors to do so, with a particular focus on maintenance and inspection contracts. Expectations and needs of interested parties can become an obligation for the Commission if accepted.

In addition to complying with general legislation applicable to its facilities, the Commission must fulfil the requirements of environmental permits that are granted by the authorities. In Brussels and Luxembourg individual buildings each have their own

([61]) Results will ultimately appear through improvements in the areas of policy objectives I to IV, and most parameters measured input based.

([62]) As per recommendations of the ECA Special Report of 2014 on how the European Institutions measure and mitigate their Carbon Footprints.

environmental permit. The Commission seeks, when it is not the permit holder for example when renting premises, to ensure that the permit holder is compliant.

Each site is responsible for its own legal compliance which is checked through sampling each year as part of the activity of two audit campaigns that HR.D7 organise and coordinate:

- "verification" audits to maintain the EMAS registration and which will take place at the end of spring/beginning of summer; and
- "internal" EMAS audits in the autumn.

HR.D7 also monitors the follow-up of these audit findings on a corporate register and reports on progress twice yearly to EMAS Steering Committee. Furthermore, each site undertakes routine operational checks and puts in place corrective actions under the normal working conditions (usually infrastructure services and/or health and safety units).

The sampling method for buildings audits considers that the Commission is a multi-site organisation with EMAS buildings or facilities in eight sites across seven countries. The buildings and facilities of the sites of **Geel** (Belgium), **Petten** (The Netherlands), **Seville** (Spain), **Karlsruhe** (Germany) (although JRC Karlsruhe was not subject to verification audit in 2022), **Ispra** (Italy) and **DG SANTE at Grange** (Ireland) are verified each year. On the basis of reporting for 2021 two pilot Representations in the Member States have been added to the Commission's EMAS Registration, Vienna and Valletta. The administrative buildings of the Commission headquarters Brussels and Luxembourg are verified on a sampling method based on the EMAS users guide ([63]). Any new buildings entering the scope are verified the year they enter along with some previously registered buildings. On average 12 buildings have been visited in recent years ([64]).

1.3 Corporate organisational context and interested parties

The evaluation of the context and interested parties has been undertaken for each site individually and is described in the corresponding annexes to this report.

The most important longstanding corporate level contextual issue was the high expectations of the system versus the relatively limited resources available. These expectations arose from the political, social and technological context but also the culture of excellence and staff expectations. Implementation requires constant efficiency improvements and some negative prioritising of EMAS actions. The associated risk is summarised as a high level of stress and delivery constraints, but this offers the opportunity to promote the EMAS and its achievements at the Commission in the context of the Green Deal.

HR.D7 has identified needs and expectation of 14 interested parties in relation to the EMAS system at corporate level, with reputational risk being the most common. This is mainly due to their expectations of information, support, coordination which exceed the available means. Internal interested parties are more concerned by operation support and cooperation. The major target to respond to their expectations is to maintain high quality EMAS deliverables and coordination.

As a more targeted part of the exercise to identify stakeholders needs and expectations at corporate level, the services represented on the Steering Committee have expressed their views resulting in an external study proposed and financed by DG

([63]) Commission Decision (EU) 2017/2285 of 6 December 2017 Amending the user's guide setting out the steps needed to participate in EMAS, under Regulation (EC) n° 1221/2009 of the European Parliament and of the Council on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS).

([64]) The guide requests verification of the square root of the number of buildings multiplied by 2 for a registration renewal. That means for Brussels and Luxemburg a minimum of 17 buildings in the three years period before the registration renewal (based on 2019 figures).

CLIMA to investigate possible pathways to climate neutrality by 2030. This was particularly relevant in the context of the Commission's Green Deal but puts additional demands on the heavily stretched EMAS Coordination team who are sought by internal stakeholders to provide high level briefings, and further assistance, and guidance.

On 5th April, the College of Commissioners adopted the new HR Strategy and a Communication on Greening the Commission. The objective is to reduce CO_2 emissions by at least 60% in 2030 compared to 2005 compensating the remaining emissions in 2030 with high quality carbon removals. These new targets and the actions foreseen in the Communication are integrated in the EMAS process.

1.4 Impact of Commission activities, indicators and targets

Each site reviews its environmental impact to identify those that are significant and determine how they should be managed. Details are presented in the sites' annexes to this report and summarised in Table 2.4. There is no separate review for the Commission as a whole.

Table 2 also includes objectives for Commission wide indicators associated with the target for 2023 and 2030. The table indicates that resource consumption, particularly in relation to energy, CO_2 emissions and other air emissions along with managing waste generation are particularly significant at most sites.

Table 2: Significant environmental aspects at EMAS sites 2021, associated indicators and Commission level targets for 2019-2023/30

A/ Significance of aspects at site level										B/ Indicator and Commission level target for 2019-2023 and 2019-2030 (where stated)						
Political objective group and significant aspect	**BX**	**LX**	**PE**	**GE**	**SE**	*KA*	**IS**	**GR**	**Val**	**Vie**	**Indicator**	**Units**	**Target 2023 % (1)**	**Target 2023**	**Target 2030 % (1)**	**Target 2030**
1) Efficient resource use																
Buildings energy consumption	✓ ✓	✓	✓	✓	✓	✓	✓ ✓	✓	✓	✓	1a Total energy consumption (bldgs.) 1c Non-renewable energy use	MWh/p kW/m² %	-13 -3,7 7,9	9,1 230 63,8	-23,3 -15,8 -2,4	8 201 57,7
Vehicle energy consumption	✓						✓				1b vehicle energy consumption	MWh/p kW/m²				
Water use	✓	✓	✓	✓			✓		✓	✓	1d Water use	M³/p L/m² EUR/p	-5,1 0,8	17,1 416	-10 -5,6	16,2 390
Paper consumption	✓		✓	✓			✓			✓	1e Office paper consumption	T/p Sheet/p/	-15	15,9	- -29	13,36
2) Reducing emissions to air																
CO_2 emissions (from buildings energy consumption)	✓	✓	✓	✓		✓	✓		✓	✓	2a CO_2 emissions (buildings)	TCO_2/p kgCO2/	-16,2 -8,7	1,3 32	-35,5 -30,2	1 25
Equivalent CO_2 emissions refrigerants (from buildings)	✓			✓	✓	✓	✓	✓		✓	2b Refrigerant losses	TCO_2/p kgCO2/				
Emissions from transport, including all missions and commuting (indicators only applies to Commission	✓						✓		✓	✓	2c CO_2 emissions (vehicle fleet) manufacturer actual	gCO_2/km gCO_2/km	--20	93	-54	53
Emissions of particles, dust, noise etc	✓		✓				✓	✓			2d Bldgs emissions (NOx, SO_2, PM_{10})	Tonnes/p				
Nuclear emissions		✓	✓	✓		✓	✓									
3) Improving waste management																
Non hazardous waste	✓	✓	✓	✓			✓	✓	✓	✓	3a Non-hazardous waste	T/p	-19	0,17	-24	0,16
Hazardous waste	✓	✓	✓	✓			✓	✓			3b Hazardous waste 3c Unseparated waste	T/p %	8,2	36,3	6,2	35,6
Wastewater/liquid waste	✓	✓	✓	✓			✓	✓			3d Non dom. wastewater	m³/p				
Nuclear waste						✓	✓									
4) Protecting biodiversity																
Protecting biodiversity	✓						✓		✓	✓	4a Use of land, sealed area,	m²/p,				
5) Promoting green procurement																
Contractor behaviour	✓						✓		✓	✓	5a Contracts with "eco" criteria Degree of greening criteria	%				
6) Legal compliance and emergency																
Ensuring emergency compliance and	✓		✓	✓												

1.5 EMAS objectives and UN Sustainable Development Goals (SDG)

The 17 SDGs are part of the 2030 Agenda for Sustainable Development, which includes a Political Declaration and a High-Level Political Forum for follow up. They apply to all countries, incorporating economy, environmental and social pillars of sustainability, and underpinned by the '5Ps' (people, planet, prosperity, peace and partnership). Countries report on progress in voluntary annual reports.

They have been referred to as the 'closest thing' the world has to an overall plan. The 17 high level objectives were developed by working groups of the UN Member States and other organisations and include a total of 169 targets under the 17 headings. They follow on from the Millennium Development Goals that applied only to developing countries. The 17 SDGs can be grouped as follows:

- 1 to 5 - parameters carried over from the Millennium Development Goals
- 6 to 11 - new areas
- 12 to 15 - the 'green' agenda
- 16 - peace
- 17 - means of implementation and partnership

Table 3 shows the coherence of the Commissions main EMAS objectives and core indicators with certain SDGs. There is considerable overlap in the definition.

Table 3 EMAS core indicators of global objectives and selected SDGs

	Selected Sustainable Development Goals											
EMAS global objectives and associated core indicators	3, Global health and wellbeing	4, Quality education	6, Clean water and sanitation	7, Affordable and clean energy	9, Industry innovation and infrastructure	11, Sustainable cities and communities	12, Responsible consumption and production	13, Climate action	14, Life below water	15, Life on land	16, Peace, justice and strong institutions	17, Partnerships for the goals
1) Efficient resource use												
1a Total energy consumption (buildings) 1c Non-renewable energy use												
1b vehicle energy consumption												
1d Water consumption												
1e Office paper consumption												
2) Reducing emissions to air												
2a CO_2 emissions (buildings)												
2b Refrigerant losses												

EMAS global objectives and associated core indicators	Selected Sustainable Development Goals											
	3, Global health and wellbeing	4, Quality education	6, Clean water and sanitation	7, Affordable and clean energy	9, Industry innovation and infrastructure	11, Sustainable cities and communities	12, Responsible consumption and production	13, Climate action	14, Life below water	15, Life on land	16, Peace, justice and strong institutions	17, Partnerships for the goals
2c CO_2 emissions (vehicle fleet) manufacturer, actual												
2d Buildings emissions (NOx,SO_2, PM_{10})												
Nuclear emissions												
3) Improving waste management												
3a Non-hazardous waste												
3b Hazardous waste												
3c Separated waste												
3d Non domestic wastewater discharge												
Nuclear waste												
4) Protecting biodiversity												
4a Use of land, sealed area, natural areas												
5) Promoting green procurement												
5a Contracts with "eco" criteria												
6) Legal compliance and emergency preparedness												
7) Communicating environmental responsibility and training												
8) Promoting dialogue with external partners												

2 Carbon footprint: factors and technical elements

Table 1 Summary of components, and recommended factors used in the carbon footprint

No	Description	Scope 1	Scope 2	Scope 3	
1	Mains gas for buildings PCI	Combustion 0,205 kgCO_2e/kWh		Upstream supply 0,0389 kgCO_2e/kWh	
2	Tanked gas for buildings (1)	Combustion 0,230 kgCO_2e/kWh			
3	Gas oil for buildings (1)	Combustion 0,266 kgCO_2e/kWh		Upstream supply 0,058 kgCO_2e/kWh	
4	Commission vehicle fleet (petrol) (2)	Combustion 2,28 kgCO_2e/L		Upstream supply: 0,528 kgCO_2e/L	Fixed asset 0,04 kgCO_2e/km
5	Commission vehicle fleet (diesel) (2)	Combustion 2,5 kgCO_2e/L		Upstream supply: 0,658 kgCO_2e/L	Fixed asset 0,05 kgCO_2e/km
6	Refrigerant losses: (100 Year GWP, as kgCO_2e/kg for Kyoto protocol gases) (3)	R410A (1 920), R134A (1 300) R404A (3 940), R407C (1 620), R407D (1 627), R507A (2 240), R422D (2 470), R23 (12 400), R32 (675), R427A (2 020), R508B (13 396), SF6 (23 500), R227A (2640), ISCEON89 (3805), R600A R290 (3), R32 (677), R12 (10 200), R452A (2239), R449A(1397)			
7	Refrigerant losses: (100 yr GWP kgCO2ee/kg commercial sources or calculated)	R22 (1760), NAF SIII (1447)			
8	Electricity supply: (kgCO_2e/kWh) Market approach (For Brussels it is the smaller non renewable supply)		Contract factor BX(0.275), LX(0.256), SE(0.200), GR(0.300)	Supplier line losses: 8,9% of emissions	Upstream losses: 8,9% of emissions
8a	Electricity supply (kgCO2e/kWh) Country approach (IEA, CO2 emissions per kwh of electricity only , 2019 data		BE (0.161), LX(0.110), NE(0.307), ES(0.153), DE(0.319), IT(0.266), IR(0.265), AU(0.120), MT(0.366)		
9	District heating: (kgCO_2e/kWh)		Contract factor	Upstream factor 15,8 %	

No	Description	Scope 1	Scope 2	Scope 3
10	Renewables for bldgs. energy **(6 categories).** [1]			Upstream supply (as $kgCO_2e/kWh$) i) photovoltaic (0,055) ii) biomass (0,019); iii) geothermal pumps (0,045); iv) offshore wind (0,0148); v) onshore wind (0,0127); vi) hydroelectricity (0,006);
11	**Business travel (staff) multiple categories)**			From 2021 uses the EC MIPs output, factors indicated in ARES(2020)6821862
11a	**Business travel (experts)**			From 2019, using consultant's approach in DG CLIMA study (Ares(2022) hr.d.7(2022)4148775)
12	**Fixed assets – buildings (7 categories)** Factors in $kgCO_2e/m^2$ for the following construction types: [1]			i) Not specified – offices (650) , ii) Steel - industrial building (275), iii) Steel - parking underground (220), iv) Steel - restaurants (183), v) Concrete - industrial buildings (825), vi) Concrete - parking underground (656), vii) Construction type concrete - restaurants (550) **Design life, depends on site/building conditions, typically 30 to 50 years (c)**
13	**Fixed assets – IT equipment (17 categories)** Factors in $kgCO_2e$/unit for the following items:[1]			i) PC desktop (169); ii) Docking station (148); iii) Flat screen (235); iv) Laptop (156); v) Individual printers (124); vi) Network printers & copiers (2935), vii) Fax machines (1470); viii) Scanners (1470); ix) Telephones (simple) (20); x) Telephones (smartphone and i-phones) (29*); xi) Telephones (fixe) (17); xii), Servers, (600*) ; xiii) Projectors (94) ; xiv) Videoconference installations (501); xv) Televisions (501); xvi) Other small IT devices (firewall router switches) (81); xvii tablet (9 to 11 inch (63) **Design life 4 years (c)**
14	**Goods and services contracts (non catering – 6 categories)** Factors in $kgCO_2e$ per named unit [1]			i) Security contract (FTE) (561); ii) Cleaning contract (FTE) (1180); iii) Other service contracts - consultants (kEUR) (170); iv) Other service contracts - translators (kEUR) (170); v) Other service contracts - (kEUR) (170); vi) Purchased paper, used or new (tonnes) (919);
15	**Goods and services contracts (catering – 7 categories)** Factors in $kgCO_2e$ per tonne			i) beef (28600); ii) pork (5890); iii) fish (9220); iv) chicken (4752); v) milk (1220); xii) Other dairy products (average yoghurt and butter) (6185); xiii) coffee (3140)
16	**Waste disposal (11 categories)** Factors in $kgCO_2e$ per tonne [1]			i) Incinerated waste – domestic waste (362); ii) incinerated waste – food (47); iii) methanisation – food (87); iv) Recycled/reused – paper (36); v) Recycled/reused – cardboard (36); vi) Recycled/reused – wood (36); vii) Recycled/reused – glass (36); viii) Recycled/reused - plastic PMC (877); ix) Recycled/reused – others (36); x) Hazardous waste - all types (706); xi) Landfill (probably mostly projects) (33)
17	**Teleworking emissions**			Since 2021, see Ares(2022)4075097, includes electricity consumption, space heating, videoconferencing, fixed assets of IT equipment.

Notes (1) Europe average from ADEME, Base Carbone 2018; (2) France value from ADEME, Base Carbone 2018; (3) IPCC 5th Assessment Report (2014, from p 731) https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf, As referenced by ADEME, Base Carbon 2018 (100 year GWP values) All factors supplied and revised by Commission's internal EMAS auditor

The factors for energy consumption include both scope 1(combustion) and scope 3 (upstream) components, the latter being typically 20 to 30% of the former. Scope 2 emissions are restricted to purchased electricity from the grid, which is applicable to all sites, and to district heating which is available at a minority of sites for example Luxembourg and Karlsruhe.

Scope 3 comprises emissions from a wide range of sources. The categories added in 2018/19 (items 12 to 16 in the above table), include 48 subcategories with potential data requirements at each site. In 2021 the approach to category 11 was modified, and both 11a and 17 were introduced.

The conversion factors used each year are relatively stable when based on physical or chemical properties of fuels, or refrigerants. They can be updated more frequently when considering for example the embodied energy of IT equipment that depend on complex supply chains. Of the 17 factors used for estimating embodied energy for IT equipment, several have reduced in recent years some of these, for example relating to servers, or laptops by quite a large margin. This reflects updated and improved methods of estimating the emissions and more efficient production processes.

Evaluating emissions for buildings and IT equipment is based on amortisation: the emissions are spread evenly across the assumed lifetime of the assets. The sites have used values they consider "appropriate" to their premises for buildings emissions. DG DIGIT provides information for calculating emissions from IT equipment for Brussels, Luxembourg and Grange, but not for the JRC. DG DIGIT has used an accounting lifetime of 4 years to determining how many units in each category of equipment have been amortised.

The following table shows the uncertainties associated with types of data, and conversion factors as introduced in Section 4.2.2 'Uncertainties".

Table 2 Uncertainty associated with types of data, and conversion factor

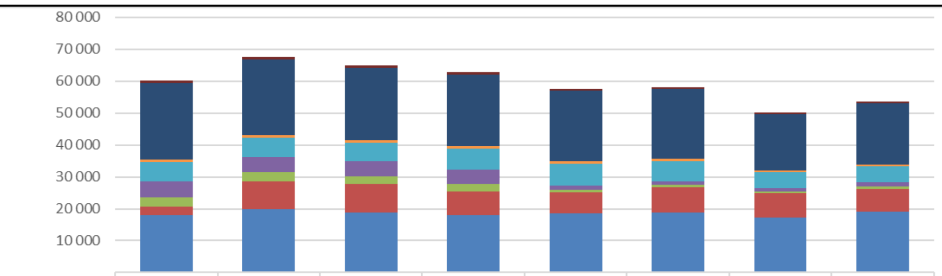
Uncertainty %	Type of data	Conversion factors to calculate CO2e for:
Most certain		
0	Data measured and validated by an external auditor. Data is directly used to calculate GHG emission without any additional transformation **(Top quality)**	
5	Data with high level of certainty: measured precisely. Data has been processed with a high level of certainty (i.e. use of a conversion factor) **(High quality)**	Combustion of heating fuels
10		Combustion of petrol, diesel (and upstream emissions)
20		Purchased paper (embodied)
30	Data measured with risk of small deviance or calculated using precise and commonly accepted assumptions Data processed by ratio (**Medium quality)**	GWP potential of refrigerants/coolants; Upstream emissions PVs, embodied energy of small IT devices, service contracts security/cleaning, most catering emissions
50	Data available with a certain risk on accuracy or calculated based on many assumptions (**Low quality**)	Embodied emissions of buildings, most IT, food; upstream emissions of geothermal pump; waste emissions (recycled/re-used PMC)s
70		Waste – recycled paper, cardboard, wood glass
80		Embodied energy of more complex IT servers, switches, routers, service contracts (consultants, translators etc)
90		Waste (hazardous waste, food (methanisation), incineration of food or domestic waste
Least certain		

3 Trends in selected components of the commission's carbon footprint

3.1 Emissions due to buildings' energy consumption

Buildings' energy consumption represents the part of the Carbon Footprint over which the sites have the most control. Figure 1 presents the relative contribution of individual EMAS sites in 2021. Brussels and JRC-Ispra together account for nearly two thirds of CO_2 emissions, with JRC Seville and Grange responsible for very small amounts.

Figure 1 EMAS sites' CO_2e emissions from buildings' energy consumption, 2014-21 (tonnes)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	60 242	67 614	64 994	62 921	57 587	58 138	50 114	53 562
Grange	879	958	877	768	661	631	553	496
JRC Ispra	23 952	23 500	22 577	22 499	22 110	21 898	17 614	19 166
JRC Seville	892	976	839	899	789	660	495	559
JRC Karlsruhe	5 868	6 085	5 757	6 605	6 724	6 364	4 880	5 148
JRC Geel	5 130	4 663	4 676	4 388	1 281	1 089	1 032	1 294
JRC Petten	2 819	2 788	2 451	2 364	779	717	531	576
Luxembourg	2 584	8 720	9 090	7 276	6 783	7 996	7 851	7 311
Brussels	18 118	19 924	18 726	18 122	18 461	18 782	17 159	19 012

Brussels emissions are relatively low considering its energy consumption reflecting that, electricity is supplied from renewable sources.

At JRC Ispra the tri-generation gas plant provides for a more efficient energy supply for the site, than would be provided by the market. The grid supplies a small amount of electricity, and therefore the site accounts for a significantly greater proportion of the total emissions. Part of this emissions are produced to carry out tests such as Vehicles Emission Tests, needed to support more sustainable EU environmental regulations. The Commission increased the emissions in 2021 by 9%, from 48 k tonnes to 52 k tonnes CO2e.

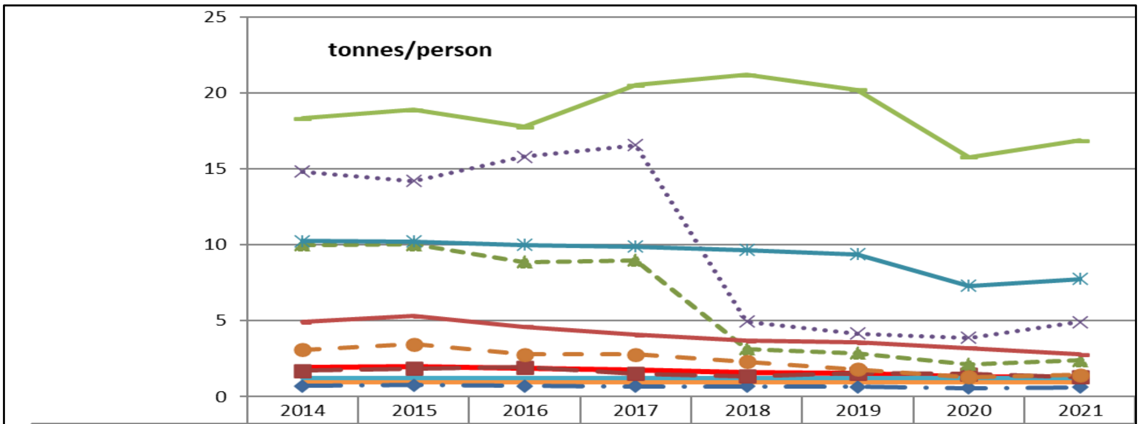
Figure 2 shows the historical trends in per capita and per square metre buildings emissions along with the aggregated Commission value and the 2014-23 and 2014-30 targets.

A gradual return to work in 2021, resulted in a 5% increase in per capita emissions and a slightly lower increase in emissions per square metre achieving the 2023 target for just the latter. The data show that in the last year there was a small increase for most of the sites, mainly due to the slow return to the office.

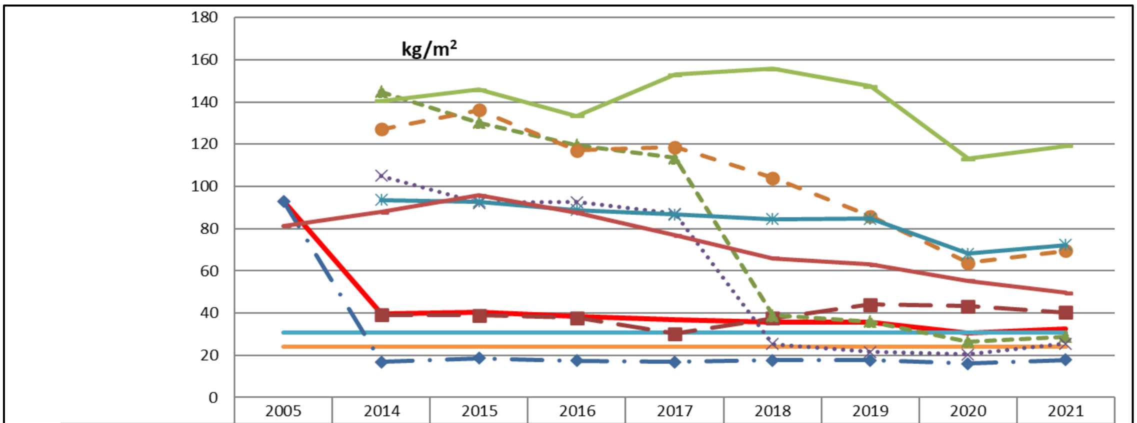
The JRC sites in Geel and Petten significantly reduced their emissions in 2018 by switching to an electricity contract with predominantly renewable sources, and JRC-Geel employs heat pumps in one of the main buildings. Seville followed in 2020. Although such contracts result in low or zero emissions for energy use, there is a small amount representing embedded emissions of the renewable sources.

Overall, the Commission has reduced emissions gradually since all sites have been included in reporting in 2011 and had met both 2014-20 targets by 2018. There are relatively few actions that directly target reducing CO_2e emissions from buildings, as this is often an additional benefit of actions that reduce energy consumption.

Figure 2 EMAS sites' CO_2e emissions from buildings' energy consumption, 2014-21 (tonnes/person, kg/m²)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	1,95	1,99	1,86	1,77	1,60	1,55	1,29	1,33
Target 2014-23	1,23	1,23	1,23	1,23	1,23	1,23	1,23	1,23
Target 2014-30	0,96	0,96	0,96	0,96	0,96	0,96	0,96	0,96
Brussels	0,71	0,78	0,70	0,67	0,68	0,65	0,57	0,62
Luxembourg	1,73	1,87	1,95	1,52	1,35	1,56	1,50	1,29
JRC Petten	10,0	10,0	8,88	8,99	3,14	2,88	2,15	2,40
JRC Geel	14,8	14,2	15,8	16,6	4,94	4,2	3,9	4,9
JRC Seville	3,09	3,45	2,80	2,79	2,31	1,79	1,30	1,43
JRC Karlsruhe	18,3	18,9	17,8	20,5	21,2	20,2	15,8	16,9
JRC Ispra	10,3	10,2	10,0	9,9	9,68	9,39	7,31	7,74
Grange	4,91	5,32	4,62	4,09	3,69	3,58	3,20	2,78



	2005	2014	2015	2016	2017	2018	2019	2020	2021
Commission	92,8	39,5	40,4	38,3	36,8	35,6	35,5	30,6	32,5
Target 2014-23	30,75	30,75	30,75	30,75	30,75	30,75	30,75	30,75	30,75
Target 2014-30	23,91	23,91	23,91	23,91	23,91	23,91	23,91	23,91	23,91
Brussels	93	17	19	18	17	18	18	16	18
Luxembourg		39	39	38	30	37	44	43	40
JRC Petten		145	130	120	113	39	36	27	29
JRC Geel		105	92	93	87	25	22	20	26
JRC Seville		127	136	117	119	104	86	64	70
JRC Karlsruhe		141	146	133	153	156	147	113	119
JRC Ispra		94	93	89	87	84	85	68	72
Grange	81	88	96	88	77	66	63	55	50

The sites identified the following **key** specific actions in the 2022 Global Annual Action Plan:

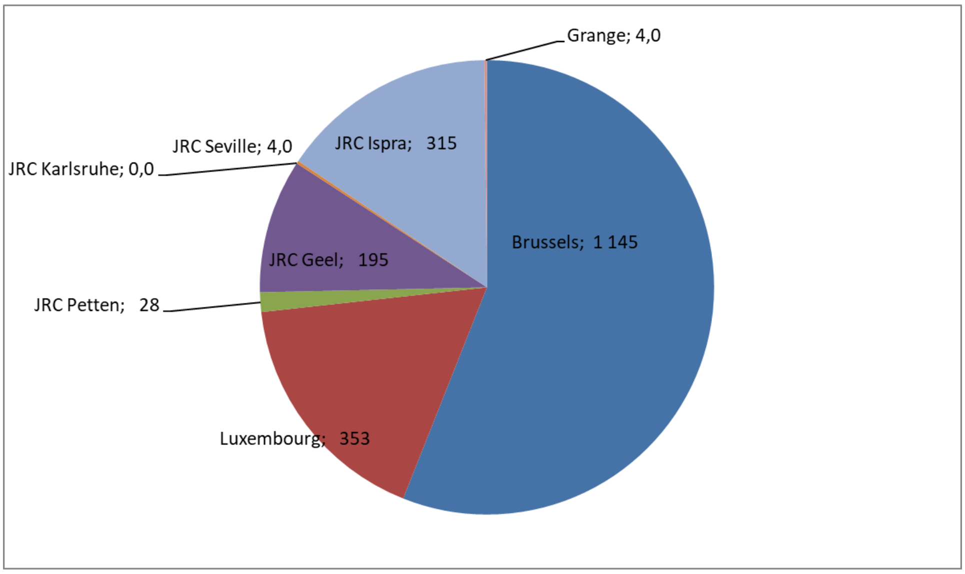
- Corporate actions: Continue the annual review of GHG approach to reporting through the specialist services of the internal auditor (ARCADIS, supported by CO2logic) and incorporate the impact of teleworking into the Carbon Footprint
- JRC-Ispra: apply BREEAM environmental standards to the project and construction of selected JRC building over 3 Mio EUR and life cycle analysis for buildings projects over 1 Mio EUR
- JRC-Petten: photovoltaic installations

- DG SANTE at Grange: use bio-Liquid propane gas (LPG) instead of LPG to heat water during the summer and avoid using diesel.
- DG COMM Reps: Development and operation of a monitoring system to measure CO2 eq emissions

Notwithstanding the actions described above, Commission experience suggests that reducing emissions in existing buildings is extremely difficult and that a buildings policy that promotes occupation of newer, more efficient buildings will lead to greater gains.

3.2 Emissions due to refrigerant or coolant loss

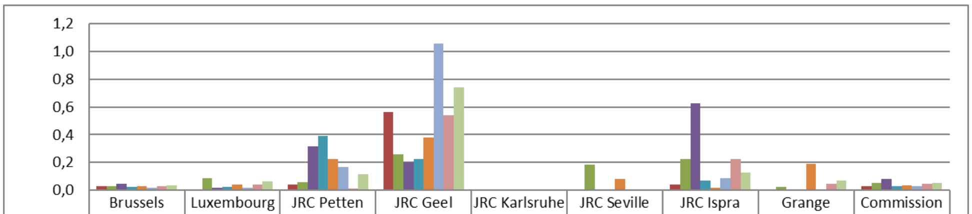
Figure 3 CO_2e losses from refrigerant leaks at the Commission sites in 2021 (tonnes)



Refrigerants have Global Warming Potentials (GWP) typically between 1 000 and 10 000 meaning that a leak of just a few kilograms can have the equivalent atmospheric global warming impact of several tonnes of CO_2e. But they typically account for no more than 1 to 2% of buildings' CO_2e emissions. Between 15 and 20 refrigerants are recorded in EMAS reporting at JRC-Ispra and JRC-Geel, and fifteen at JRC Petten.

Figure 3 shows that the four largest sites (BX, LX, GE, IS) are responsible for over 98% of the total emissions. Figure 4 shows that the experimental sites tend to have the greatest per capita emissions.

Figure 4 Refrigerant losses recorded at EMAS sites, 2013-21 (tCO_2e/person)



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Seville	JRC Ispra	Grange	Commission
2014	0,030	0,000	0,042	0,566	0,000	0,000	0,039	0,000	0,032
2015	0,028	0,087	0,059	0,258	0,000	0,182	0,224	0,026	0,052
2016	0,049	0,018	0,318	0,202	0,000	0,000	0,624	0,000	0,084
2017	0,027	0,023	0,393	0,222	0,000	0,000	0,071	0,000	0,032
2018	0,030	0,043	0,222	0,378	0,000	0,079	0,016	0,191	0,034
2019	0,020	0,017	0,170	1,059	0,000	0,000	0,089	0,000	0,032
2020	0,030	0,040	0,010	0,539	0,000	0,000	0,224	0,046	0,046
2021	0,036	0,062	0,118	0,741	0,000	0,000	0,127	0,070	0,050

Per capita refrigerant losses are highest at the JRC site there is considerable experimental infrastructure, (notably at Petten, Geel and Seville).

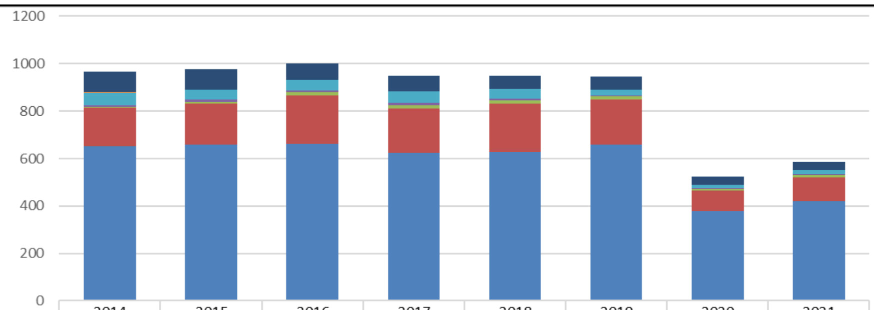
The recent increase recorded at JRC-Geel was due to expanded reporting. JRC-Karlsruhe continues to report no losses during normal operation under its protocol (less than 3%). Overall, the Commission's total and per capita refrigerant losses have remained relatively stable since 2017.

Total losses reduced significantly at JRC Ispra in 2018 but increased in 2019 and 2020 and decreased in 2021. JRCs Geel and Petten that accommodate large experimental installations requiring cooling or insulation. Release of R410a, SF6 and ISCEON89 are the mainly responsible for the JRC-Geel emissions.

3.3 CO_2e emissions from the site vehicle fleet

Emissions from vehicle fleet represent a very small, but highly visible, proportion of the total carbon footprint. Figure 5 shows CO_2 emissions from Commission fleet vehicles. The three largest sites have the largest vehicle fleets, and therefore generate the most emissions.

Figure 5 CO_2e emissions from Commission fleet vehicles at EMAS sites, 2014-21 (tonnes)



	2014	2015	2016	2017	2018	2019	2020	2021
Grange	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
JRC Ispra	88,8	87,2	70,1	64,6	54,0	54,4	35,2	33,2
JRC Seville	1,2	1,1	0,7	1,0	0,8	0,8	0,2	0,0
JRC Karlsruhe	50,9	41,1	43,8	48,3	40,8	21,8	12,8	18,2
JRC Geel	8,8	8,6	8,0	8,2	7,3	6,1	5,3	4,3
JRC Petten	1,6	8,7	14,7	16,3	15,5	10,6	5,6	8,5
Luxembourg	162,5	171,9	203	187	204	193	89	101
Brussels	653,3	659,3	663	623	626	657	377	420

Total vehicle fleet emissions reduced slightly between 2016 and 2019, but by 44% from 2019 to 2020 (944 to 526 tonnes) and increased a little in 2021 (584 tonnes). Brussels and Luxembourg accounting for 89 % of the total.

Table 1 shows the evolution of vehicle fleet size and distances covered for the Commission EMAS sites. The Commission has reduced the size of its vehicle fleet since 2015 by nearly 30%.

In 2020 and 2021 the overall fleet size hasn't changed much, but the total distance driven and the kms per vehicle changed significantly from 2019, especially in 2020, mainly due to the pandemic.

Table 1 Site vehicle fleet characteristics

Site	Fleet vehicles (average)							Total kms						
	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021
Brussels	117	107	129	126	131	129	125	2 477 072	2 829 675	2 508 253	2 311 311	2 346 590	1 432 721	1 766 920
Luxembourg	25	30	30	33	32	32	31	665 992	771 824	731 060	812 152	781 567	322 876	408 831
JRC Petten	4	4	4	4	4	4	4	30 513	55 440	61 324	56 473	45 396	21 963	37 109
JRC Geel	7	7	7	7	7	7	7	NR	NR	NR	NR	11 909	6 940	6 708
JRC Karlsruhe	11	11	12	12	12	12	12	137 616	133 520	124 944	104 666	77 749	94 250	96 380
JRC Seville	1	1	1	1	1	1	1	4 356	3 192	4 016	3 859	5 521	714	
JRC Ispra (1)	122	123	121	110	110	119	115	286 517	240 217	208 053	192 277	200 893	149 008	136 077
Grange	1	1	1	1	0	0	0	NR	NR	NR	NR	NR	NR	NR
Commission	**288**	**284**	**218**	**207**	**210**	**217**	**208**	**3 607 221**	**4 036 796**	**3 640 578**	**3 483 666**	**3 469 625**	**2 028 472**	**2 452 025**

NR: Not reported; (1) Total kms and kms/vehicle presented for conventional (petrol or diesel) vehicles, ie 87 in 2017, in 74 in 2018

Table 2 indicates the type of vehicle in Commission site fleets in 2021.

Table 2 Number of vehicles by type at Commission sites in 2021

Type of vehicles	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Sevilla	JRC Karlsruhe	JRC Ispra	JRC Grange
Electric	14	4	1	1	0	2	50	0
Hybrid	62	10	0	0	0	0	1	0
Euro 6	39	16	0	1	0	4	5	0
Euro 5	0	0	2	1	0	5	1	0
Euro 4	0	1	0	0	1	1	34	0
Euro 3	0	0	0	0	0	0	14	0
Euro 2	0	0	0	1	0	0	2	0
Euro 1	0	0	0	0	0	0	4	0
Euro 0	0	0	0	0	0	0	4	0
Total vehicle fleet	**125**	**31**	**4**	**7**	**1**	**12**	**115**	**0**

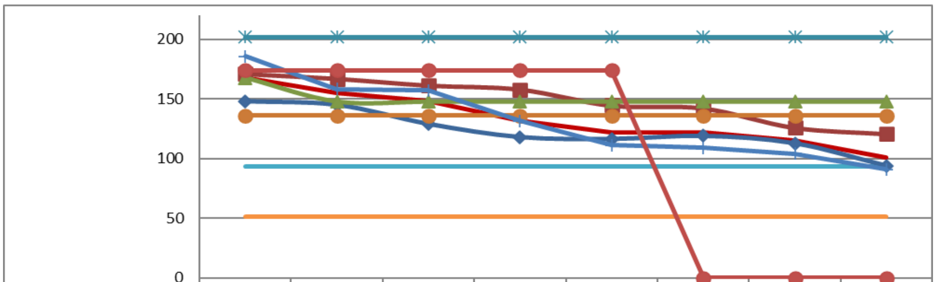
Note: For Petten, Geel and Karlsruhe, total includes some specific utility equipment not included in these categories

Brussels and JRC-Ispra lead the way with electric vehicles that are widely used for local journeys. Most of the Commission vehicle trips in Luxembourg are longer distance, for which electric vehicles currently lack sufficient range. JRC-Ispra has increased the number of electric vehicles from 3 in 2014 to 41 in 2020 and to 50 in 2021.

Brussels has a stable number of charging points for service vehicles and for staff in several Brussels buildings. Further installations are ongoing for staff vehicles. Luxembourg recently replaced 4 petrol vehicles with 3 hybrid vehicles, a significant step forward.

The Commission uses manufacturer's specified tailpipe emissions as a core indicator to encourage the purchase of vehicles that emit less when they operate, as shown in Figure 6.

Figure 6 Manufacturer tailpipe emissions ([65]) for vehicle fleet at EMAS sites, 2014-21 (gCO_2e/km)



	2014	2015	2016	2017	2018	2019	2020	2021
Commission	168	155	148	132	122	122	115	101
Target 2014-23	93	93	93	93	93	93	93	93
Target 2014-30	51	51	51	51	51	51	51	51
Brussels	148	145	129	118	116	119	113	94
Luxembourg	171	167	161	158	145	142	126	121
JRC Petten	168	148	148	148	148	148	148	148
JRC Geel								
JRC Karlsruhe	202	202	202	202	202	202	202	202
JRC Seville	136	136	136	136	136	136	136	136
JRC Ispra	186	158	157	132	111	109	104	91
Grange	174	174	174	174	174	0	0	0

Figure 6 demonstrates that the Commission is nearly achieving the 2023 and 2030 targets for reducing the emissions of its fleet through purchasing decisions reflected also in the tables discussed above.

The sites have set ambitious targets for 2023 and 2030, eventually more than halving the manufacturer's tailpipe emissions to 54 gCO_2e/km by 2030.

The Global Annual Action Plan contains the following examples of site level actions to reduce CO_2 emissions for the vehicle fleet:

- Corporate/HR ECCT: Continue annual review of GHG approach to reporting through the specialist services of the internal auditor (ARCADIS, supported by CO2logic)
- Brussels: To include in the new call for tender (2021-2024) for the transport courier service, the obligation to use an electric car fleet (min. 50%); Greening of the fleet allocated to the College, increase the % of full electric or hybrid cars
- Luxembourg: Gradual replacement of owned / leased gasoline / diesel vehicles by hybrid or electric vehicles, when possible
- JRC-Ispra: Multi annual renovation of the fleet with additional electric and hybrid vehicles

([65]) Note: For Petten, Geel and Karlsruhe, total includes some specific utility equipment not included in these categories

- JRC-Petten: Offering service bikes, showers and bike parking infrastructure and charging stations for electric vehicles. Staff members can rent electric bikes (which is part of the battery research program)
- JRC-Seville: Offering showers and bike parking infrastructures
- DG COMM/Reps: Progressive replacement of internal combustion engine vehicles with plug-in hybrid or battery electric models; Staff awareness actions on reducing greenhouse gas emissions, sustainable professional travel and commuting, and digital pollution

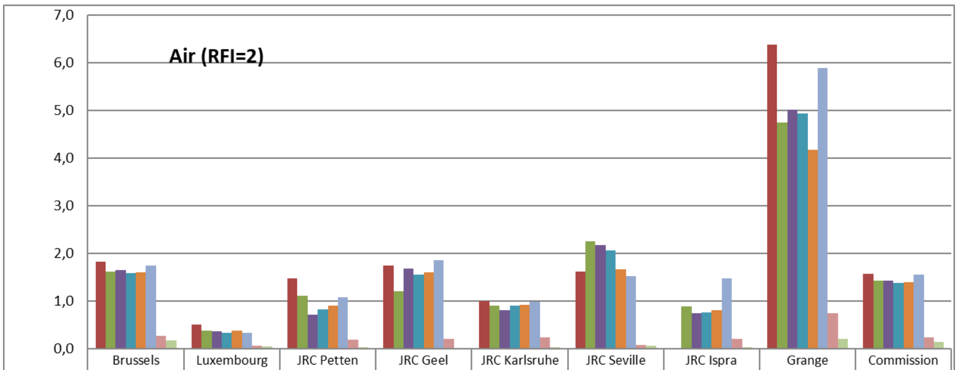
3.4 Staff missions, breakdown by EMAS site

The Commission has estimated CO_2 emissions for missions undertaken by staff at the EMAS sites using data provided by the Commission's travel agency ([66]) which made use of the Commission's proprietary management system ([67]). The data indicate that air travel accounts for over 90% of missions emissions.

The overall warming effect of aircraft emissions, especially at higher altitudes, i.e. for flights exceeding 400 - 500 km, is greater than that produced by CO_2 emissions alone. This is because other jet engine emissions such as soot and water vapour are thought to contribute to an overall warning effect between two and four times that generated by CO_2 emissions alone. Although there is considerable uncertainty, and research is ongoing, a radiative forcing ([68]) index (RFI) of 2 ([69]) was used to calculate flight emissions.

Figure 7a-c shows the per capita emissions estimated for the main modes of transport booked with the Commission's travel agency (2014-20), and through the Commission's mission planning tool (MIPs) in 2021. The development of the MIPs tool for reporting staff missions' emissions ensures that all missions are included in the primary data source (not just those booked through Commission's the travel agency), and therefore requiring assumptions and extrapolation to represent all missions.

Figure 7a-c Per capita emissions for missions by air (RFI=2), car rental and rail ([70]) (tonnes CO2e



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Seville	JRC Ispra	Grange	Commission
2014	1,83	0,51	1,48	1,74	1,01	1,61	0,02	6,38	1,57
2015	1,63	0,38	1,11	1,20	0,91	2,25	0,89	4,74	1,42
2016	1,65	0,36	0,71	1,68	0,81	2,18	0,75	5,01	1,43
2017	1,59	0,34	0,82	1,56	0,90	2,05	0,76	4,93	1,39
2018	1,60	0,37	0,91	1,60	0,92	1,67	0,81	4,17	1,39
2019	1,75	0,34	1,08	1,86	0,99	1,52	1,48	5,88	1,55
2020	0,27	0,07	0,20	0,20	0,24	0,09	0,21	0,74	0,24
2021	0,18	0,04	0,02	0,02	0,03	0,07	0,03	0,21	0,15

There has been a substantial reduction in emissions associated with air travel owing to the COVID pandemic, with per capita emissions approximately one tenth of the 2019 value and a further reduction compared to 2020.

DG SANTE at Grange has the highest per capita emissions for air travel because staff include a high proportion of food and veterinary inspectors who conduct frequent missions throughout the world.

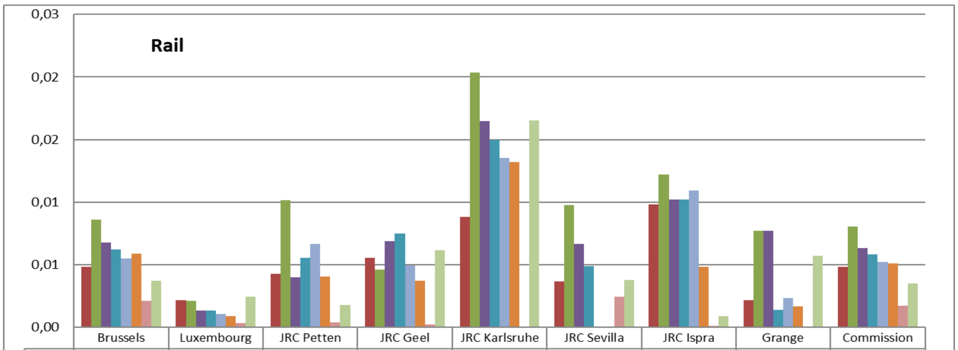
([66]) American Express report emissions for air train and hire cars, as calculated by Atmosfair who use an approach developed with the German environmental authorities. Note that travel arrangements for JRC-Ispra staff are not generally made through this agency so figures are under reported in 2013, 2014, estimations made from 2015.

([67]) Commonly known as MIPS.

([68]) Radiative forcing is a measure of man's contribution to disturbing the natural balance between incoming solar radiation and reflected outgoing radiation as measured at the top of the troposphere, the atmospheric layer extending 10 to 18km from the earth's surface, where weather processes occur.

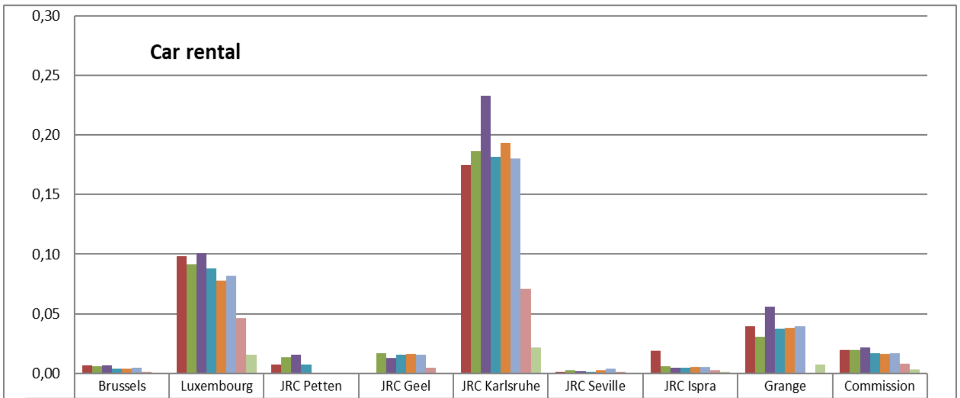
([69]) RFI=2 considered (minimum) acceptable (Internal Audit Report, Carbon Footprint of the European Commission, May 2018

([70]) Reduced from Agency data, corrections applied to account for journeys not booked through the Commission's travel agency



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Sevilla	JRC Ispra	Grange	Commission
2014	0,0048	0,0022	0,0043	0,0056	0,0088	0,0037	0,0098	0,0022	0,0049
2015	0,0086	0,0021	0,0102	0,0046	0,0203	0,0097	0,0122	0,0077	0,0081
2016	0,0068	0,0013	0,0040	0,0069	0,0165	0,0067	0,0102	0,0077	0,0063
2017	0,0062	0,0013	0,0056	0,0075	0,0150	0,0049	0,0102	0,0014	0,0059
2018	0,0055	0,0011	0,0067	0,0050	0,0135	0,0001	0,0109	0,0023	0,0052
2019	0,0059	0,0009	0,0041	0,0037	0,0132	0,0001	0,0049	0,0017	0,0051
2020	0,0021	0,0004	0,0004	0,0003	0,0001	0,0024	0,0001	0,0000	0,0017
2021	0,0037	0,0025	0,0018	0,0062	0,0165	0,0038	0,0009	0,0057	0,0035

JRC Karlsruhe travel by train the most, along with JRC Ispra. Several sites increased the quantity of rail travel in 2021 after very low travel frequency in 2020.



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Seville	JRC Ispra	Grange	Commission
2014	0,0065	0,0979	0,0072	0,0003	0,1748	0,0012	0,0191	0,0392	0,0194
2015	0,0063	0,0916	0,0136	0,0168	0,1860	0,0028	0,0057	0,0308	0,0193
2016	0,0068	0,1010	0,0157	0,0129	0,2327	0,0019	0,0048	0,0559	0,0215
2017	0,0041	0,0880	0,0072	0,0153	0,1816	0,0012	0,0049	0,0373	0,0170
2018	0,0040	0,0779	0,0000	0,0162	0,1934	0,0027	0,0052	0,0382	0,0159
2019	0,0044	0,0821	0,0000	0,0154	0,1804	0,0036	0,0053	0,0397	0,0167
2020	0,0012	0,0459	0,0000	0,0046	0,0711	0,0009	0,0026	0,0000	0,0079
2021	0,0007	0,0155	0,0005	0,0003	0,0219	0,0000	0,0011	0,0073	0,0030

Luxembourg staff travel far less frequently by air, but in common with JRC Karlsruhe, conduct more journeys by rental car for which per capita emissions (for sites other than Karlsruhe), are less than a tenth of those for air. It is important to note that:

Per capita rental car emissions are roughly one twentieth those for rail travel, and rail emissions roughly one hundredth of those for air travel.

3.5 Staff missions - breakdown by DG/Service

Although reporting under EMAS is site based, increasingly, and particularly since the inception of the Green Deal, individual DGs and services can download emissions data from the MIPs reporting tool. This simpler and more transparent approach to emissions reporting was developed in late 2020, and will help DGs develop their own initiatives to reduce their missions travel

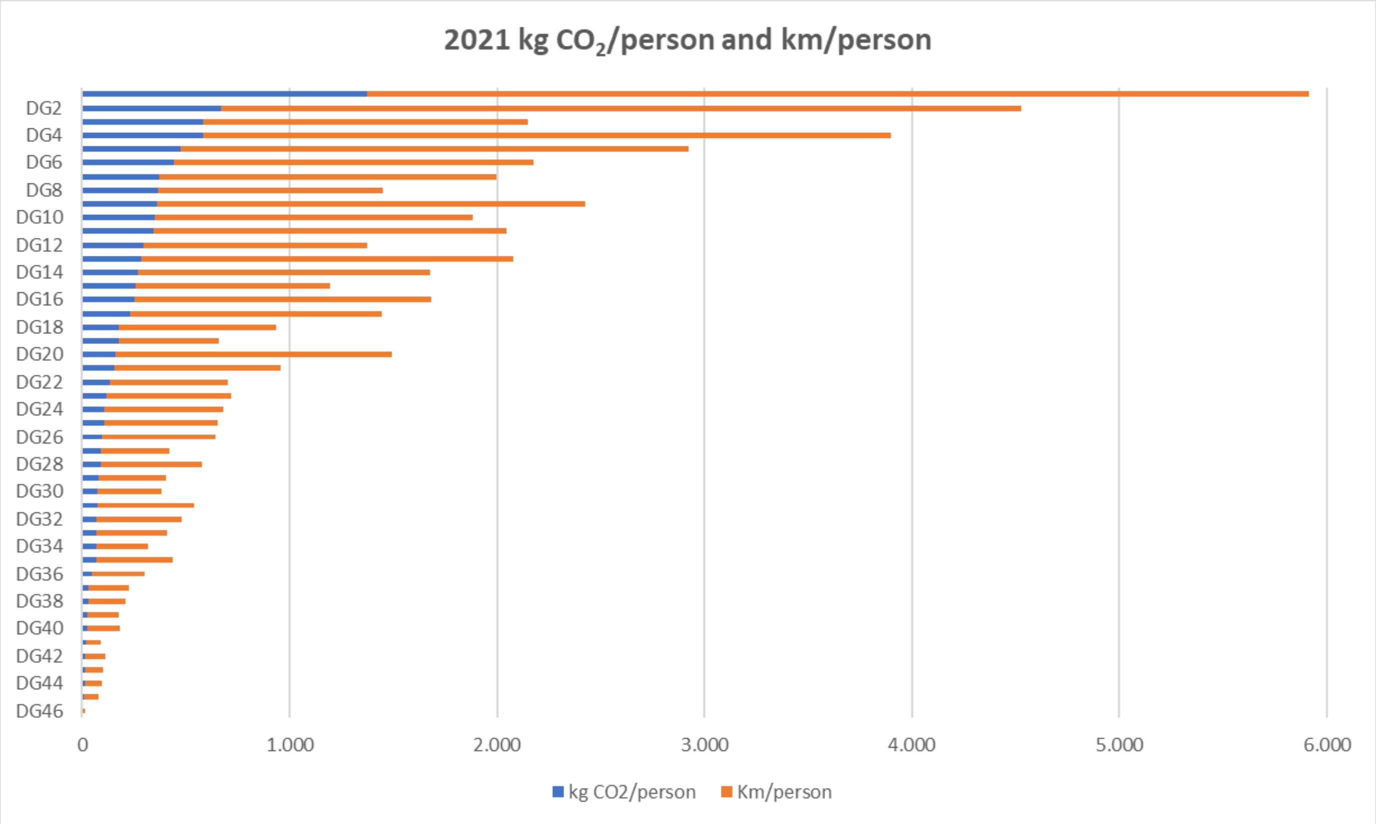
Table 3 Distribution of emissions among DGs/Services, 2019-2021

	N. of DGs		
	2019	**2020**	**2021**
>= 4 tonnes	4	0	0
1 to 4 tonnes	26	3	1
0,5 to 1 tonnes	6	13	3
<0.5 tonne	9	29	42

Corporate Summary

	kgCO2/person		
Highest value	9.108	2.519	1.376
Average value	1.803	486	209
Lowest value	95	17	2

The curve of distribution by DG, for 2021 from highest to lowest kgCO2/person, is shown below. This along with the above table demonstrates the huge variation in missions travel between DGs and Services, and suggests that they will require very specific approaches to reducing their missions emissions in order to achieve reductions in the longer term.



3.6 Homeworking emissions breakdown by site

To calculate the most significant impacts of telework, it is necessary to consider the heating and cooling of the home workplace, the electricity consumption of computer equipment and lighting and other equipment used daily by the teleworker. The impact of the increase in videoconferencing can also be considered, whether the consumed electricity comes from renewable sources or not, and, if possible, the embodied emissions associated with new equipment purchased for teleworking.

The calculation ([71]) gives rise to the following emissions CO2eq per site and per source of emissions, and Brussels presence data is assumed for all sites. The per site numbers will be updated when actual presence numbers at site level are available.

Table 4 Sources of energy emissions per site (Tonnes CO2e, indicative)

Source of Energy emissions	BRU	LUX	PE	GE	SE	*KA*	IS	GR	VIE	VAL	Total	Total per teleworker (kgCO2e)
Teleworking heating limited working area	5.891,3	1.262,7	23,1	54,7	14,1	*50,2*	263,7	28,6	2,2	0,1	**7.591**	**215,3**
Electricity for cooling limited working area	4,0	0,9	0,1	0,0	0,3	*0,2*	4,1	0,0	0,0	0,2	**9,9**	**0,3**
Electricity	1.956,2	127,9	29,9	16,8	27,4	*40,6*	186,4	21,3	0,7	2,0	**2.409**	**68,3**
Emissions of videoconferencing	339,2	13,0	0,5	0,6	0,9	*0,7*	5,5	0,4	0,0	0,0	**361**	**10,2**
IT equipment fixed assets (embodied energy)	355,0	52,1	1,4	2,6	3,2	*3,1*	11,8	0,0	0,0	0,0	**429**	**12,2**
Total energy emissions	**8.545,7**	**1.456,5**	**55,0**	**74,8**	**45,8**	***94,8***	**471,5**	**50,3**	**2,9**	**2,2**	**10.800**	**306,3**
Emissions per teleworker (kgCO_2e) ([72])	**327,5**	**291,0**	**268,6**	**243,0**	**100,4**	***266,1***	**162,9**	**242,4**	**117,2**	**141,7**	**306**	

3.7 CO_{2e} emissions from commuting

As shown in Section 2, staff commuting emissions decreased by 24% in 2021, due to low presence in the office (with just 17% of staff presence registered in Brussels).

The Commission estimated commuting emissions for 2021 ‘pro rata’ from 2019 data, according to the average presence in the office registered by site management. Estimates of emissions generated by staff commuting are available for most sites and use mobility survey data, although these are not undertaken annually. OIB undertakes a survey for Brussels staff every 3 years, the latest in 2017, to inform its local mobility plan that is a requirement of local legislation (as in JRC Geel), but the 2020 and 2021 exercises were postponed owing to the COVID pandemic.

The greatest reported per capita emissions are for those predominantly rural research sites or Luxembourg. Luxembourg, JRC sites in Geel and Ispra have per capita emissions around 0,20 tonnes. Commuting emissions for Luxembourg are relatively high owing to cross border travel from Belgium, France and Germany, Public transport has been free in Luxembourg since March 2020. Luxembourg is now subsidising cross-border public transport. In 2019, The JRC, through actions in its different sites held successful staff awareness campaigns on sustainable mobility. Luxembourg estimated its commuting emissions for the first time in 2020.

([71]) Ares hr.d.7(2022)4134770

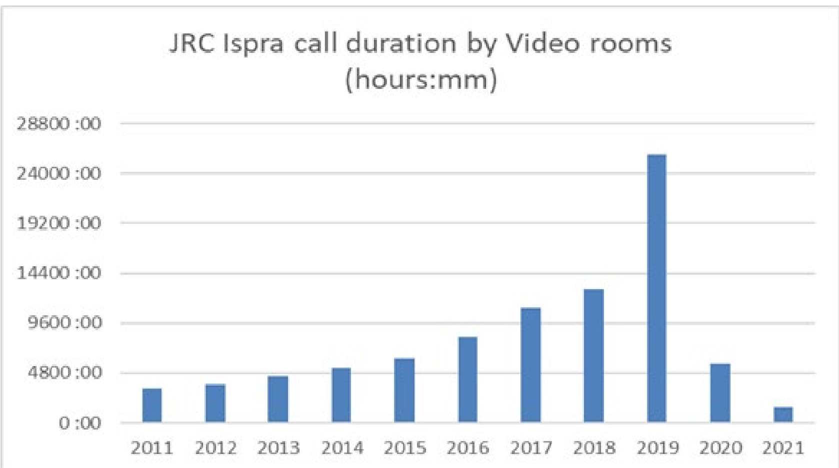
([72]) Emissions per teleworker means that only the percentage of teleworker of staff population is taken as denominator.

3.8 Alternatives to missions and commuting

Additional generic actions to reduce emissions are recorded in Table 5.

Table 5 Actions at site level in the EMAS Global Annual Action Plan to reduce emissions from mobility

	Description	BX	LX	PE	GE	*KA*	SE	IS	GR	COM	Reps
	Reducing emissions - business (and local work) travel										
Studies / awareness	Promote VCs over missions						1				1
	Develop emissions calculator									3	
	Analyse mission patterns and linked carbon footprint										1
	Promote bikes, bike facilities, schemes	1						1			
Large investment	Introduce new electric or hybrid vehicles	5	1					1			1
	Install charging for service and private e-vehicles						2	1			1
	Reducing emissions - personal travel										
Studies / awareness	Commuting study pilot										
	Carbon footprint from commuting						2			2	
	Promote car pooling					*1*					
	Promote public transport (inc. transborder)	3					1				
Operational optimisation	Plan/investigate to install e-charging for cars (and /or bikes)	1				*1*	4				1
	Reducing total emissions										
Studies / awareness	External validation of carbon footprint approach									1	
	Develop common approach document for carbon footprint (response to ECA)									1	
	Implement LCA for organisation's impact							1			
	Implement "smart" policy							1			
Operational optimisation	Install heat pump							1			



DG DIGIT has steadily increased the amount of video conferencing infrastructure available across the Commission responding particularly to DG SCIC's requirements for meeting rooms.

Reduced office presence in JRC-Ispra in 2020 and 2021 resulted in a considerable reduction in the use of video rooms as shown here.

3.9 External experts’ missions’ emissions

Within the framework of the EMAS Registration and the calculation of the Commission GHG emissions, and under the Greening Communication,-it is necessary to consider the CO_2 emissions for external experts’ travels for which the cost is borne by the Commission. Calculations for 2019-2021 are presented below:

Table 6: CO2e emissions* generated by experts' travels

Travel mode	2019		2020		2021	
	CO2 emissions experts (tonnes)	Km	CO2 emissions experts (tonnes)	Km	CO2 emissions experts (tonnes)	Km
Air	30.919	127.108.000	8.683	24.365.391	722	2.005.006
Train	48	5.592.678	9	1.081.308	1	66.493
Car	250	983.540	38	151.113	26	86.999

* Data for 2020, 2021 calculated using consultants’ approach for 2019 and supplemented with additional information. The decreasing trend is clear, but the main reason id due to the pandemic and to the restrictions in travels all over the world.

3.10 Fixed asset emissions (buildings)

These accounted for nearly 20% of the carbon footprint in pre-COVID years, and 27% in 2021. The annual rate of emissions depends on the design life ([73]) selected to calculate amortisation, and which varies between sites. Older buildings may be “amortised” in relation to the CO_2e emissions required for their construction. Table 7 shows the factors ([74]) used to calculate these emissions, which are subject to a relatively high degree of uncertainty (50%), along with the total reported emissions and emissions for 2021.

Table 7 Total and annual buildings (fixed asset) emissions for 2021 (tonnes CO_2e)

	Unspecified construction	**Steel construction**			**Concrete construction**			**Emissions**	
	offices	industrial buildings	underground parking	restaurants	industrial buildings	underground parking	restaurants	Total	2020
Conversion factor (kgCO_2e/m^2)	650	275	220	183	825	656	550		
Site									
Brussels	692 712					317 949	6 847	1 017 508	27 154
Luxembourg	115 369				3 396	32 879		151 643	4 298
JRC Petten	4 900	1 168			593			6 661	190
JRC Geel	6 477	449			31 672		366	38 963	540
JRC Seville									
JRC Karlsruhe									
JRC Ispra	93 413	697			44 466		3 155	141 731	2 835
DG SANTE at Grange	6 442			18				6 460	258
	919 312	**2 314**		**18**	**80 126**	**350 828**	**10 368**	**1 362 966**	**35 275**

([73]) Design life in years - Brussels, Luxembourg, Petten 30, Geel 60 (varies by building), Ispra 50 , Grange 25

([74]) There is a large difference in the factors for steel and concrete construction. Offices of an unspecified nature must be considered to be largely made from concrete given the relatively high value of this factor.

3.11 Fixed asset emissions (Information Technology)

While conversion factors relating to the 16 categories of IT equipment are also subject to considerable uncertainty (50%), they can change as research evolves. Of the factors in Table of Appendix 2 that reduced in 2019, several related to larger equipment such as servers and video equipment. Equipment in use for longer periods or reduced inventories are alternative explanations for reduced IT emissions.

Table 8 shows the categories of IT equipment responsible for the largest annualised emissions in 2019, 2020 and 2021. Flat screens and network printers and copiers provide the largest per capita emissions.

Table 8 Annualised total and per capita emissions (Tonnes, CO_2e) for selected IT (fixed asset) categories 2018-2021

Category of IT equipment	Total				Per capita			
	2018	2019	2020	2021	2018	2019	2020	2021
PC desktop	1 251	497	104	61	0,04	0,02	0,00	0,00
Docking stations	563	977	1 115	1 120	0,02	0,03	0,04	0,04
Flast screens	3 944	3 875	1 075	1 078	0,14	0,13	0,04	0,03
Laptops	5 461	1 015	1 181	1 181	0,19	0,04	0,04	0,04
Network printers and copiers	1 752	1 496	1 407	1 266	0,06	0,05	0,05	0,04

3.12 Emissions from purchased goods and services

This accounts for a relatively small proportion of the carbon footprint, but includes emissions related to catering, specifically seven categories of the most carbon intensive foods served, including meat, dairy and coffee). The data presented in Table 9 includes sites which manage their own canteens. Per capita annual emissions for catering at reporting sites in 2019 ranged from 0,11 to 0,22 tonnes, but in 2020 and 2021 were much lower owing to staff absence under COVID conditions.

Table 9 Catering emissions for seven energy intensive food groups in 2021, (tonnes CO_2e)

	Brussels	%	Luxembourg	%	JRC Geel	%	JRC Ispra	%	Grange	%
Beef	62,0	52,9	47,8	36	5,3	47	32	18	2,2	59
Pork	15,0	12,8	5,0	4	0,8	7	30,1	17	0,13	3,3
Fish	18,1	15,4	25,1	19	1,0	9	57	32	1,07	28
Chicken	15,6	13,3	10,9	8	0,6	4,9	21,4	11,9	0,00	0,0
Milk	1,2	1,0	6,0	4,5	0,6	5,0	4,4	2,4	0,00	0
Other dairy (avg yogurt/butter)	4,4	3,7	35,0	26,5	3,0	27	11,2	6,2	0,01	0,2
Coffee	0,9	0,7	2,0	1,5	0,0	0,2	23,3	13,0	0,37	9,7
Total (tonnes CO2 e)	**117**	100	**132**	100	**11,3**	100	**180**	100	**3,8**	100
Total (tonnes CO2 e /person)	0,036		0,041		0,050		0,053		0,022	

The COVID pandemic reduced catering services significantly in 2021, where in Brussels eventually most canteens were closed. The catering related emissions for JRC Karlsruhe are null as the small café' was closed for the whole year.

3.13 Emissions from waste disposal

Table 10 shows emissions from the 11 categories of waste disposal in recent years.

Table 10 Emissions generated through waste disposal from 2018 to 2021 (tonnes CO_2e)

	Tonnes				Percentage of total			
Waste Disposal Category *	**2018**	**2019**	**2020**	**2021**	**2018**	**2019**	**2020**	**2021**
Incinerated waste - domestic waste	2 733	2 772	1 097	857	36,3	34,7	30,0	22,0
Incinerated waste - food	0,00	0,00	0,00	0,00	0,0	0,0	0,0	0,0
Methanisation - food	394	456	231	105	5,2	5,7	6,3	2,7
Recycled/reused - paper	2 496	2 694	1 427	1 468	33,2	33,7	39,0	37,7
Recycled/reused - cardboard	14	12	10	12	0,2	0,2	0,3	0,3
Recycled/reused - wood	89	58	51	68	1,2	0,7	1,4	1,8
Recycled/reused - glass	78	88	49	25	1,0	1,1	1,3	0,6
Recycled/reused - plastic PMC	190	199	86	57	2,5	2,5	2,3	1,5
Recycled/reused - others…	946	920	380	799	12,6	11,5	10,4	20,5
Hazardous waste - all types	551	765	313	476	7,3	9,6	8,5	12,2
Landfill (probably mostly projects)	34	27	18	25	0,5	0,3	0,5	0,6
Total	**7 525**	**7 992**	**3 660**	**3 893**	**100**	**100**	**100**	**100**

These account for account for a very small part of the carbon footprint, with four sites reporting less than 0,1 tonnes per person total annual emissions. Overall, however, they represented nearly 4% of the Commission's carbon footprint in 2018-19, falling to around 0,61% in 2021. Landfill represents 0,6% of the total emissions arising from waste disposal. Incinerated waste and paper recycling are the two largest sources of CO_2e emissions.

3.14 Total air emissions of other pollutants

The EMAS regulation requires the reporting of emissions of 'other' air pollutants, where appropriate (including as a minimum NOx, SO_2 and PM_{10}). The results for 2019 to 2021 are as follows:

Table 11 'Other' air emissions at Commission sites in 2019-21 (kg)

Site	Emissions in 2019 of:					Emissions in 2020 of:					Emissions in 2021 of:				
	NOx	SO_2	PM_{10}	VOC	CO	NOx	SO_2	PM_{10}	VOC	CO	NOx	SO_2	PM_{10}	VOC	CO
Brussels	16 210	62	85	1 778		14 793	57	77	1 622		16 617	63	87	1 822	
Luxembourg	4 140	18	22	454		4 284	18	22	470		4 082	18	21	448	
JRC Petten	417	NM	NM	65		308	NM	NM	52		320	NM	NM	56	
JRC Geel	384	12	3	43	2	377	4	2	42		421	10	3	47	1
JRC Karlsruhe	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
JRC Seville	21	NR	NR	NR	NR	25	NR	NR	NR	NR	25	NR	NR	NR	NR
JRC Ispra	37 322	NA	NA	NA	46 092	24 450	NA	NA	NA	25 240	26 040	NA	NA	NA	24 800
Grange	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Commission	**58 494**	**92**	**109**	**2 340**	**46 094**	**44 237**	**79**	**102**	**2 185**	**25 240**	**47 504**	**91**	**111**	**2 373**	**24 801**

NA - Not Applicable, NR - Not Recorded, NM - Not Measured

In relation to these emissions:

- Brussels, owing to the large number of buildings, (and consequently boilers) is one of the two main contributors of NOx. JRC Ispra's tri-generation plant generates electricity and is therefore responsible for a large proportion of the reported NOx emissions and also reports a significant amount of CO emissions JRC Petten includes physical measurements and calculations for NOx whereas VOC data is based on purchase and consumption of solvents, SO2 and PM10 are excluded as the authorities consider them negligible.
- Owing to its active nuclear activities, Karlsruhe filters and tests its air emissions regularly for nuclear (alpha and beta) particles.

EUROPEAN COMMISSION

Environmental Management System

EMAS
VERIFIED ENVIRONMENTAL MANAGEMENT
BE-BXL-000003

Environmental Statement 2022

2021 results

Annex A: Brussels

For further information on environmental performance in Brussels please contact:

Functional mailbox: OIB-RE3-EMAS@ec.europa.eu

Or visit EMAS page on My Intracomm EMAS system (europa.eu)

Foreword

The mission of OIB[1] is to ensure a functional, safe and comfortable workplace for Commission staff and to provide good quality support and well-being services, based on a client-oriented approach in an environmentally friendly and cost-effective way. This mission statement translates into concrete actions by the OIB, which are consistent with the Commission objective to reduce the environmental impact of its everyday activities. The OIB, as manager of the Commission's headquarters in Brussels, plays a fundamental role in the implementation of this policy.

In this annex to the Environmental Statement, dedicated specifically to the Commission's environmental performance in Brussels, we highlight the main achievements of 2021, such as the reduction in energy consumption, CO_2 emissions, office paper consumption, as well as further improvements in waste sorting. They bear witness of the continuous efforts put forward by the OIB through concrete actions in these areas.

The COVID 19 pandemic situation had a considerable impact on last year's performance, as it had already been the case in 2020. The decisions taken by the Commission, such as teleworking for non-critical staff and the extra ventilation of Commission buildings to ensure a safer working environment, showed how quickly the Commission, as well as its staff, could adapt to extraordinary circumstances. This framework invited the Commission to start a deep reflection on its real-estate portfolio in Brussels, to which the OIB actively participates.

Challenging times require extraordinary measures: through the recently adopted Communication on Greening the Commission, the Institution has set a clear target to reduce its CO_2 emissions by 60% compared with 2005 figures and to become climate neutral by 2030. This ambition will require significant efforts and investments to which the EC services and in particular the OIB will strongly contribute, in improving the Commission's environmental performance, this way striving towards a more sustainable European Union.

Signed
Marc Becquet

Head of Service
OIB- Office for Infrastructure and Logistics in Brussels

[1] Office for Infrastructure and Logistics in Brussels

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ANNEX A: BRUSSELS – Administrative activities

Brussels is the largest site in the European Commission real estate portfolio hosting the headquarters of the Commission, including its flagship building the Berlaymont. The Office for Infrastructures and Logistics in Brussels (OIB) has the mission of ensuring a functional, safe and comfortable workplace for more than 29 000 staff members, spread across over 1 000 000 m² of mostly office space. In early 2022 the Commission adopted a Communication on Greening the Commission describing how it will become carbon neutral by 2030 and promote circular economy and biodiversity. Measures will be progressively implemented that will contribute to a Commission wide reduction of 60% emissions with remaining emissions to be subject to carbon removal credits.

A1 Overview of core indicators at Brussels since 2005

OIB has been collecting data on core indicators for the Brussels site since 2005. Their values in 2005 and from 2014 to 2020 are shown in Table A1, along with performance trend, and targets where applicable for 2020.

Tableau A1 - Historical data, performance and targets for core indicators for Commission level reporting[2]

Physical indicators:	Historic data values						Performance since:		Future targets		Future targets	
(Number, desciption and unit)	2005 (1)	**2014**	2018	2019	2020	2021	2005	2014	2014-23	2014-30	2023	2030
							Δ %	Δ %	Δ % (2)	Δ % (2)	value(2)	value (2)
1a) Energy bldgs (MWh/p)	19,06	**6,95**	6,75	6,39	5,42	5,27	**-72,3**	**-24,1**	-11,0	-18,0	6,18	5,70
1a) Energy bldgs (KWh/m^2)	373	**166**	176	172	152	151	**-59,5**	**-9,0**	-4,0	-12,0	159	146
1c) Non ren. energy use (bldgs) %		**41,2**	43,3	43,4	44,9	50,4		**22,5**	0,0	-5,0	41,2	39,1
1d) Water (m^3/p)	28,44	**12,57**	11,22	11,53	7,78	6,28	**-77,9**	**-50,1**	0,0	-5,0	12,6	11,9
1d) Water (L/m^2)	556	**300**	294	311	218	180	**-67,7**	**-40,1**	0,0	-5,0	300	285
1e) Office paper (Tonnes/p)	0,081	**0,033**	0,022	0,021	0,008	0,005	**-93,5**	**-83,8**	-40,0	-50,0	0,020	0,016
1e) Office paper (Sheets/p/day)	77	**33**	23	21	8	5	**-93,1**	**-83,8**	-40,0	-50,0	19,8	16,5
2a) CO_2 buildings (Tonnes/p)	4,77	**0,71**	0,68	0,65	0,57	0,62	**-87,0**	**-12,0**	-11,0	-18,0	0,63	0,58
2b) CO_2 buildings (kg/m^2)	93	**17**	18	18	16	18	**-80,9**	**5,5**	-4,0	-11,0	16,2	15,0
2c) CO_2 vehicles (g/km, manu.)	249	**148**	116	119	113	94	**-62,2**	**-36,5**	-25,0	-40,0	111	88,8
2c) CO_2 vehicles (g/km, actual)		**213**	227	236	222	192		**-9,9**				
3a) Non haz. waste (Tonnes/p)	0,300	**0,222**	0,181	0,211	0,094	0,099	**-66,9**	**-55,4**	-20,0	-25,0	0,178	0,167
3c) Unseparated waste (%)	46,1	**40,8**	41,8	36,4	26,4	19,8	**-57,1**	**-51,6**	-10,0	-10,0	36,8	36,8
3c) Unseparated waste (T/p)		**0,093**	0,082	0,083	0,026	0,021			-20,0	-20,0	0,074	0,074
Economic indicators (Eur/p)												
Energy consumption (bldgs)	1 168	**515**	435	469	380	523	-55	1,6				
Water consumption		**46,7**	42,1	43,2	29,7	24,2		-48,3				
Non haz. waste disposal		**36,2**	29,5	34,4	15,3	16,2						

Reporting and the COVID pandemic: Reporting for 2021 retains the same approach for continuity, as previous years, and is therefore based on site activity and total staff numbers. The data will therefore reflect the impact of a very significant staff absence on facilities operation.

The EMAS Corporate Coordination Team has estimated the **Environmental Impact of teleworking** focussing particularly on energy consumption and CO_2 emissions **(**with high level assumptions for paper, water consumption and waste disposal). These impacts are referenced separately to regularly reported data for the buildings in report.

Since EMAS registration in 2005 consumption for all parameters has reduced considerably. The pandemic situation due to the COVID19 virus has had a massive impact in the daily operations of the European Commission, and therefore in its environmental performance. As a result, per capita figures in 2021 show a substantially improved performance since 2019 across all parameters. The technical sections in this report contain detailed information on these results.

The table below shows a certain stability in the evolution of the EMAS system in Brussels:

[2] Note: (1) Earliest reported data, for a reduced scope of buildings (2) compared to 2014; (3) EMAS Annual Action Plan 2020
*Target for %improvement for the period 2014-2020, reviewed in 2018
(upwards for indicators already met, while keeping the ones not yet achieved- decision EMAS Steering Committee Sept/2018)

Tableau A2 - EMAS baseline parameters

	2005	2014	2015	2016	2017	2018	2019	2020	2021
Population: staff in EMAS perimeter	4 033	25 667	25 698	26 562	27 148	27 254	28 769	29 916	30 604
Population: total staff	21 203	27 392	27 089	26 927	28 225	28 494	28 948	29 941	31 440
No. buildings for EMAS registration	8	62	62	62	62	58	60	60	60
Total no. operational buildings		62	62	64	64	61	61	61	61
Useful surface area in EMAS perime	206 166	1 075 372	1 067 270	1 069 453	1 077 739	1 042 008	1 066 617	1 066 617	1 069 244
Useful surface area for all buildings,		1 075 372	1 069 673	1 082 004	1 090 075	1 069 020	1 069 020	1 069 020	1 078 072

Surface measured according to Brussels Energy Performance of Buildings legislation specifications

Staff in the EMAS perimeter includes those working for Executive Agencies that are located in buildings managed by the Commission and within the EMAS scope[3]. EMAS applies to the whole of the Brussels site. From year to year however, there may be changes in the total number of buildings as the portfolio of occupied buildings evolves on a regular basis. In 2021, a new building was added to the scope, W910, occupied by CINEA, the European Climate Infrastructure and Environment Executive Agency[4]. The BU24 building has been abandonned at the beginning of 2021[5]. Only one building is not registered under EMAS in 2020, PALM, for which a major refurbishment is foreseen.

A2 Brussels activities[6], context and key stakeholders, environmental aspects

A2.1 Activities

Most of the Commission's activities in Brussels are classic administrative tasks. Other services, include 22 cafeterias, 13 canteens, restaurants, archives, print shops, a car fleet, a medical service, crèches and after school day care centres.

Many of the buildings are located around the European Quarter on the Eastern side of Brussels. A cluster of 10 buildings is located further afield in the southeast of the city, in the "Beaulieu" area. A further few buildings are located outside the centre to the north and the south of Brussels including three office buildings, printing and central mail facilities in the Commune of Evere. The map on page A7 shows the geographical distribution of the buildings in Brussels (with two, KORT- historical archives in Kortenberg and OVER- a sports centre, in the Flemish Region).

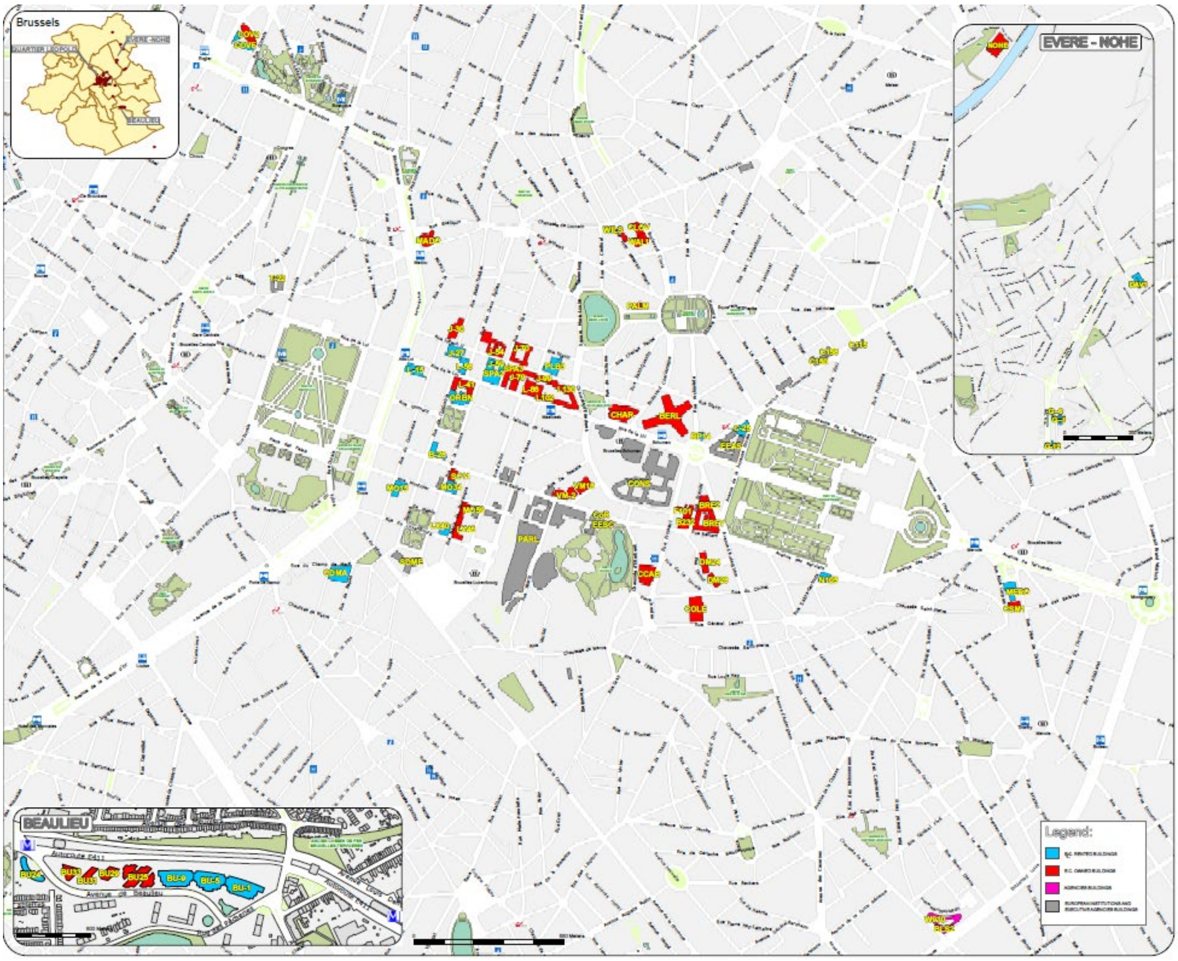
Table A11 shows a summary of some of the main characteristics of the buildings. The largest buildings are BERL, CHAR and MADO, together representing 23% of the area (over 247 000m²) more than 30% of the electricity consumption and 25% of the gas consumption.

[3] Staff figures in 2017 and 2018 were corrected (double counting of agencies staff in building COVE).

[4] Data for W910 regarding electricity, gas, water and waste include figures since 2019 for comparison purposes.

[5] BU24 figures (electricity, gas, water, waste) are therefore included up until 2020 only.

[6] NACE codes associated with Brussels activities are: 99 – Activities of extraterratorial organisations and bodies; 84.1 Administration of the state and the economic and social policy of the community.



A2.2 Context – risks, and opportunities

Under the EMAS regulation, the Commission defines its operational context, its legal obligations and determines which environmental aspects related to its activities, products and services have (or may have) a significant impact on the environment and on the environmental management system (EMAS). It also considers the needs and expectations of interested parties, and decides which of these can become obligations in the management system. This Environmental Review provides a global overview of the major challenges in the next coming years.

These aspects, as well as the context and interested parties, provide the basis to define appropriate actions taking into account both risks and opportunities. In that regard, in 2021 the OIB performed a review of the environmental considerations having an impact on its activities, establishing the basis for defining strategy and objectives.

A2.2.1 External issues and circumstances affecting Brussel's environmental performance

This analysis follows the PESTLE [7] framework, allowing for the identification of both risks and opportunities. The list below, showing reference to actions for the most important points, takes stock of the impact of the pandemic situation occurred in 2020 and 2021:

[7] PESTLE criteria– Political, Economic, Social, Technological, Legal, Environmental

1. **Economic** – Budget variations influence possible investments to reduce resource consumption. Significative energy savings, leading to relevant reductions in the carbon footprint of the EC depend on substantial investments in the real estate portfolio.
2. **Social-** Changes in individual and collective behaviour due to external factors (such as a pandemic) may have a considerable effect on the working environment of the Institution, its energy consumptions and respective impacts. This may create the right atmosphere for structural changes in crucial areas such as working methods and real estate management.
3. **Environmental** - Variation of seasonal temperatures from one year to another have an important impact on energy consumption and generate variable buildings performances. The regulation of a large number of technical installations is complex, but there is an opportunity to use technological development for better efficiency and more rapid actions.
4. **Legal** – There is a growing number of environmental regulations and regional legal framework to apply to the large portfolio of buildings in Brussels. It may become more difficult to comply with requirements. Close collaboration with local authorities and regulatory bodies help improve the environmental performance whilst ensuring legal compliance.

Two of these aspects, of a legislative nature, have the most significant impacts:

The PLAGE regulation on energy efficiency, requiring for an average 10% reduction in primary energy consumption across the building portfolio by 2025 (in the first phase, and an additional 8% in the second phase, running through 2030);

The COBRACE regulation on mobility, establishing a 30% reduction of parking space in Commission buildings by 2030;

The OIB is designing detailed action plans to cope with these extremely demanding objectives, which include:

PLAGE[8] action plan	COBRACE[9] action plan
• A comprehensive pool of actions aiming at improving the energy efficiency of the existing portfolio	• Reduction of parking places with renewal of environmental permits
• The request of the necessary budget to implement said actions;	• Dialogue with building owners
• The use of monitoring tools, such as IPMVP, which allow for a close follow-up of the results	• Cooperation with DG HR
• The cooperation with Brussels Environment, the Regional agency responsible for environmental action	• New ways of working allowing for more days of teleworking

A2.2.2 Internal issues and circumstances affecting Brussel's environmental performance

These have been analysed using ASCPF[10] criteria. With regard to risks and opportunities, the two most important are as follows:

[8] PLAGE: Plan Local d'Action pour la Gestion Énergétique

[9] COBRACE: Code Bruxellois de l'Air, du Climat et de la maîtrise de l'Énergie

[10] ASCPF criteria – Activities, Strategic direction, Culture and employees, Processes and systems, Financial

1. **Activities** – Brussels' site has a large portfolio of aging buildings, and OIB manages a large range of activities and number of contractors, which increase the complexity of implementing many environmental initiatives. However, there is an opportunity to act at many different levels and to initiate a wide scope of actions.

2. **Culture & employees** – OIB has a client oriented culture and the needs of its clients have to be addressed. Combining political objectives and operational realities may represent a challenge, as well as meeting clients' expectations. However, both the political objectives and the clients' expectations set the bar for further improvements.

One aspect of major importance is the ambition of the European Commission **to become climate neutral by 2030, applying to its own operations the same principles of the European Green Deal.** To this goal, the Commission set the **target at a 60% reduction in CO_2 emissions by 2030** compared to 2005 figures, which will entail a significant change in the way the OIB operates, in particular with regard to real estate management.

The Communication Greening the Commission, adopted on 05/04/2022, defines the setting, the ambition and the road-map to achieve such an important goal. Anticipating these impacts, the OIB identified the following action domains:

Greening action plan
• **Reduction** of office surface • Energy **efficiency** investments/renovations • Financial **support** for sustainable commuting • Further **replacement** of car fleet with EV and PHEV vehicles • Further application of **GPP** principles in tender procedures

A2.3 Stakeholders (interested parties), compliance obligations risks and opportunities

The table in Section 12.2 summarises the main OIB stakeholders, organised in "clusters" due to their large number, especially in terms of contractors and suppliers. The ambition described above only accentuates the level of the response to be supplied by the OIB, in order to comply with such high stake targets.

A2.4 Environmental aspects

The Commission fully updated its assessment of environmental aspects for the Brussels site in 2021 (following the three-year EMAS cycle), the results of which are summarised in section 12.3.

A3 More efficient use of natural resources

A3.1 Energy consumption of Commission buildings and vehicles

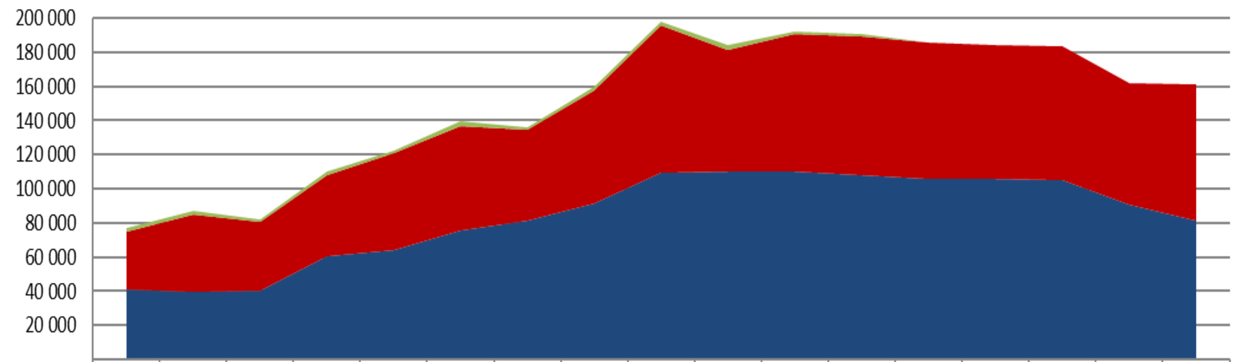
Buildings energy consumption data should take in consideration the context of climatic conditions. Analysis of degree data for 2021 suggests that climatic conditions were cooler over the summer (less 35% cooling required) and winter (more 21% heating required) than the previous year.

A3.1.1 Energy consumption of buildings

Figure A1 shows the evolution of total annual final energy consumption in the EMAS perimeter while Table A11 (at the end of this document) provides indicative data for individual buildings. The total has increased over time as more buildings were registered under EMAS each year, with almost all buildings included since 2014. Electricity[11] represented 53% of the total in 2005, peaked at 62% in 2014 (a mild year) having stabilised at 57% since 2017. The significant reductions in electricity consumption achieved during the pandemic have lowered that percentage to slightly over 50% of total energy.

As mentioned above, the pandemic situation has had a significant impact in almost all indicators, with total energy consumption showing a 15% reduction since 2019.

Figure A1 - Annual buildings energy consumption (MWh) in the EMAS perimeter (indicator 1a)



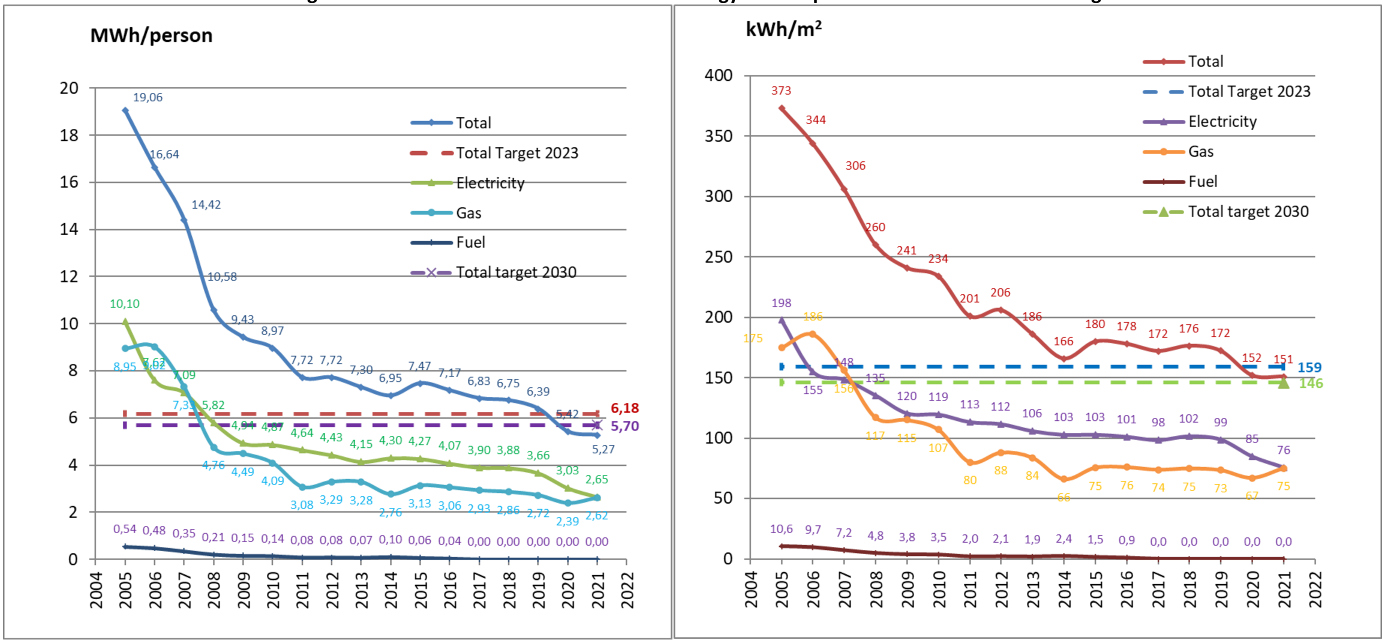
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Photovoltaic (MWh)								43,4	9,4	9,8	26,3	26,5	25,5	28,2	28,0	28,1	28,1
Supplied Diesel (MWh)	2 176	2 506	1 969	2 166	2 011	2 240	1 471	1 737	1 933	2 570	1 617	993	0	0	0	0	0
Supplied Gas (MWh)	33 931	44 754	39 824	47 309	56 410	61 311	52 633	66 264	86 501	70 881	80 556	81 180	79510	78.024	78.309	71.465	80.276
Electricity (MWh)	40 749	39 909	40 427	60 445	64 247	75 666	81 656	91 498	109 25	110 43	109 78	108 16	105 94	105 81	105 37	90 523	81 079

Note: Diesel (fuel oil) is no longer used for heating buildings, only a small amount is consumed during periodic testing of emergency diesel generators.

Per capita and consumption per square metre are presented here below:

11 Solar PV data is theoretical.

Figure A2 and A3: Evolution of total annual energy consumption for Brussels EMAS buildings



Total energy consumption for EMAS buildings (indicator 1a) reduced by 65% and 54% per capita and per square metre respectively since the first EMAS registration in 2005, up until 2019. The reduction in both indicators follows similar trends. Figures for 2021 show a further decrease in overall energy consumption, with different results for gas and electricity, due to the need for extra ventilation during the pandemic, which required more heating (9% and 12% more, measured per person and per m² respectively). On the other hand, electricity consumption dropped a further 12.5% (per person) and 12% (per m²). Constantly changing climatic conditions risk having an impact on energy consumption, but guaranteeing a comfortable working environment for Commission staff remains OIB's paramount concern.

Primary and normalised energy and the regional regulation for energy performance

OIB also reports on energy performance, using primary and normalized energy data allowing for a more accurate follow-up of the measures to be implemented under the regional legislation PLAGE (Plan Local d'Action de Gestion Énergétique), which will use this metric (kWh/m²) and 2019 as reference year (according with the information received so far).

The indicator kWh/m² in the table below shows the average of the Environmental Building Performance (EBP) certificates as issued by the regional authorities (Brussels Environment).

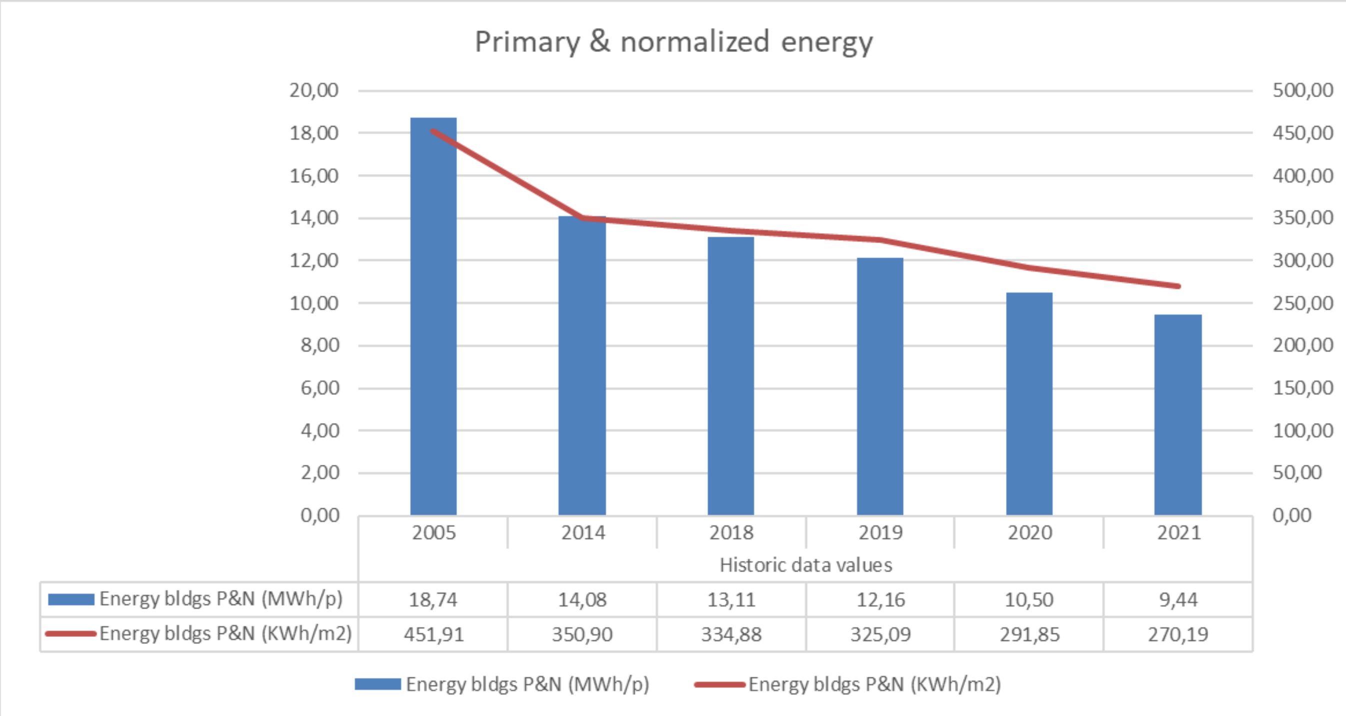
Tableau A3 - Primary & normalized energy[12]

Primary & Normalised Energy	Historic data values						Performance trend (%) since:				
(Number, description and unit)	2005	2014	2018	2019	2020	2021	2005	2014	2018	2019	2020
Energy bldgs P&N (total MWh)	397269	361417	357217	346770	311314	**288922**	-27,3%	**-20,1%**	-19,1%	-16,7%	**-7,2%**
Energy bldgs P&N (MWh/p)	18,74	14,08	13,11	12,16	10,50	**9,44**	-49,6%	**-33,0%**	-28,0%	-22,4%	**-10,1%**
Energy bldgs P&N (KWh/m2)	451,91	350,90	334,88	325,09	291,85	**270,19**	-40,2%	**-23,0%**	-19,3%	-16,9%	**-7,4%**
staff (source déclaration EMAS)	21203	25667	27254	28522	29655	**30604**	44,3%	**19,2%**	12,3%	7,3%	**3,2%**
m²	879089	1029967	1066696	1066696	1066696	**1069323**	21,6%	**3,8%**	0,2%	0,2%	**0,2%**

[12] **Primary and normalised energy (P&N):** = electricity final consumption (invoices)*2,5 (reference for BE))+(gas consumption(invoices)*DD factor)
Degree days factor =total year degree days / total degree days BE reference http://www.gaznaturel.be/fr/particulier/degres-jours
For reporting purposes, 2021 figures include the building W910

The table and graph above show not only the very significant reductions made since 2005, with a significant reduction in 2019, but also that results for 2020 and 2021 dropped even further, because of the low occupancy of the buildings, to 10.5 and 9.4 MWh/person and 292 and 270 kWh/m².

Figure A4 – Primary and normalized energy



The Annual action plan includes 20 active measures prioritising the reduction of energy consumption, grouped and summarized here below, along with two measures introduced in late 2020:

Ongoing active measures to reduce energy consumption	New in 2021
• Energy efficiency plans, under the Energy Performance of Buildings (EPB) directive[13] as well as following recommendations from energy audits. • Comfort and lighting hour's optimization. • Upgrading of lighting systems and installation of motion detectors. • Insulation of heating pipes. • Closure of buildings during the End of Year holiday period. • Launching of call for tender for energy meters. • Communicating with building owners on energy saving measures.	• Inspection of buildings, outside the occupancy hours, to detect any lighting or HVAC equipment working which should normally be idle. • Powering down of buildings, adapting energy consumption to the low occupancy of the buildings.

The buildings inspections, action nr. GAAP 567 covered 55 buildings, yielding over 600 remarks, 25% of which were solved through quick fix maintenance actions. The remaining ones will require some investment.

A3.1.2 Energy consumption of fleet vehicles

Tableau A4 - Summary vehicle energy consumption

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total (MWh/yr)	2 535	2 468	2 292	2 313	2 322	2 177	2 170	2 208	1 266	1 413

[13] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

MWh/person	0,123	0,094	0,089	0,090	0,087	0,080	0,080	0,077	0,042	0,046
kWh/km (per 1000 kms)				0,47	1,34	0,97	1,09	1,04	0,00	0,00
Diesel used (m^3)	219,4	215,4	201,0	203,9	197,8	177,6	144,1	132,1	54,0	31,7
Petrol used (m^3)	10,63	8,16	6,46	5,33	13,40	21,88	60,68	85,39	73,49	113,97

As expected, total annual vehicle energy consumption[14] illustrated above shows an increase due to the higher number of kilometres made by the fleet (23% more than in 2020) although still 25% below pre-pandemic figures. Energy consumption is about 1% of that for buildings, witnessing a steady switch from diesel to fuel due to the inclusion of plug-in hybrid electrical vehicles, which include small fuel running thermal engines.

A3.1.3 Renewable energy use in buildings and vehicles

The following table shows the evolution in non-renewable energy use for the buildings.

Tableau A5 - Renewable and non-renewable energy use in buildings (MWh and percentage of total)

Contributions to renewable energy	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
i a) electricity contract 1 (% renewables)	60	100	100	100	100	100	100	100	100	100	100	100	100
electricity contract 1 (MWh renewable)	36.621	71.883	77.573	86.923	103.791	104.865	104.246	106.414	103.891	104.238	103.899	89.254	79.939
i b) electricity contract 2 (% renewables)	0	0	0	0	0	0	0	0	0	0	0	0	0
electricity contract 2 (MWh renewable)	0	0	0	0	0	0	0	0	0	0	0	0	0
viii) (PV) (% renewable)	100	100	100	100	100	100	100	100	100	100	100	100	100
(MWH renewable)	0	0	0	43	9	10	26	27	26	28	28	28	28
Total renewables (MWh)	36.621	71.883	77.573	86.967	103.801	104.875	104.273	106.440	103.916	104.266	103.927	89.282	79.968
Total renewables (%)	29,9	51,6	57,1	54,5	54,0	58,8	54,3	55,9	56,0	56,7	56,6	55,1	49,6
Total non ren. energy use, (MWhr/yr)	**86.048**	**67.335**	**58.188**	**72.532**	**88.434**	**73.451**	**87.709**	**83.924**	**81.569**	**79.602**	**79.785**	**72.734**	**81.415**
Non ren. energy as part of total, (%)	**70,1**	**48,4**	**42,9**	**45,5**	**46,0**	**41,2**	**45,7**	**44,1**	**44,0**	**43,3**	**43,4**	**44,9**	**50,4**

The overall share of renewable energy represented 50% of the total buildings energy consumption, and this was achieved by purchasing electricity from renewable sources since August 2009. No additional renewable energy sources were installed on site in 2021, however, the OIB has carried out an evaluation of the potential for the installation of PV panels in the Commission buildings in Brussels (action 503 in the Global Annual action plan). Decisions on this regard are subject to the definition and implementation of the real estate strategy in the coming years. Replacing conventional fleet vehicles with electric or hybrid vehicles and accommodating staff's requests to use electric vehicles has also been a priority as shown below:[15]

Commission fleet vehicles: A batch of 20 plug-in hybrid vehicles were added to the fleet in 2018, replacing mostly diesel engine cars, adding to the **13 fully electric already in use since 2017**. In 2021, the number of plug-in hybrid cars has increased by a further eight, adding to the 21 in the previous two years. The total of full electric/plug-in hybrid vehicles is now 62, representing 46% of the fleet that includes also 10 armoured vehicles, which have an impact in fuel consumption/km.

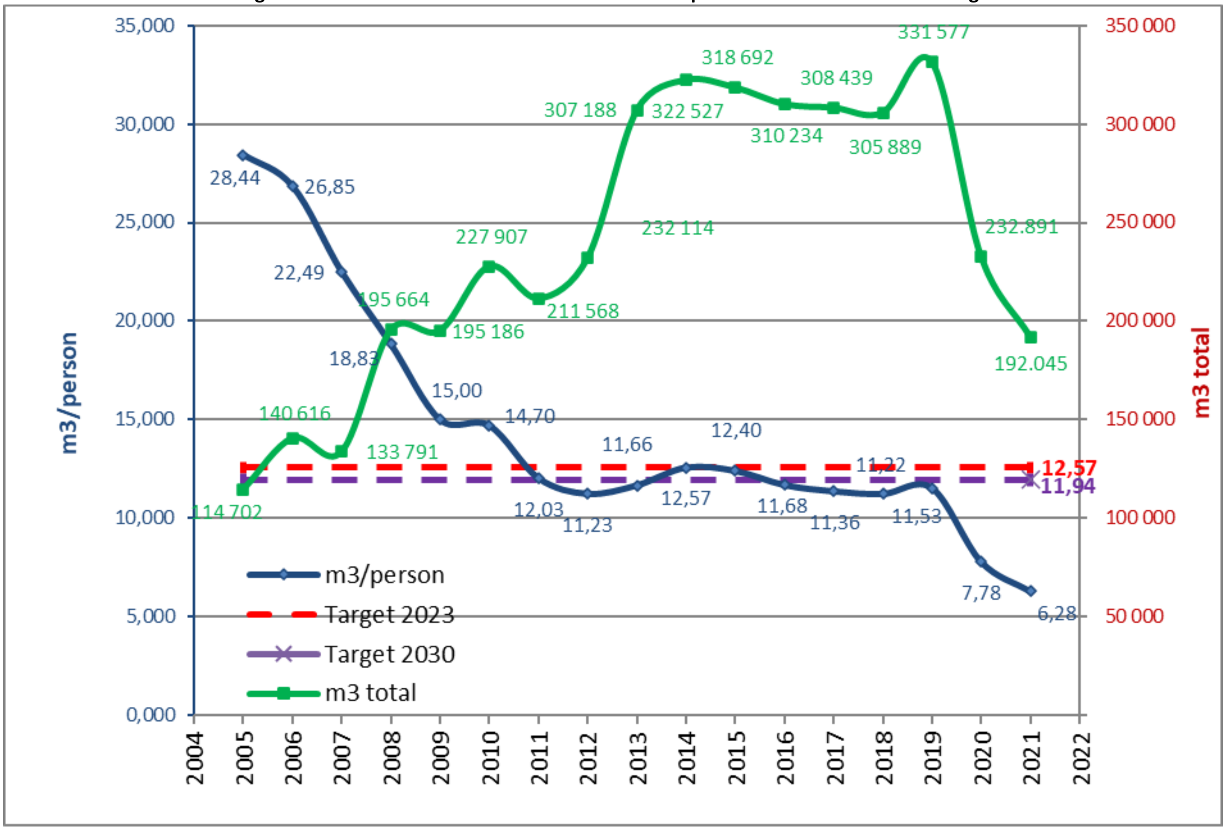
Staff can recharge electric/hybrid vehicles: Since 2017, 137 electrical chargers were installed across 27 Commission buildings, and the target is to make such facilities available in all Commission car parks by 2023. This project seeks to facilitate the use of electric cars, in line with the general policy of promoting greener transport modes, going beyond the Brussels Region's requirement (10% of parking spaces in existing buildings equipped with electric chargers by 2023).

[14] The emission factor was harmonised for whole Europe (10.62 instead of 11.10), based on the updated version of the Carbontrust study (Conversion factors 2016- www.carbontrust.com)

[15] Buildings with EV chargers B-28, BERL, BU25, CHAR, CSM1, F101, J-79, LX46, MADO, NOHE, ORBN, OVER, CDMA, COV2, J-99, DAV1, L130, L-86, COLE, DM28, J-30, L107, BRE2, BREY, L-51, PLB3, SPA2.

A3.2 Water consumption of Commission buildings

Figure A5 - Evolution of total annual water consumption for Brussels EMAS buildings



Note total consumption increased up until 2013 because reporting was only for EMAS registered buildings

Figures above show a considerable reduction in water consumption since the initial EMAS registration in 2005, with the 2019 value representing only 27% and 39% of the 2005 figure when measured on a per capita and per square metre basis respectively. The rising trend in total water consumption before 2013 is related to the steady growth of the EMAS area in that period.

As already mentioned, water consumption in 2020 and 2021 shows a significant decrease due to the low occupancy of the buildings during the lockdown: since 2019, overall and per m² figures have dropped by 47%, and per person 50%.[16]

Saving measures undertaken since 2015 include improved water management, installation of leak detection systems and loss prevention mechanisms. Water saving devices (tap aerators) have been installed in 10 priority buildings[17] and subsequently across most of the remaining buildings. Initiatives aiming at the reduction of Single Use Items, such as the installation of water fountains in the cafeterias, may have an impact in overall consumption, as well as warmer temperatures during summer months, requiring for an increased use of water for cooling and humidification.

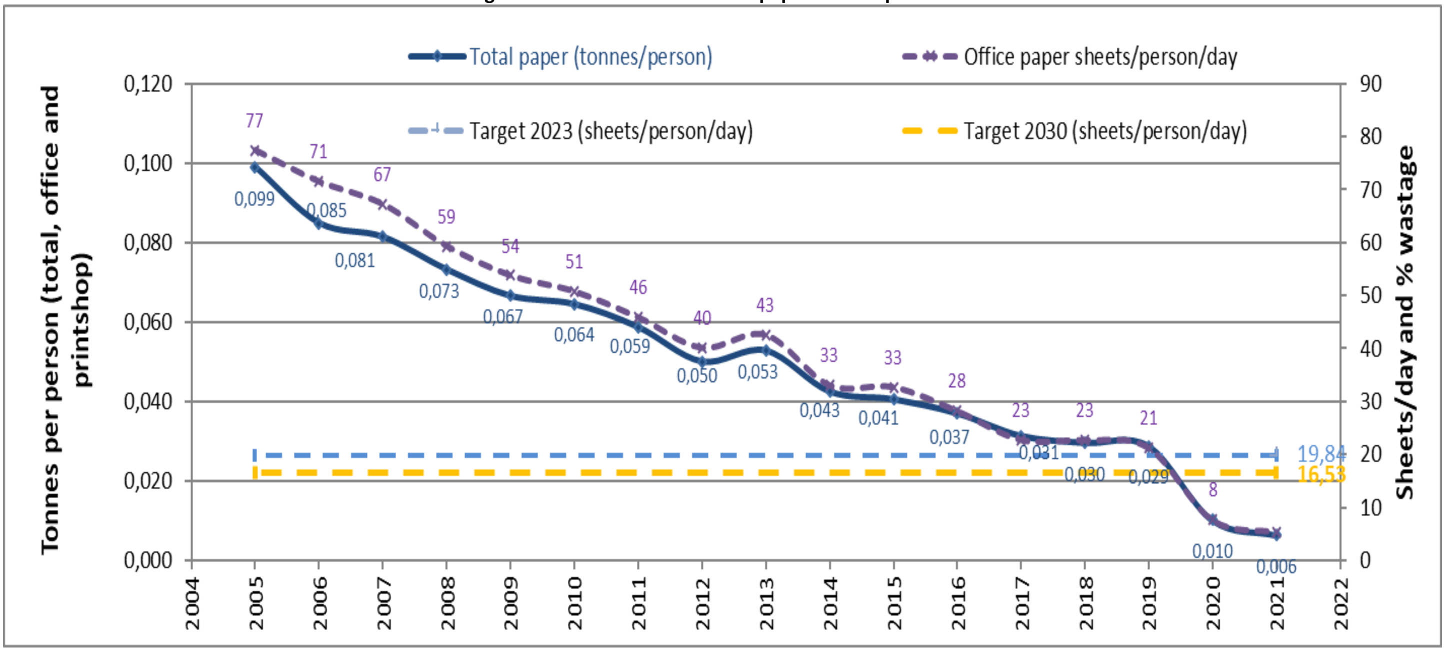
A3.3 Office and printshop paper use in Commission buildings

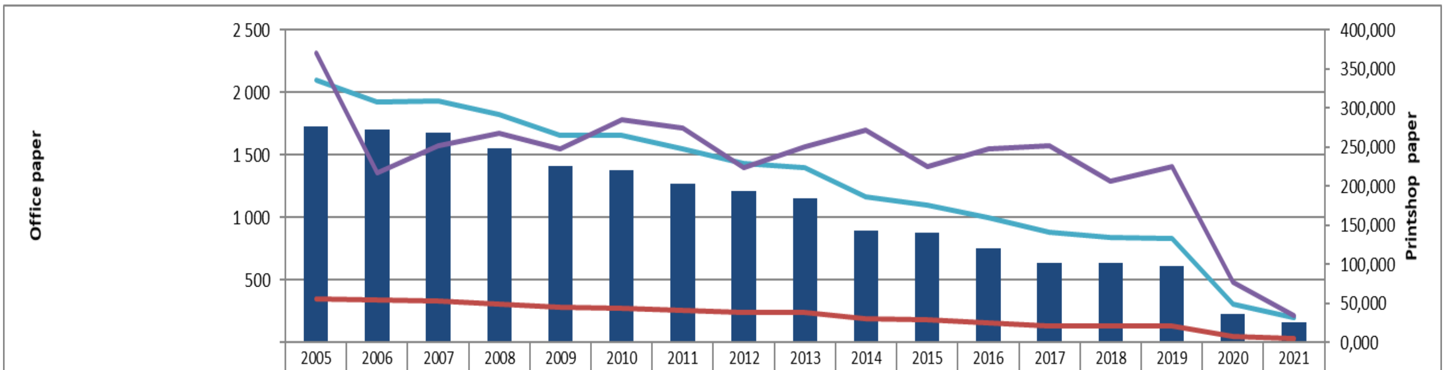
Total office and printshop paper consumption

[16] The calculation method for building W910 is based on invoices (SET 2020-OCT 2021), while for the remaining buildings direct meter readings were used

[17] Action 58 in the EMAS Global Annual Action Plan

Figure A6 and A6a - Evolution of paper consumption





	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Office paper (tonnes)	1 727	1 703	1 681	1 557	1 412	1 376	1 271	1 212	1 150	894	875	750	634	639	608	227	166
Total paper consumption (tonnes)	2.097,74	1.920,83	1.933,31	1.825,03	1.659,74	1.660,55	1.545,14	1.436,23	1.399,90	1.165,80	1.099,91	997,60	885,87	844,73	833,70	304,33	200,93
Office paper A4 x 1 Mil	346,12	341,31	336,90	312,05	282,93	275,77	254,73	242,91	237,91	191,12	187,08	160,33	135,64	136,53	129,98	48,45	35,50
Printshop paper (tonnes)	370,741	217,825	252,306	268,032	248,038	284,550	274,140	224,230	249,900	271,8	224,8	247,6	251,4	206,1	225,7	77,6	34,9

Figure above shows that paper consumption[18] (kg/person) follows a long lasting downwards trend, reducing by more than 70% since 2005. In 2019 there was already a 4.8% reduction over 2018 as consumption fell from 639 tonnes to 608 tonnes.

In 2021 however, this indicator shows a staggering 79% reduction compared to 2019 results (from 608 to 166 tonnes), again due to the pandemic: printing behaviour has changed dramatically in 2 days! The European Commission and its staff have shown a remarkable capacity to adapt to new working circumstances, moving towards the goal of becoming a paperless organization.

This reduction deepens the trend underway, which is down to continued efforts to increase the use of electronic signature and distribution of documents. The new print-on-demand network printers, installed in all Commission buildings in 2019, have also contributed to this result.

Ongoing active measures to reduce paper consumption
• increase digital circulation and management of documents
• use of scanned documents
• e-signing transfer of documents
• replacing paper signatories

[18] Historically reported for total Commission staff.

- use of double-sided printing
- close monitoring of paper consumption
- improving electronic processes

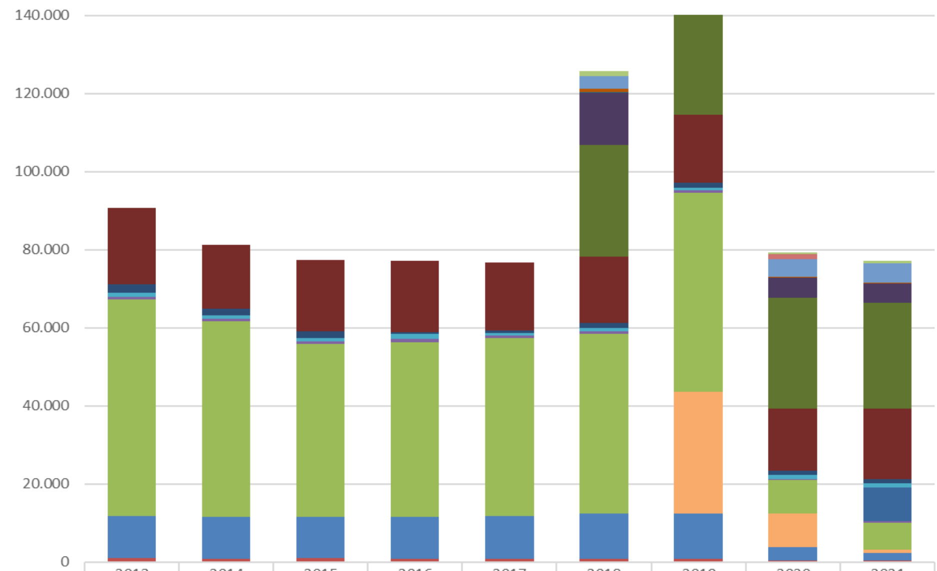
The consumption of higher-grade paper in the print shop has followed the above-mentioned trend, with a similar 66% reduction compared with 2019.

A4 Reducing carbon footprint and air emissions

A4.1 Overall Carbon footprint

Figure A7 shows the contribution of components[19] of the Commission's carbon footprint measured as equivalent tonnes of CO_2 emissions (T CO_2e) for Brussels[20]. Per capita emissions for these categories are contained in Table A.12.4. This includes teleworking emissions.

Figure A7 - Annual CO_2 (and equivalent) emissions (Tonnes CO_2e)



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	90.710	81.255	77.282	77.088	76.807	125.829	161.473	79.276	77.046
Own waste	0	0	0	0	0	1.394	1.468	511	513
Catering	0	0	0	0	0	0	3.852	1.084,99	117,19
Service contracts	0	0	0	0	0	3.285	3.612	4.555	4.872
Paper supply	0	0	0	0	0	845	834	304	201
Fixed assets - Commission vehicles	0	0	0	0	0	116	117	72	88
Fixed assets - IT	0	0	0	0	0	13.400	8.021	5.027	4.858
Fixed assets -buildlings	0	0	0	0	0	28.466	28.919	28.381	27.154
Buildings - fuel for heating	19.685	16.456	18.272	18.204	17.508	17.181	17.518	16.001	17.974
Buildings - electricity	1.967	1.662	1.652	522	614	1.281	1.264	1.158	1.039
Buildings - district heating/cooling	0	0	0	0	0	0	0	0	0
Buildings coolant losses	1.150	821	763	1.315	749	847	572	899	1.145
Teleworking emissions						0	0	0	8.540
Vehicle fleet fuel consumption	704	653	659	663	623	626	657	377	420
Missions air (RFI=2) and air taxi	55.427	50.176	44.352	44.835	45.494	46.070	51.052	8.460	7.069
Experts' travel	0	0	0	0	0	0	31.217	8.730	748
Staff commuting	10.850	10.672	10.672	10.672	11.046	11.565	11.565	3.325	1.966
Missions excluding air	927	815	912	877	773	754	805	392	342

19 Figures regarding potentially important contributors such as fixed assets, such as service contracts over which management has more limited influence, are included only as of 2018. Goods and service contracts do not include catering.

20 Air travel emissions calculated using RFI20 = 2; Conversion factor used to calculate equivalent emissions for fuel consumption include combustion (scope 1) and small upstream component (scope 3)

Up until 2017 (and based on the reported data, which didn't include fixed assets), the largest contributors were emissions due to air travel for missions, combustion of fuels for buildings energy consumption, and combustion of fuels for staff commuting. Starting 2018, the Commission also reports on additional categories of scope three emissions[21], such as fixed assets (buildings and IT), contracts for goods and services as well as waste production. As shown in figure A7, emissions from buildings, as fixed assets, are estimated at over 27 000 tonnes, representing over 34% of the total, and thus becoming the largest source of emissions, underlining the importance of real estate policy.

Gas consumption for buildings heating is the second largest component, 50% higher than emissions estimated from commuting. Emissions due to electricity consumption are very low because almost 100% of the supply comes from renewable sources.

As for previous indicators, CO_2 emissions in 2021 have dropped considerably compared with 2019: -39% in total emissions, with air travel emissions, catering and IT fixed assets as the main contributors to this reduction.

The data in section 12.4 show the carbon footprint per person, with 2018 representing a significant increase due to the inclusion of the above-mentioned additional scope 3 data (4.5 tonnes CO_2e/person instead of 2.7). Figures for 2021 data confirm the overall trend with a further decrease to 2.6 tonnes CO_2e/person.

Here below we analyse the data per chapter of emission.

A4.1.1 Buildings' emissions from energy use (17 970 tCO_2e in 2021, 23 % of carbon footprint)

The evolution of total emissions from buildings energy consumption per capita and per square metre is shown in Figure A7. These follow broadly the same trend as energy consumption.

It is worth mentioning that energy consumption, and the related CO_2 emissions, have not dropped as one might expect in buildings that have remained mostly empty for over 9 months in 2020. The Commission has decided to extra ventilate the buildings (4 hours every day), as well as using strictly 100% fresh air (not recycled, as it is common practice by the OIB, for energy saving reasons), in order to guarantee the safest work environment possible to the colleagues obliged to work in Commission premises. This decision has had a considerable impact in energy consumptions, which have been estimated to be approximately +3% in electricity and +10% in gas (during the heating months, October until December). The same policy applied during 2021.

[21] Reporting for buildings and fleet energy use also includes upstream emissions

Figure A8 - CO_2 emissions from buildings heating in the EMAS perimeter

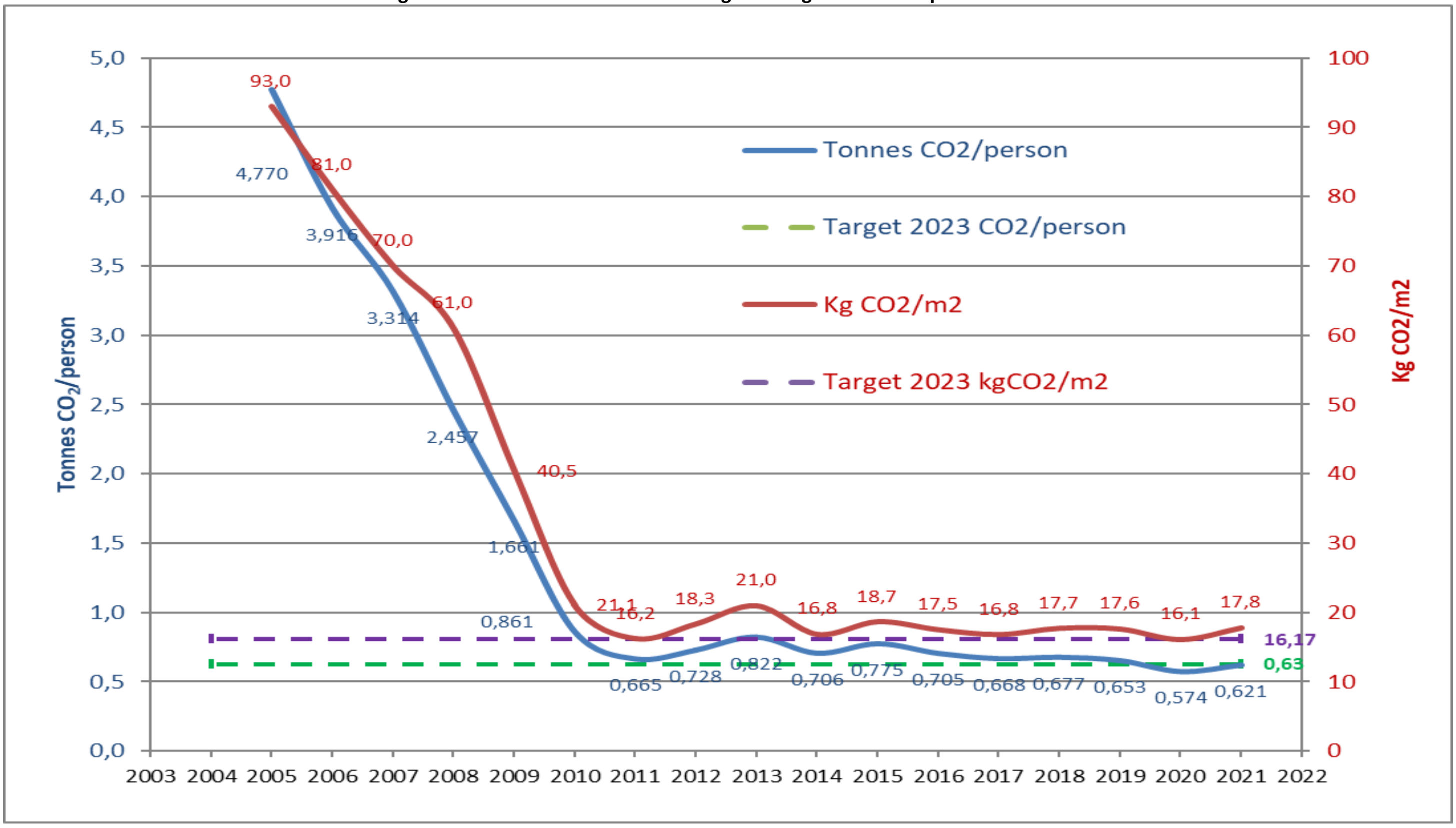


Figure A8 above shows that CO_2 emissions have reduced considerably since the first EMAS registration in 2005, with a large drop since purchasing around all electricity from 100% renewable sources in August 2009 (and assuming that renewable electricity does not generate CO_2 emissions). Consequently, emissions are largely unchanged since 2011, which is consistent with Figures A1 and A2 that show gas consumption has decreased very slightly over this period on a per person and square metre basis.

Values in 2021 show the same trend as the majority of the indicators, bearing witness of the impact of the pandemic.

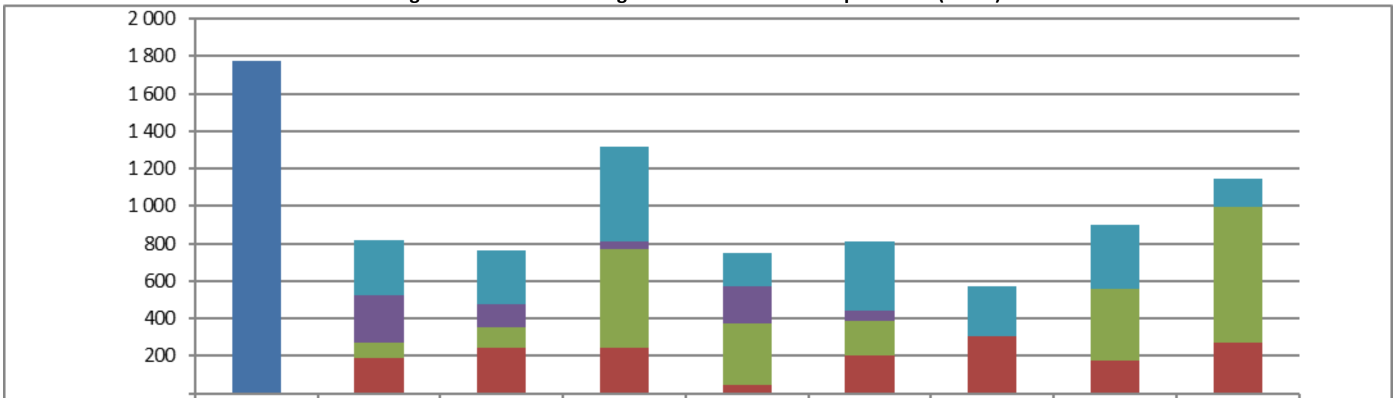
A4.1.2 Emissions from household energy use (8 540 tCO_2e in 2021, 11% of carbon footprint)

Homeworking emissions were estimated for the first time in 2021 in response to the change in behaviour under the COVID pandemic and comprise emissions from i) work and domestic appliances used while teleworking ii) energy consumption from space heating and cooling, and iii) from the embodied energy of IT fixed assets that the Commission financed (see fixed assets section below).

A4.1.3 Fugitive emissions from Commission buildings (refrigerant/coolants) – (1 145 tCO_2e in 2021, 1 % of carbon footprint)

A **refrigerant** is a substance, commonly a fluid, used in refrigeration cycles. Each kilogram of refrigerant lost may be equivalent to between 1 000 and 5 000 kg of CO_2 e. OIB has monitored the total quantity of refrigerants in technical installations (excluding catering), and losses since 2005. Figure A9 shows that 2021 figures are close to the average since 2016 (2019 was an atypical year with lower incident rate).

Figure A9 - Losses of refrigerants in Brussels EMAS perimeter (tCO_2e)



	2005	2014	2015	2016	2017	2018	2019	2020	2021
Total (TCO2e)	1 777	821	763	1.315	749	847	572	899	1.145
R407C		293,2	285,1	501,4	174,8	366,0	262,4	341,8	147,4
R404A		252,6	126,1	43,3	197,0	52,0	0,0	0,0	0,0
R134A		84,8	104,0	529,2	330,2	188,6	0,0	382,2	722,8
R410A		190,1	247,7	241,0	47,4	202,2	309,1	174,7	274,6
R22A	1 777	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

The phasing out and substitution of refrigerants such as R404a or R134a, used in kitchen cooling equipment, and R407c, R410a, used in HVAC installations, is scheduled for 2025 or 2030, following the applicable legislations, which are closely monitored.

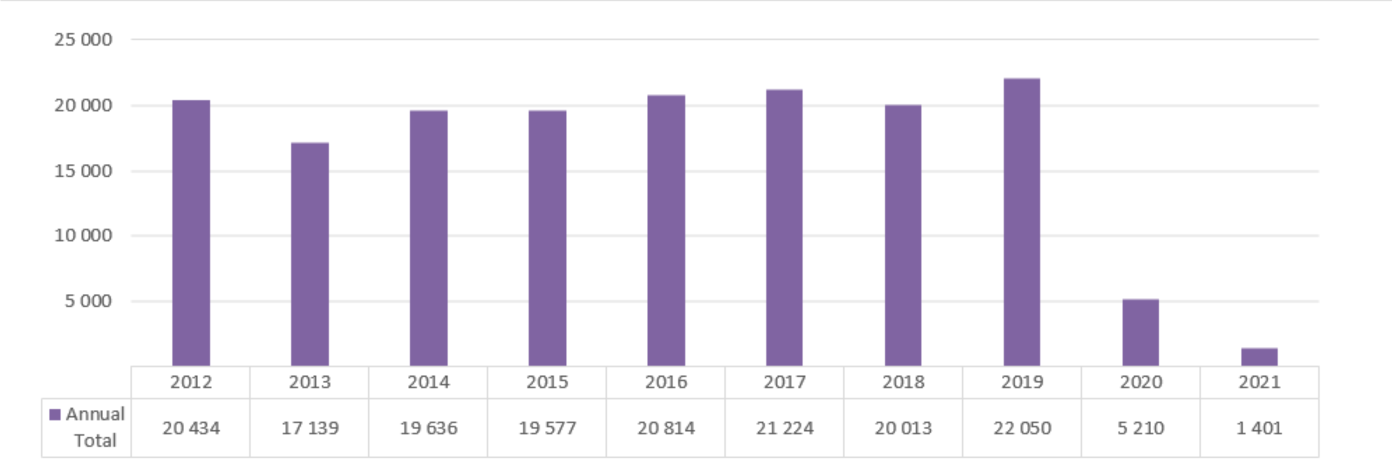
A4.1.4 Staff travel for missions (7 411 tCO_2e in 2021, 10 % of carbon footprint)

Missions policy is largely the remit of individual DGs, although there are facilities management approaches that reduce the need to travel as described in the GAAP. These include:

Ongoing active measures to reduce travel related emissions
• evaluating the use of videoconferencing within the Commission
• promoting videoconferencing in DGs and using monthly utilisation reports
• continuing to promote the use of service bicycles
• continuing to distribute tickets for journeys on public transport within Brussels

Figure below shows the number of trips undertaken using service bicycles to attend internal or external meetings or events in Brussels.

Figure A10 - Trips made by Commission bicycles



Pre-pandemic around 20 000 trips were made annually using Commission bikes. In 2020 there was a reduction of more than 76% compared with 2019, while a further 73% reduction in 2021 bear witness of the impact of the confinement throughout the whole 2021 year. These trips include those using the 75 electrical bikes (out of 320 bikes) added to the fleet in the last 3 years.

A4.1.5 Staff travel missions by Commission vehicle (420 tCO_2e in 2021, 0.5% of carbon footprint)

Table A6 - Fleet vehicle characteristics and tailpipe CO_2 emissions

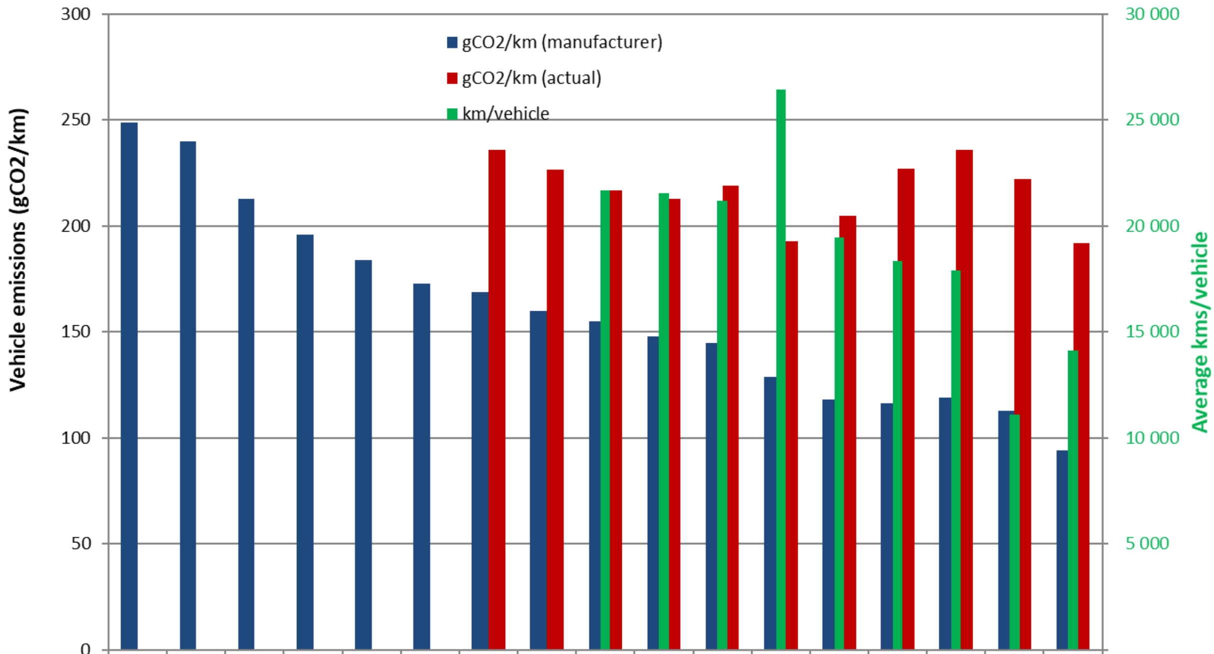
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Number of vehicles (avg. fleet size)	160	120	114	117	107	129	126	131	129	125
of which electric/hybrid engine				10	10	13	13	13	13	14
of which Euro 6 engine				56	74	98	93	73	65	39
of which Euro 5 engine				51	23	18	0	0	0	0
Internal fleet efficiency (litres/100km)		8,6	8,4	8,4	7,5	8,0	8,9	9,3	8,9	8,2
CO_2 emissions										
i) from diesel (tonnes)	693	681	635	644	625	561	455	418	171	100
ii) from petrol (tonnes)	29,9	22,9	18,1	15,0	37,7	61,5	170,5	239,9	206,4	320,0
Total vehicle tailpipe emissions	**595**	**704**	**653**	**659**	**663**	**623**	**626**	**657**	**377**	**420**

The CO_2 emissions have steadily decreased since 2013. Table A7 also shows a switch from diesel to petrol engines, demonstrated by the respective CO_2 emissions: while in 2013 CO_2 emissions from diesel represented 97% of the total, in 2021, it dropped to 24% only. This switch also explains the slight increase shown in 2021, as well as the size of the fleet.

The confinement rules in the response to the pandemic have also influenced the use of the car fleet, reflected in a significant reduction of the mileage and therefore of the related CO_2 emissions, by more than 36% (compared with 2019 figures).

Figure below shows how vehicle emissions (per km) and average vehicle use have evolved across the years.

Figure A11- Emissions per km and distance travelled per vehicle



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
gCO2/km (manufacturer)	249	240	213	196	184	173	169	160	155	148	145	129	118	116	119	112,81	94
gCO2/km (actual)							236	227	217	213	219	193	205	227	236	222	192
km/vehicle									21 694	21 547	21 172	26 446	19 444	18 344	17 913	11 106	14 135

Initiatives undertaken since 2015 include systematic replacement of vehicles having reached the end of their economic life cycle with more environmentally friendly models, featuring lower engine capacity, hybrid technology or electric motors. The OIB provides drivers with 'eco-driving' training and since 2015; it uses the "ecoscore" label for cars, advised by the Brussels Capital Region, in its car fleet management.

A4.1.6 External expert travel- (748 tCO_2e in 2021, 1% of carbon footprint)

Emissions for experts who travel to Brussels and are financed by the Commission's administrative budget.

A4.1.7 Staff commuting (1 966 tCO_2e in 2021, 3% of carbon footprint)

Initiatives undertaken in 2021 concerning commuting included:

Ongoing active measures to reduce commuting related emissions
• continued financial support for public transport season tickets for staff who give up the right to permanent access to a parking space
• installing additional bicycle parking places (currently over 5200) and showers in Commission buildings
• promoting the "Bike to Work" and "Bike Experience" schemes of external organisations
• compliance with the regional legislation COBRACE, aiming at the reduction of parking space in office buildings

These measures, aiming to promote the use of sustainable modes of transport by staff were continued in 2020 and 2021, to some extent. Indeed, the pandemic has also induced a change of behaviours regarding mobility, with a significant reduction of the use of public transport and an increased use of bicycle or car when staff had to come to the office. Staff participation in online awareness raising actions has also increased.

In 2021, the OIB has inaugurated two large bike hubs in buildings L130, serving the Rue de la Loi/ Rue Joseph II area, and BREY, serving the area around Schumann/Rue Belliard, catering for a total of more than 900 bikes and scooters. These facilities are equipped with chargers for electric bikes, showers and a quick repair shop, pictured below.

As in other indicators, the decision to make teleworking compulsory (by the Belgian Authorities, followed by the Commission), had a very strong impact on commuting related CO_2 emissions: a reduction of 71% in 2020 when compared with 2019. Figures in 2021 show a further 44% reduction, due to the lower building occupancy (an annual average of 16%, bringing the emissions at 1850 tonnes, instead of 11565).

A4.1.8 Fixed assets (32 450 tCO_2e in 2021, 42 % of carbon footprint)

Embodied emissions are associated with:

- Buildings, (27 154 tCO_2e, 35 %): These depend on building's design life and the type of construction, based on a 30-year amortisation approach. Has reduced by 4.3% since 2020;
- Commission fleet vehicles (88 tCO_2e, 0.1 %) : Depending on the distance driven, it has increased by 23%;
- IT office equipment (4 858 tCO_2e, 6.2 %): Amortisation period used for each of 17 types of IT equipment of 4 years, the total amount has increased by 3.7%;
- IT home office (350 tCO_2e, 0.4 %): As above, but for equipment the staff Commission provides for home use. In 2020 the Commission initiated a policy of reimbursing or supplying screens, docking stations and IT peripherals, continued throughout 2021.

A4.1.9 Goods and services (5 190 tonnes in 2021, 6.7 %)

Corresponding to:

- Service contracts (4 872 tCO_2e, 6.2 %), based on the value of contracts in cleaning, security and other services such as technical maintenance and consultancy, shows an increase by 7% compared with the previous year.

- Paper purchase (201 tCO_2e, 0.3 %), following the downward consumption trend, has decreased by 34% since 2020.
- Catering (117 tCO_2e, 0.2 %) – based on consumption of 7 food types, has decreased substantially due to the number of canteens and cafeterias closed throughout most of 2021.

A4.1.10 Own waste treatment emissions (531 tCO_2e in 2021, 0.7 %)

A4.2 Total air emissions of other air pollutants (SO_2, NO_2, PM)

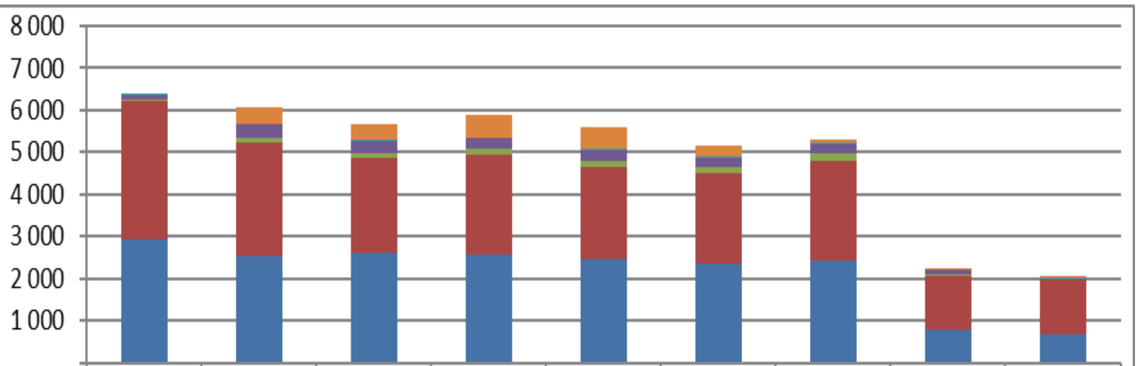
Brussels is one of several European cities experiencing high levels of airborne pollution. The EC occupies more than 60 buildings with large HVAC (Heating, Ventilation, and Air Conditioning) installations, and uses a fleet of over 100 predominantly diesel vehicles, even though their numbers and percentage of the total have been reduced to 50% (65 over 129). The Commission must ensure that it is contributing positively to improve this situation.

The pollutants typically released into the air are those of combustion; therefore, boilers and vehicle engines constitute a source of pollution. OIB started to collect data in 2013 to improve reporting on these atmospheric pollutants, and the Commission completely phased out fuelled boilers, in 2017.

A5 Improving waste management and sorting

A5.1 Non-hazardous waste

Figure A12 - Evolution of total non-hazardous waste in Brussels (tonnes)



	2005	2014	2015	2016	2017	2018	2019	2020	2021
Total non haz.waste (tonnes/person)	0,300	0,222	0,209	0,218	0,198	0,181	0,211	0,094	0,099
Total non hazardous waste (tonnes)	6 359	6 081	5 654	5 882	5 580	5 158	6 103	2 810	3 116
Furniture		404	349	528	506	256	49	32,4	37,8
Glass (20 01 02)	12,5	29,4	26,46	25,55	23,03	27,68	40,55	13,80	6,69
Organics (20 01 08)	83,7	311,2	288,61	260,79	242,70	212,54	244,43	79,19	1,40
PMC (15 01 06)	46,9	116,1	123,08	142,06	147,06	144,37	151,61	59,71	31,46
Paper and card (20 01 01)	3 265	2 675	2 274	2 349	2 212	2 167	2 398	1 266	1 299
Unsorted waste déchets (20 03 01)	2 951	2 545	2 594	2 577	2 449	2 351	2 407	787	670

Figure A12 indicates that non-hazardous waste generated[22] per person has reduced by 27% since 2005 until 2019 (217 kilograms instead of 300). In 2021, as expected, figures on unsorted waste have dropped by more than 58%, consequence of the low occupancy of the Commission buildings in Brussels. Unsorted waste and paper/carton continue to make up a large percentage of the waste produced (over 67%). From 2014 to 2016, data include the weight of office furniture recovered by Oxfam under a contract that was also used for recycling/reuse of obsolete IT equipment. Since 2017 this procedure was replaced by the sorting of the materials (metal and wood) performed at the OIB's warehouse (and then recovered by Suez) as well as the return to the suppliers (for chairs and desks) for reuse/recycling. (For DIGIT IT obsolete equipment, see section A6.2).

Following the external verifier's recommendation, figures related to waste produced by refurbishment works have been included in this year's reporting.

In overall terms, and since 2017, the figures show a transfer of unsorted waste to other categories, which is a positive indicator of a better sorting behaviour by the staff.

Principles of circularity were incorporated into the waste management contract that came into force in May 2017[23]. OIB has launched other initiatives on waste management since 2015, which are still ongoing, such as:

Ongoing active measures on waste management
• Improving the selective sorting of waste using sorting bins in areas and buildings for public use • promoting the implantation of collaborative working areas which reduces the number of waste containers available and consequently improve waste sorting e-signing transfer of documents • reducing the number of individual bins

The new contract for refurbishment works signed in 2019 applies the same principles of circularity, paying a special attention to:

- **reusing and repairing construction products;**
- **improving the construction waste sorting and recycling;**
- **using low environmental impact materials, such as products containing recycled materials (i.e. wall tiles, suspended ceiling plates, carpet tiles) and products with environmental certifications (i.e. cradle-to-cradle certified wall partitions, water based eco-labelled painting, FSC certified word).**

The environmental management implemented in the framework contract, in cooperation with the contractor, allows to continuously improving data quality and thoroughness regarding waste (reporting on 2021, 2020 and 2019 for reference), to set targets, monitor the KPI evolution and to implement new actions to aiming at lowering the environmental impact of the contract.

Data for 2021 also include waste from the print shop activities (as well as 2019 and 2020 for reference), as suggested by the auditors.

The measures introduced in previous years aiming to reduce the use of Single Use Plastic items continued to receive great attention. The OIB has successfully launched a series of initiatives in this regard, namely:

[22] Historically reported for total Commission staff

[23] And reinforced in the new contract, to be signed in the first semester 2022

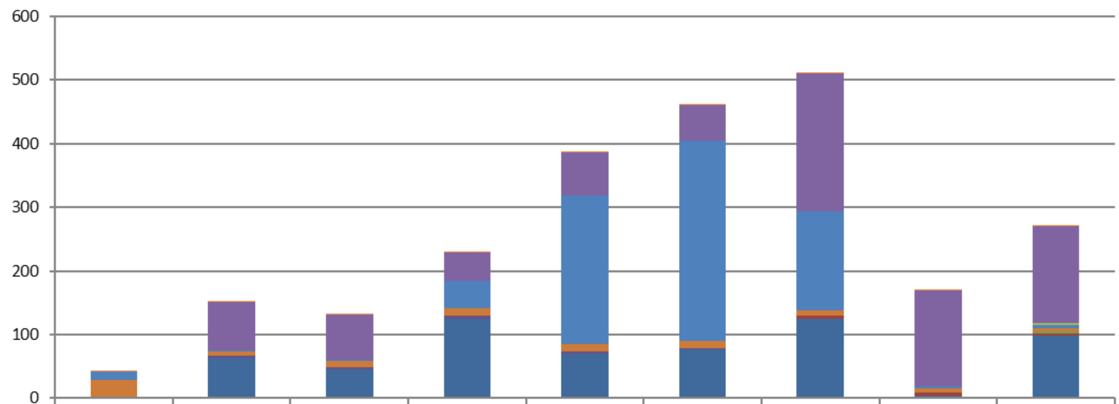
Ongoing active measures on Single Use Plastics
• full replacement of plastic cups in water fountains and vending machines by recycled and recyclable paper ones
• use of specific bins aimed at this type of waste
• plastic stirrers replaced by wooden stirrers in cafeterias and restaurants and removed from vending machines
• no longer possible to order plastic cups for catering services and events
• water fountains installed in restaurants and cafeterias (using upcycled furniture)

A5.2 Hazardous waste

Per capita hazardous waste generation represents less than 5% of total waste. Since 2014, data supplied by DG DIGIT relating to the weight of IT material collected by Oxfam (and more recently by Close the Gap) for recycling and re-use have been incorporated in the hazardous waste data, and the data series extrapolated back to 2006. In 2019, these figures increased from 55 to 215 tonnes, due to higher quantities of PCs, laptops and portable phones collected.

Data for 2020 show a strong reduction in the categories linked to building maintenance, which have seen their operations reduced to a strict minimum because of the compulsory confinement. These activities have regained momentum in 2021.

Figure A13- Evolution of total hazardous waste in Brussels (tonnes)



	2005	2014	2015	2016	2017	2018	2019	2020	2021
Total hazardous waste (tonnes)	42,89	151,60	131,97	229,98	386,11	460,76	511,60	171,34	276,70
Total hazardous waste (tonnes/person)	0,0020	0,0055	0,0049	0,0085	0,0137	0,0162	0,0177	0,0057	0,0088
Oxfam contract WEEE (20 01 35)		76,02	72,33	45,00	67,50	55,54	215,92	150,6	152,82
Diverse chemical waste	1,188	0,00	0,00	0,00	0,00	0,00	0	0	3,56
Mineral Oil	0,000	0,00	0,00				0	0	0
Oil and fat (20 01 25)	13,04	1,65	1,12	44,10	233,60	315,76	155,73	2,425	4,766
Cartriges laserjet-inkjet (08 03 17)	25,72	7,35	10,21	10,54	10,65	10,13	8,01	6,828	5,254
Paint - toner	1,466	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,16
Chemical batteries (20 01 33)	1,47	2,35	3,24	6,19	4,39	1,81	0,82	0,793	0,191
Chemical-fixer-developing agents	0,00	0,00	0,00	0,00	0,00	0,00	0	0	2,05
Microfiches	0,004	0,000	0,000	0,000	0,000	0,000	4,5	4,5	4,5
Maintenance of buildings/lifts (13 05)	0,00	64,23	45,07	121,71	68,24	75,59	122,76	2,3	95,723
Medical waste (18 01 03)				2,44	1,73	1,94	2,55	1,88	2,08

A5.3 Waste sorting

OIB seeks to maximise the sorting of waste into potentially useful recycling streams, and minimise the amount of unsorted "general" waste. 2020 and 2021 figures are not be representative, due to the low occupancy of the buildings.

The success of the introduction of sorting stations, allowing for a better waste sorting in offices, has continued throughout 2020 and 2021. From installation mostly in buildings with open office spaces, starting in 2018 as a pilot project, it was extended in 2019 and 2020 to more buildings to a current 18. By the end of 2020, 771 stations have been installed, including at the entrance of each Commission building in Brussels. All floors in the flagship building of the BERL have been equipped with these sorting stations.

Following 2021's floods in Belgium, the OIB has contributed to schools, associations and the Belgium Red Cross with books and office supplies, gathered in Commission buildings in Brussels under the GOAL (Give Objects Another Life) project. This action was relevant, in terms not only of waste management and circularity but mainly of social responsibility showed by the Institution and the colleagues participating.

Tableau A7 - Evolution of waste sorting at the Commission in Brussels

	2005	2014	2015	2016	2017	2018	2019	2020	2021
Percentage of waste not sorted	46,1	40,8	44,8	42,2	41,0	41,8	36,4	26,4	19,8
Percentage of waste sorted	53,9	59,2	55,2	57,8	59,0	58,2	63,6	73,6	80,2

A5.4 Industrial wastewater disposal

There is no disposal of industrial wastewater at Brussels.

A6 Protecting biodiversity

The OIB continuously strives to improve the environmental impact in the building sector, despite the urban character of the site, including adopting several measures contributing, directly or indirectly, to protect biodiversity and including:

Ongoing active measures on protecting biodiversity
• integrating and managing several green areas in its buildings; • managing a green park at the Overijse site, with an area of 13 000 m²; • introducing infrastructure measures such as green roofs in building projects such as the one at Overijse (roof 1 800 m²); • opting for green procurement of goods and services: (e.g. where possible integrating environmental considerations in the selection of construction materials).

The 104 483m² of nature oriented area represent 36% over the total 287 785m² of sealed area[24], representing 3,3m² per capita.

The OIB has launched a new project in 2021, with the aim of elaborating a strategy for the improvement of conditions for biodiversity in the external green areas of the buildings occupied / managed by the Commission in Brussels (action 505 in the Global Annual Action Plan). The project is carried out in collaboration with the University of Liège, Agro-bio Tech department Gembloux, and with the involvement and consultation of a broad spectrum of stakeholders:

- OIB departments and other Commission DGs (ENV, JRC, HR), including the network of EMAS Correspondents across the Commission;

- Local and regional authorities;

- Other European Institutions;

- NGOs involved in the fields of environment and sustainability.

This strategy, as main deliverable, is scheduled to be presented in the third quarter of 2022.

A7 Green Public Procurement

A7.1 Incorporating GPP into procurement contracts

OIB aims to apply "green" public procurement principles into its contracts exceeding 60 000 EUR (action 54 of the Commission's Global Annual action plan), and has increased the number of contracts including such criteria in the last few years.

[24] Nature oriented surface as included in the maintenance contract of the buildings' surroundings; total area corresponds to the plot area of all buildings

Since 2016, the OIB uses PPMT, an IT programme allowing for a closer identification and follow-up of the GPP criteria indicator included in OIB procurement. OIB uses a three level classification of the tenders (green, not green and green by nature), which gives sufficient detail in the analysis of the environmental criteria. In 2021, environmental criteria were included in all 15 contracts considered as “green”, while the remaining had no environmental features.

The OIB continued to apply GPP principles to tender procedures, for instance including environmental criteria in the Real Estate Prospecting Notices (API), applying New European Bauhaus principles (NEB) in OIB works. A recent example is an acquisition contract for a conference centre, worth more than € 250 million, signed in 2021. The future building will be classified as BREAM Excellent (only 24 % of BREEAM certified buildings have excellent or higher certification) and the energy performance will be 18% better than the applicable minimum ‘nearly-zero energy building’ legal requirements. In addition, the work for the new visitor’s center in CHARL included NEB principles (in matters such as aesthetics, inclusion and low environmental impact materials).

Ongoing active measures on GPP principles’ application

- New sustainability clauses in future framework contracts;
- Organisation of internal meetings to share good practices;
- Explore new actions to promote sustainability and circular economy principles under the NEB (such as tests to reuse carpet tiles extracted from one building in fitting out works in the renovation of another).

A8 Demonstrating legal compliance and emergency preparedness

A8.1 Managing the legal register

Several units within the OIB are registered users of the Regulation Monitoring contract REMO, for legislation relating to EMAS, technical equipment and persons with reduced mobility, launched by the European Parliament. This monitors new regulations, and enables the OIB (through emails and links to designated users) to be up-to-date on relevant legislation. The EMAS team at OIB performs an analysis of the new legislations and highlights its potential impacts, suggesting the course of action necessary to guarantee compliance.[25]

[25] OIB GREEN PLATFORM (sharepoint.com)

The Brussels environmental legal register (for the Brussels and Flemish regions) is updated every year by an external consultant, and checked by OIB, ensuring the completeness and adequacy of the registers in relation to the Commission's obligations. The Legal Conformity page in OIB's Green Platform invites potential interested services to contact the EMAS team asking for further support on the follow-up of legislative matters.

In Brussels, occupying a building requires an environmental permit, issued by the regional authorities. In order to obtain these, the Commission must comply with the environmental legislation. Brussels Environment, the regional environment and energy administration department, performs legal compliance audits whenever an environmental permit is renewed or extended. In addition, internal EMAS audits performed by specialist external consultants and the external verification exercise check how the Commission demonstrates legal compliance in relation to environmental legislation. From these audits, we can conclude that all buildings in the Brussels site are compliant, and that the Commission engages in regular dialogue with local authorities on the subject.

A8.2 Prevention and risk management

OIB records statistics relating to the findings of buildings inspections of health, safety and environment. These audits and inspections are based on permits and legal requirements for each building and technical installation. Out of 1620 reports issued in 2020, 44% had no remarks, while 54 % stated minor and 2% major non-conformities.

Following an EMAS related non-conformity recorded in 2020, concerning the required control by a laboratory of the emissions from heating equipment bigger than 1 MW, the OIB signed an amendment to the SECT[26] contract, integrating these inspections in its scope. A number of previous controls have been updated to better meet environmental needs: The results are included in a table on Health & safety controls in section 12.5.

A8.3 Emergency preparedness

Beyond the procedures and services in place at the European Commission, concerning emergency preparedness and response related to health, safety and security incidents at work (24/7 helpdesk line 22222), the OIB monitors the application of the legislation on well-being at work, in particular the evaluation of risks and corrective measures with an impact on the environment.

With regard to technical issues, the OIB also manages the 24/7 helpdesk line 55555, which deals with technical incidents in the buildings (related lighting, heating, cooling, water, etc.).

[26] Service externe de contrôles techniques

A9 Communication and training

A9.1 Internal and external communication

Internal communication may involve Commission staff and contractors. A summary of the actions (aimed at Commission staff in all buildings, and not only OIB's) are included in section 12.6 while section 12.7 the main external actions conducted by Brussels in relation to environmental matters can be found in .

A9.2 Internal and external training

Trainings have been undertaken throughout the year covering both internal and external stakeholders, as shown in section 12.8
The EMAS coordination team at OIB followed several training sessions during 2019 on the following subjects:

- Circular economy;
- Public Buildings Design, Construction and Maintenance;
- Energy management;
- Roll-out of IPMVP (International performance measurement verification protocol).

Well trained EMAS staff: Two EMAS team at OIB are Energy Building Performance (EBP) public buildings registered certifiers and EBP advisers. Another member of the team has successfully completed the IRCA27 training in ISO 14001 lead audit, while another completed a Master's degree in Environmental Sciences and Management at the Université Libre de Bruxelles (ULB). As in previous years, the EMAS team at OIB welcomed a trainee under the Blue Book Program in the European Commission

A10 EMAS Costs and savings, conversion factors

A10.1 Costs and savings

Calculations showing the costs associated with running EMAS in Brussels (OIB) terms of staff time and that of supporting contracts (5 EUR/p) and energy (370 EUR/p) are presented in a table in paragraph 12.9.

Energy is by far the largest single resource cost, and the overall annual costs have reduced by millions over several years. As with most of the other indicators, the pandemic situation also affected these results in 2020, showing a sharp reduction of the energy costs per person (-19.2% compared with 2019). Energy costs decreased significantly since2014, baseline year for the previous EMAS objectives (by 20% in total costs and by over 26% in costs per person).

A10.2 Conversion factors

Conversion factors (most of which apply to all the sites) are shown in an Appendix X of the Corporate Summary.

[27] International Register of Certified Auditors

A11 Site breakdown: Buildings’ characteristics and performance (selected parameters, indicative data)

Building	Occupant	Staff	Office	Café	Self rest	Creche/ child	Printing and	Medical	Depot, large	Workshop	Sports/	Electricity	Mains gas	Water (m3)	Non hazardous waste (tonnes)	Comment
1) Building essential details 2021:			**2) Building use 2021**									**3) Energy sources and amount**		**4) Water and waste consumption**		
BRUSSELS																

B232	Rue Breydel 4	SANTE	BXL 2009/016	11 584	465	X													708705	903633	1752	9,19	
B-28	Rue Belliard 28	DIGIT, OIB	BXL 2007/009	14 987	1284	X	X												1570616	680978	1043	35,74	
BERL	Rue de la Loi 200	Collège, SG, SJ, COMM, OIB, EPSC, HR	BXL 2005/001	151 410	2353	X	X	X											19843010	13499682	27474	111,44	
BRE2	Avenue d'Auderghem 19	ENV	BXL 2005/002	18 747	586	X	X				X								1268003	1178135	1731	48,97	
BREY	Avenue d’Auderghem 45	DEFIS, GROW	BXL 2009/015	35 198	786	X	X	X											2531720	2415776	8820	77,82	Includes HT and LT
BU-1	Avenue Beaulieu 1-3	REGIO	BXL 2008/013	13 911	441	X					X								960048	1280119	2722	108,07	Includes figures for waste for buildings BU-5 and BU-9.
BU25	Avenue de Beaulieu 25	CNECT	BXL 2012/044	18 130	502	X													1237871	881498	1348	32,14	
BU29	Avenue de Beaulieu 29	REGIO	BXL 2011/033	6 131	25	X	X												432152	269046	597	36,81	Includes figures for waste for BU31 & 33.
BU31	Avenue de Beaulieu 31	CLIMA	BXL 2011/034	6 185	282	X													323057	288125	602		
BU33	Avenue de Beaulieu 33	CNECT	BXL 2011/035	6 843	212	X													505997	265706	463		
BU-5	Avenue de Beaulieu 5-7	ENV, REGIO	BXL 2005/003	11 843	284	X	X	X											873185	1125702	1885		Figures for waste included in BU-1.
BU-9	Avenue de Beaulieu 9-11	ENV, OIB	BXL 2005/004	13 040	453	X					X								927250	1384163	3385		Figures for waste included in BU-1.
C-25	Avenue de Cortenbergh 25	EPSO, DIGIT		8 574	149	X													564985,6	725304	1077	3,69	
CCAB	Rue Froissart 36	SCIC	BXL 2013/049	18 634	539	X	X	X											2493677	2474087	17528	25,46	
CDMA	Rue du Champ de Mars 21	RTD, JRC	BXL 2009/017	19 096	706	X	X												1301730	1665994	1107	26,45	
CHAR	Rue de la Loi 170	ECFIN, COMM, TRADE, REFORM	BXL 2013/050	55 342	1447	X	X	X											4091763	3652851	14626	59,07	
COVE-COV2	Placer Rogier 16	Executive Agencies	BXL 2014/055	71 430	1939	X	X	X											4810255	5851778	23335	56,05	
CSM1	Rue Père de Deken 23	OIB, REGIO	BXL 2011/026	12 276	648	X	X												692457	815706	1627	33,29	

1) Building essential details 2021: | 2) Building use 2021 | 3) Energy sources and amount | 4) Water and waste consumption

BRUSSELS

Building		Occupant			Staff	Office	Café	Self rest	Creche/ child	Printing and	Medical	Depot, large	Workshop	Sports/	Electricity	Mains gas	Water (m3)	Non hazardous waste (tonnes)	Comment
DM24	Rue Demot 24	MOVE, ENER, EAS	BXL 2014/055	15 827	510	X	X								1043253	1197646	2065	20,46	
DM28	Rue Demot 28	MOVE	BXL 2013/051	11 277	406	X									764691	1129988	2472	16,42	
F101	Rue Froissart 101	SANTE	BXL 2010/031	8 351	241	X	X								399765	585328	1281	16,74	
G--1	Avenue de Genève 1	DGT, DIGIT	BXL 2011/037	12 580	287	X			X						937149	574505	1657	25,34	
G-12	Avenue de Genève 12	DGT	BXL 2011/038	16 946	514	X	X								870723	1462708	2286	21,46	
G--6	Avenue de Genève 6	DGT	BXL 2011/039	17 240	421	X	X	X							783226	1043277	1566	20,30	
J-27	Rue Joseph II 27	EMPL	BXL 2009/019	13 265	429	X	X								748560	617510	1269	24,44	
J-30	Rue Joseph II 30	OLAF	BXL 2009/020	18 157	463	X	X								2603415	1528063	2329	21,07	
J-54	Rue Joseph II 54	NEAR, INTPA	BXL 2007/012	19 739	433	X	X								1008909	839730	1114	23,99	
J-59	Rue Joseph II 59	INTPA	BXL 2010/030	9 396	286	X									530241	293273	837	10,38	
J-70	Rue Joseph II 70	EAC, OSP	BXL 2010/029	20 082	565	X	X								1067669	1610611	1823	23,07	Electricty in J-70 is exclusively LT.
J-79	Rue Joseph II 79	CDP-OSP , MARE, TAXUD	BXL 2009/021	16 134	482	X	X								1119572	1088809	1979	22,65	
J-99	Rue Joseph II 99	MARE	BXL 2014/056	8 281	515	X									347844	242614	1212	22,65	
L102	Rue de la Loi 102	AGRI, SCIC	BXL 2013/052	4 935	155	X									180766	192807	483	31,86	Waste figures included in L-86
L130	rue de la Loi, 130	AGRI	BXL 2014/057	37 043	986	X	X	X							2497891	2853837	4447	6,46	Includes HT and LT
L-15	Rue de la Loi 15	NEAR	BXL 2013/053	17 482	485	X	X								1197880	959663	865	26,09	
L-41	Rue de la Loi 41	INTPA	BXL 2009/022	27 864	863	X	X	X							1592107	1851083	2208	33,74	
L-56	Rue de la Loi 56	COMM ,Galileo	BXL 2012/046	9 666	317	X									704231	552372	864	4,70	
L-86/L-84	Rue de la Loi 86	ECHO	BXL 2011/032	13 355	434	X	X								1173009	1530908	2475	27,72	Includes L102 waste figures
LX40	Rue de Luxembourg 40	TAXUD, JUST	BXL 2013/054	7 803	223	X									449264	419765	354	18,54	
LX46	Rue de Luxembourg 46	HOME, JUST	BXL 2010/023	17 478	596	X									1115982	1653949	2035	20,75	Includes consumption MO59

Building	Occupant	Staff	Office	Café	Self rest	Creche/ child	Printing and	Medical	Depot, large	Workshop	Sports/	Electricity	Mains gas	Water (m3)	Non hazardous waste (tonnes)	Comment
1) Building essential details 2021:			2) Building use 2021									3) Energy sources and amount		4) Water and waste consumption		
BRUSSELS																

MADO	Place Madou, 1	DIGIT, IAS, COMP	BXL 2014/058	40 716	1200	X	X	X											2506998	3894824	10459	40,81	
MERO	Av. Tervuren, 41	PMO	2020	13 145	511	X	X												558177	1026632	1275	14,50	
MO15	Rue Montoyer 15	BUDG, DIGIT	2020	11 543	522	X	X												677875	84766	746	18,67	
MO34	Rue Montoyer 34	DIGIT, HR	BXL 2005/007	12 820	381	X		X											824532	594964	979	35,44	Includes waste figures of SC11.
MO59	Rue Montoyer 59	JUST	BXL 2010/024	8 671	275	X	X												0				Consumption included in LX46.
N105	Avenue des Nerviens 105	GROW	BXL 2010/025	9 546	302	X													523642	652740	2924	11,04	
ORBN	square Frère Orban, 8	RTD	BXL 2014/059	25 141	723	X	X	X											1199205	1136314	813	18,17	
PLB3	Philippe Le Bon 3	HR et formation	BXL 2015/060	16 584	146	X	X	X											782018	837795	3657	15,87	
SC11	Rue de la Science 11	HR	BXL 2005/008	9 002	414	X	X												482992	707522	973		Figures for waste included in MO34.
SPA2	Rue de SPA 2	FISMA	BXL 2012/047	19 567	451	X	X												909862	982880	2064	18,72	
SPA3	Rue de Spa 3	TAXUD, EMPL	BXL 2012/048	12 288	502	X													633075	668499	2358	13,55	
VM18	Rue Van Maerlant 18	EAC, SCIC, OP	BXL 2010/028	9 330	39	X	X		X										794014	1007814	1203	21,00	Figures for waste include figures for VM-2.
CLOV (2)	Boulevard Clovis 75	OIB	BXL 2007/010	6 274	20		X	X	X		X								450788	682287	5156	34,00	
DAVI (2)	Avenue de Bourget 1-3	OIB	BXL 2007/011	12 600	122		X			X									1038180	1091136	736	47,97	
WILS (2)	Rue Wilson 16,	OIB	BXL 2007/010	2 544	4				X													7,33	Electricity and gas for WILSON are included in CLOVIS figures (one single EAN)
VM-2 (2)	Rue Van Maerlant 2	Cercles de Loisirs, le Foyer, Brasserie	BXL 2010/027	15 960			X	X											922273	1473792	2587		Waste figures included in VM18.
COLE (2)	~~Rue du Cornet 41-45~~ Rue G.Leman 60	OIB	BXL 2011/026	8 850	74		X		X		X								504067	1274282	4254	36,70	
KORT	Industriepark Gullendelle, Vinkstraat 3 3070 KORTENBERG	OIB.Archives Historiques	VL 2015/002	1 070	15							X							705281	673909	161	37,69	
WALI	Boulevard Clovis 53	OIB	BXL 2015/061	5 679	136		X	X	X		X								258180	561322	2262	21,52	
OVER	Dennenboslaan, 54- 3090 OVERIJSE	OIB	2015	2 600	7									X					123622	189071	707	11,77	
W910	Chaussée de Wavre, 910- 1040 ETTERBEEK	CINEA		9 052	421														911423	1148388	1988	29,93	
BRUSSELS TOTALS				1 069 244	28 556														81 078 833	80 275 666	192 045	1 538	

A12 Tables

A12.1 Indicative climate conditions

Indicative climate conditions [1]	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Heating degree days, heating req	2 184	2 397	1 722	1 986	2 111	1 991	1 989	1 940	1 771	2 137
Cooling degree days, cooling requ	325	360	345	365	409	415	584	435	499	324
Total degree days	2 509	2 757	2 067	2 351	2 520	2 406	2 573	2 375	2 270	2 461
kWh/person/degree day [2]	**3,08**	**2,65**	**3,36**	**3,18**	**2,84**	**2,84**	**2,62**	**2,69**	**2,39**	**2,14**

(1) www.degreedays.net; monthly data for EBBR station (15.5 C reference temperature)

(2) using buildings energy consumption data for Brussels site

A12.2 Summary of main stakeholders' requirements to be addressed in the management system as obligations

Stakeholder Group	Stakeholder needs & expectations	EMS obligations
European Institutions	Development plans and operational activities run according the policy laid out at Institutional level	To ensure a high quality service whilst complying with political and budgetary constraints (example, the implementation of the EMS).
Clients	Correct and timely facility management services by OIB, in compliance with environmental legislation	Implementation by management: quality of the facility management services and modern infrastructure supplied by the OIB (examples, meetings between DGs and OIB to improve the quality of the service provided, and continuous improvement of the environmental performance).
Suppliers / contractors	Information on environmental requirements, targets and technical specifications	Implementation by management: to define appropriate environmental criteria at the relevant stages of the procurement and project management process (examples, use of GPP toolkit and environmental requirements in tenders).
Staff	Responsible environmental behaviour, transparent communication regarding environmental procedures and impacts	Infrastructure and operational services quality; communication plan: environmental engagement by OIB, reflecting the needs and aspirations of the staff, through communication plans and activities (example, communication to staff on OIB initiatives like Velo Mai, sorting stations or posters on building environmental profile).
Regulatory authorities	Compliance with Regional and EMAS regulations.	To ensure legal compliance on OIB facility management activities, insofar contractors and suppliers as well as the staff are concerned. Legal Register; Communication to management; Implementation by management; Compliance Evaluation and audits (example, Site Management Reviews and reports on the performance of the EMS)

Policy makers	Strategic and operational plans compliant with National and Regional regulations and targets (example Energy Efficiency Directive)	Implementation of the EMS: to promote the OIB role of leading by example regarding environmental compliance and practices, by setting challenging targets and plans to comply with the ones set to other public or semi-public actors (example, the actions under the EED).
General Public	Transparent communication, accountability	Proactive planning and communication giving reassurances on OIB activities to the public, press and NGOs (example, the publication of the Environmental statement).
Neighbours	Transparent communication, accountability	Proactive planning and communication, as well as corrective measures, if necessary, giving reassurances on OIB activities to the public.

A12.3 Summary of significant environmental aspects for the Brussels site

Aspect group	Environmental Aspect	Environmental impact	Activity, Product or Service	Indicators	Risk	Opportunity
1) Air	Emissions of CO_2, NO_x, SO_x and VOCs.	Resources depletion, air emissions, global warming, acid rain	Heating & cooling systems	T/year	Less performant installations increase gas consumption, emissions and resources depletion	Environmental performance improved by renewed installations and better regulation
	Emissions of CO_2, NO_x, SO_x and VOCs.	Resources depletion, air emissions, global warming, acid rain	Fleet use	T/year	Less performant vehicles increase fuel consumption, emissions and resources depletion	Reduction of parking space, through compliance with COBRACE regulation, could decrease emissions
2) All	Fire prevention	Air, soil and water contamination	Emergency preparedness	n° of incidents	Impact on business continuity	Regular drills improve awareness and preparedness
3) Biodiversity	Land use	Ressources depletion, loss of biodiversity, land degradation	Real Estate Management	m²/total	Air and soil degradation	Impulse for a better use of the space used, fostering biodiversity also through staff participation
4) Life cycle	Contruction/ Renovation	Resources depletion, air emissions, soil-water contamination, transport	Real Estate Planning	LCA (Life Cycle Analysis) based on EN 15978 standard	Poorer quality works lower environmental performance	Environmental performance improved by quality renovation works
5) Ressources	Gas, Fuel	Resources depletion, air emissions, global warming	Energy	MWh/y/pe rson	Less performant installations increase electrical consumption, emissions and resources depletion	Environmental performance improved by renewed installations and better regulation

	Electricity	Ressources depletion, air emissions, global warming	Energy	MWh/y/person	Less performant installations increase electrical consumption, emissions and resources depletion	Environmental performance improved by renewed installations and better regulation
	Water	Resources depletion	Water consumption	m³/y/person	Less performant installations increase water consumption, emissions and resources depletion	Environmental performance improved by renewed installations and better regulation
	Office supplies and furniture	Resources depletion, air emissions, global warming	Office work	Green criteria	GPP criteria may have a potential impact on price	GPP criteria help the marketplace go greener
6) Soil/Water contamination	Chemicals disposal/ leaks of chemicals/ leaks of Gasoil	Soil/Water contamination	Maintenance	n° of incidents	Non-compliance with regulations could hinder the use of the building	Environmental performance improved by compliance with better regulation
7) Waste	Hazardous waste	Air, soil and water contamination	Maintenance	T/person	Non-compliance with waste management flows could hinder the use of the building	Improving waste management flows represents an improvement opportunity in itself.
	waste production: organic / non organic.	Air, soil and water contamination	Production of meals	T/y/person	Poorer organic waste management reduces the quantities sent to gas production (bio-méthanol)	Improving management of organic waste reduces quantity of waste being incinerated
	Waste	Resources depletion, pollution	Waste	Green criteria	Although all plastic items are recycled or incinerated, the risk is resources depletion (oil based products). Potential impacts on cost.	To lead by example.

* These indirect aspects are managed via a series of specific mechanisms, including impact analysis (see Corporate volume point 2.1), and regulatory measures.

A12.4 Carbon footprint elements (tonnes CO_2e/person)

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Scope 1: Fuel consumption and fugitive emissions									
Fuel for bldgs: mains gas	0,59	0,50	0,56	0,55	0,53	0,52	0,50	0,44	0,49
Fuel for bldgs: tanked gas (1)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel	0,02	0,03	0,02	0,01	0,00	0,00	0,00	0,00	0,00
Biomass	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Commission vehicle fleet	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,01	0,01
Refrigerants	0,04	0,03	0,03	0,05	0,03	0,03	0,02	0,03	0,04
Scope 2: Purchased energy									
External electricity supply (grey),	0,06	0,06	0,06	0,02	0,02	0,02	0,01	0,01	0,01
External electricity supply contract (renewables), combustion	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
District heating (combustion) (2)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Scope 3: Other indirect sources									
Fuel for bldgs: mains gas (upstream)	0,13	0,11	0,13	0,12	0,12	0,11	0,11	0,09	0,10
Fuel for bldgs: tanked gas (upstream) (1)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel (upstream)	0,00	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Commission vehicle fleet (upstream)	0,01	0,00	0,01	0,01	0,00	0,00	0,00	0,00	0,00
Site generated renewables (upstream) (3)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
External grey electricity supply, line losses	0,02	0,01	0,01	0,00	0,00	0,00	0,00	0,00	0,00
External 'renewables' electricity contract (upstream with line loss)	0,00	0,00	0,00	0,00	0,00	0,03	0,03	0,03	0,02
District heating (upstream) (2)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Business travel: air (combustion) + (including air taxi)	2,09	1,83	1,64	1,67	1,61	1,62	1,76	0,28	0,22
Business travel: rail (combustion)	0,01	0,00	0,01	0,01	0,01	0,01	0,01	0,00	0,00
Business travel: hire car (combustion)	0,01	0,01	0,01	0,01	0,00	0,00	0,00	0,00	0,00
Business travel: private car (combustion)	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,01	0,01
Experts' travel: air emissions	0,00	0,00	0,00	0,00	0,00	0,00	1,07	0,29	0,02
Experts' travel: rail emissions	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00
Commuting (combustion) (4)	0,41	0,39	0,39	0,40	0,39	0,41	0,40	0,11	0,06
Fixed assets - buildings	0,00	0,00	0,00	0,00	0,00	1,00	1,00	0,95	0,86
Fixed assets - IT	0,00	0,00	0,00	0,00	0,00	0,47	0,28	0,17	0,15
Fixed assets - Commission vehicles	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Paper supply	0,00	0,00	0,00	0,00	0,00	0,03	0,03	0,01	0,01
Service contracts	0,00	0,00	0,00	0,00	0,00	0,12	0,12	0,15	0,15
Catering	0,00	0,00	0,00	0,00	0,00	0,00	0,13	0,04	0,00
Own waste	0,00	0,00	0,00	0,00	0,00	0,05	0,05	0,02	0,02
Teleworking emissions (equipment electricity use)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,07
Teleworking emissions (fixed assets, equipment)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
Teleworking emissions (space heating)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,19
Sum	**3,4**	**3,0**	**2,9**	**2,9**	**2,7**	**4,4**	**5,6**	**2,6**	**2,5**

A12.5 Health & safety controls

Test/control	Reference	No. buildings controlled 2021
Cogeneration systems and associated air analysis	6G	5
Air conditioning installations over 15 years old	6F & 6J	62
Generators and associated air analysis	6H	58
Boilers and associated air analysis	6A	21
Gas supply installations	6B	62
CO in parking and underground levels (48h)[28]	7B	72
Fine particles (copy machines)	7C	62

[28] Some buildings had 2 controls throughout the year.

A12.6 **Summary of main internal communication actions in 2021 (shown in OIBNet and flatscreen)**

Title	Domain	Dates in 2021
On-line talk: DG Climate Action, its work and its impact on the EU citizens	CO_2	February, March
Green calendar 2021 (europa.eu)	EMAS General	January
New on line EMAS basics training for all staff! (europa.eu)	EMAS General	February
Saving Energy in Commission buildings (europa.eu)	Energy	January
Results of the end of the year energy-saving action 2020 (europa.eu)	Energy	February
Ventilation systems back in operation in all buildings (europa.eu)	Energy	May
Quelles économies d'énergie à la Commission pendant le confinement ? (europa.eu)	Energy	June
Saving energy in Commission buildings over the summer (europa.eu)	Energy	July
End of year energy-saving action over the Christmas break (europa.eu)	Energy	December
Where are we with the European Green Deal? (europa.eu)	Green Deal	January
Greening the Commission: Let's walk the talk together!	Green Deal	March, April
Make the greener choice (europa.eu)	Green Deal	April
"Greening" your summer - on holiday or at work! (europa.eu)	Green Deal	June
Towards a greener European Commission (europa.eu)	Green Deal	November
Volunteer for a Green Change: Lessons learnt and the way forward (europa.eu)	Green volunteering	March

Velowalk: Bougeons pour une bonne cause (europa.eu)	Mobility	March
Velomai : Enfourchez votre vélo et aidez l'OIB à devenir champion ! (europa.eu)	Mobility	May
Introduction des Pass multi-voyages dans Mobility.net (europa.eu)	Mobility	June
Welcome to the Maelbeek Eco-Mobility Hub! (europa.eu)	Mobility	June
Mobility Week kicked off and keeps rolling (europa.eu)	Mobility	September
EU - Mobility Conference (europa.eu)	Mobility	September
Register to the bike repair workshop (europa.eu)	Mobility	October
Plastic waste: new sorting rules in Brussels offices (europa.eu)	Waste	March
New rules for the blue waste bins (europa.eu)	Waste	April
Less waste, more action together (europa.eu)	Waste	November
OIB Success Stories: L'action GOAL - une seconde vie pour nos objets (europa.eu)	Waste	November

A12.7 The main external actions conducted by Brussels in relation to environmental matters:

Action description	Participation at Brussels site level	Organisation and external stakeholders	Dates in 2021
Communication with Regional authorities	Planning, organization, participation, follow-up and reporting on audits performed by the IBGE or the Fire Department (SIAMU); training and seminars taken at IBGE facilities; participation in meetings, held at IBGE, concerning the future legislation on energy savings and the legislation COBRACE, as well as the annual EMAS meeting; frequent contacts with building owners and property managers.	OIB and IBGE, SIAMU and property owners and managers	Through-out the year

A12.8 Action plan training

Description	Participation at Brussels site level	Participants (estimated)	Dates in 2021

Training for newcomers	Assisting HR COORD in trainings for newcomers	60	Several throughout the year
Presentation	Biodiversity project: progress meeting with other European institutions	online	May

A12.9 EMAS administration and energy costs for buildings in the EMAS area

Parameter	2005 (1)	2014	2015	2016	2017	2018	2019	2020	2021
Total Staff (EMAS Office Buildings)	4 033	25 667	25 698	26 562	27 148	27 254	28 769	29 916	30 604
Total Staff (Commission)	21 203	27 392	27 089	26 927	28 225	28 494	28 948	29 941	31 440
EMAS administrative cost (EUR)/staff		**4,82**	**4,95**	**4,98**	**4,89**	**5,19**	**5,18**	**5,08**	**4,99**
Total energy cost for EMAS office buildings (EUR)	4 710 826	13 221 363	12 762 057	11 923 315	11 871 153	11 854 129	13 504 098	11 364 046	16 013 105
Total energy cost for all Commission buildings (3) (EUR)	24 766 587	14 109 930	13 452 851	12 087 158	12 342 098	12 393 467	13 588 120	11 373 543	16 450 530
Total per capita energy cost for EMAS office buildings (EUR/person)	**1 168**	**515**	**497**	**449**	**437**	**435**	**469**	**380**	**523**
Electricity (Eur/person)	845	395	365	341	343	342	397	328	327
Gas (Eur/person)	307	113	129	107	95	93	72	52	197
Fuel (Eur/person)	16	7	3	1	0	0	0	0	0

Notes:

a. Unit costs: Assume 2005 same as 2006
b. Including, in 2016 Executive Agencies in Commission managed buildings
c. Assuming non EMAS area have similar costs for energy as EMAS area

EUROPEAN COMMISSION

Environmental Management System

VERIFIED ENVIRONMENTAL MANAGEMENT BE-BXL-000003

Environmental Statement 2022

2021 Results

Annex B: Luxembourg

For further information on environmental performance in Luxembourg please contact:

Functional mailbox: OIL-EMAS@ec.europa.eu

Or see EMAS page on MyOIL: EMAS (europa.eu)

Foreword

The Office for Infrastructure and Logistics in Luxembourg (OIL) ensures that all activities associated with the housing of staff, the management of social welfare infrastructure and the logistics of the Commission in Luxembourg are carried out to the best standards. This includes for example building management, transport services for staff and goods, office supplies administration, catering and after-school childminding services.

OIL strives to reduce the overall environmental impact of all aspects of its activities in accordance with corporate policy. This environmental statement summarises the environmental performance of the Commission for Luxembourg and the measures taken to mitigate the impact of our activities in 2021.

In 2021, special working arrangements for the management of the COVID-19 pandemic continued to apply, with a significant number of staff teleworking. This led to a decrease in waste generation and transport as well as in paper and water consumption. Energy does not show a reduction in consumption, due to health-related measures such as increased ventilation with 100% fresh air.

In 2021, OIL completed the EMAS scope in Luxembourg with the registration of the Fischer building. Also, early 2021, sorting islands were installed in all buildings in Luxembourg and individual sorting bins were withdrawn, which improved waste sorting. In the field of mobility, in July 2021, a new scheme offering staff in Luxembourg a free subscription to the Vel'OH! bike network of the City of Luxembourg was put in place, with 271 colleagues subscribing during the first six months.

For the first time, the environmental impact for teleworking is included in this report. It is an estimate, based on a methodology developed at corporate level, that takes into account energy consumption and CO_2 emissions.

2021 was a transition year towards new working patterns, during which OIL contributed to the drafting of the Communication on the Greening of the Commission and the related action plan. OIL has engaged to actively contribute to the implementation of those actions to achieve the targets set by the Communication.

Signed

Thomas KIRCHNER
Director (acting)
Office for Infrastructure and logistics Luxembourg
(OIL)

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ANNEX B: Luxembourg – Administrative activities

Luxembourg is the European Commission's second largest site, with 5 688 staff in 2021, an increase of 8.5% over 2020[1]. 12 Commission's Directorates Generals (DG) are present with more than 50 staff members. In total, in 2021, 19 DG are hosted in 18 buildings[2]. The vast majority of buildings are located in Luxembourg City.

The activities are mainly of administrative nature, with some support and logistics services (like catering, offices supplies, childcare facilities, etc.). Luxembourg also hosts the main data centres of the Commission and a radiation protection laboratory.

The Office for Infrastructure and Logistics in Luxembourg (OIL) manages the Commission's buildings and logistics in Luxembourg and coordinates implementation of the Commission's Eco Management and Audit System (EMAS) for the site.

B1 Overview of core indicators at Luxembourg since 2011

Table B1: Historical data, performance and targets of core indicators used in Commission level reporting

Physical indicators:	**Historic data values, all buildings since 2015**						**Performance since:**		**Future targets**		**Future targets**	
(Number, desciption and unit)	2011 (1)	2014	2018	2019	2020	2021	2011	2014	2014-23	2014-30	2023	2030
	EMAS	EMAS	Total	Total	Total	Total	Δ %	Δ %	Δ % (2)	Δ % (2)	value(2)	value (2)
1a) Energy bldgs (MWh/p)	8,35	10,74	11,74	12,24	11,87	10,03	**20,2**	**-6,6**	-30,0	-55,0	12,2	7,84
1a) Energy bldgs (KWh/m^2)	229	393	326	346	343	314	**37,5**	**-20,0**	-15,0	-45,0	334	216
1c) Non ren. energy use (bldgs) %		27,8	50,6	54,3	55,2	54,0		**94,1**	-8,0	-60,0	25,6	11,1
1d) Water (m^3/p)	12,26	14,48	13,63	12,42	7,92	5,59	**-54,4**	**-61,4**	25,0	0,0	18,1	14,5
1d) Water (L/m^2)	352	327	378	351	229	175	**-50,2**	**-46,3**	60,0	20,0	522	392
1e) Office paper (Tonnes/p)	0,034	0,024	0,011	0,009	0,004	0,002	**-89,5**	**-91,8**	-50,0	-55,0	0,012	0,011
1e) Office paper (Sheets/p/day)	32	24	11	10	4	2	**-88,9**	**-92,0**	-50,0	-55,0	12,0	10,8
2a) CO_2 buildings (Tonnes/p)	0,18	1,73	1,35	1,56	1,50	1,29		**-25,8**	-15,0	-75,0	1,47	0,43
2a) CO_2 buildings (kg/m^2)	5	39	37	44	43	40		3,1	0,0	-70,0	39,1	11,7
2c) CO_2 vehicles (g/km, manu.)	191	171	145	142	126	121	**-36,8**	**-29,4**	-20,0	-30,0	137	119,7
2c) CO_2 vehicles (g/km, actual)	240	260	251	247	275	246	2,7	**-5,4**				
3a) Non haz. waste (Tonnes/p)	0,245	0,103	0,136	0,131	0,099	0,059	**-75,9**	**-42,4**	-35,0	-40,0	0,067	0,062
3b) Hazardous waste (Tonnes/p)	0,0017	0,0015	0,0046	0,0348	0,0194	0,0232	1.233,7	1.495,7				
3c) Unseparated waste (%)	61,8	55,3	43,0	35,8	43,8	31,3	**-49,4**	**-43,5**	-30,0	-40,0	38,7	33,2
3c) Unseparated waste (T/p)	0,0	0,0	0,1	0,1	0,1	0,0			-50,0	-65,0	0,011	0,007
Economic indicators (Eur/p)												
Energy consumption (bldgs)		765	336	431	408	310		-59,5				
Water consumption		61,54	57,93	52,79	33,68	23,77		-61,4				
Non haz. waste disposal		35,07	52,86	49,84	36,93	18,48		-47,3				

Note: (1) Earliest reported data, for a reduced scope of buildings (and not directly comparable with current scope)
(2) Draft figures from the Global Anual Action Plan 2022

[1] This increase is mainly due to an increase of in-house and assimilated service providers in 2021, further to a reclassification exercise of service providers and some organisational changes for entering those providers in the Commission systems.

[2] Including Publications Office and the Maison de l'Europe, which was rented until 30 June 2021.

Table B1a: Historic data values for EMAS buildings only

	2011 EMAS	2014 EMAS	2015 EMAS	2016 EMAS	2017 EMAS	2018 EMAS	2019 EMAS	2020 EMAS	2021 EMAS
1a) Energy bldgs (MWh/p)	8,35	10,74	14,40	11,77	11,32	11,49	12,08	12,13	10,49
1a) Energy bldgs (KWh/m^2)	229	393	342	328	315	330	343	348	331
1c) Non ren. energy use (bldgs) %	0,00	27,83	64,6	53,2	54,8	50,6	52,3	54,0	53,4
1d) Water (m^3/p)	12,26	14,48	11,32	13,71	13,48	12,60	11,79	8,34	5,41
1d) Water (L/m^2)	352	327	269	382	375	362	335	239	171
2a) CO_2 buildings (Tonnes/p)	0,18	1,73	0,90	1,22	1,20	1,19	1,34	1,37	1,19
2a) CO_2 buildings (kg/m^2)	5	39	21	34	33	34	38	39	38
3a) Non haz. waste (Tonnes/p)	0,25	0,10	0,20	0,10	0,12	0,12	0,13	0,095	0,056
3b) Hazardous waste (Tonnes/p)	0,002	0,001	0,001	0,002	0,003	0,004	0,038	0,021	0,025
3c) Unseparated waste (%)	61,8	55,3	26,2	47,0	49,8	44,9	34,8	40,944	31,36

Until 2014, indicators were reported only for buildings included in the EMAS registration. Since 2015, indicators include all Commission buildings in Luxembourg[3]. Figures prior to 2015 are therefore not really comparable with the ones of the 2015 – 2021 period.

The evolution of indicators for all buildings since 2011 is shown in table B1, for EMAS registered buildings in table B1a.

Reporting and the COVID pandemic: Reporting for 2021 retains the same approach for continuity, as previous years, and is therefore based on site activity and total staff numbers. The data will therefore reflect the impact of a very significant staff absence on facilities operation.

The EMAS Corporate Coordination Team has estimated the **Environmental Impact of teleworking** focussing particularly on energy consumption and CO2 emissions **(**with high level assumptions for paper, water consumption and waste disposal). These impacts are referenced separately, next to regularly reported data for the buildings occupied in the Luxembourg site.

The pandemic situation due to the COVID19 virus has had an impact in the daily operations of the European Commission. This is reflected its environmental performance.

In 2021, most of the indicators continue to exhibit a downwards trend, which must be still analysed in the light of the COVID-19 pandemic. Even if there was a steady return to normality, the year was marked by long periods of teleworking and low presence in the office. The level of missions for example did not resume to pre-covid time as the use of videoconference has (perhaps permanently) changed the working methods. Paper and water consumption as well as transport showed an important reduction. Energy consumption did not significantly reduce despite teleworking because of increased ventilation in the buildings made necessary for health reasons. The technical sections in this report contain detailed information on these results.

The evolution of the key parameters of the EMAS system in Luxembourg is shown below.

Table B2: EMAS baseline parameters

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Population: staff in EMAS perimeter	759	1 315	1 422	1 492	2 378	3 912	4 059	4 277	4 355	4 494	4 939
Population: total staff	3 999	3 997	4 048	4 043	4 667	4 653	4 786	5 016	5 138	5 240	5 688
No. buildings for EMAS registration	2	3	4	6	7	10	11	14	14	15	15
Total no. operational buildings	13	14	14	14	17	19	19	18	18	18	18
Useful surface area in EMAS perimete	27 710	53 808	64 703	66 161	100 221	140 479	145 697	148 847	153 172	156 681	156 681
Useful surface area for all buildings, (r	187 912	198 807	198 807	198 807	223 997	241 023	241 023	180 923	181 623	181 606	181 606

Around 86% of the staff is hosted in EMAS registered buildings.

EMAS scope is now complete for Luxembourg until new buildings enter Commission's real estate portfolio (new building for OP in 2023 and JMO2 starting from 2024).

3 Reporting yearly only for buildings in the EMAS scope can make it difficult to analyse performance trends as the building(s) added in a given year can be very different from those already within the scope (for example data centres). In 2014, the year used to establish baseline for 2020 targets, reporting did however include data centres, which explains the large rise in energy consumption compared to 2011.

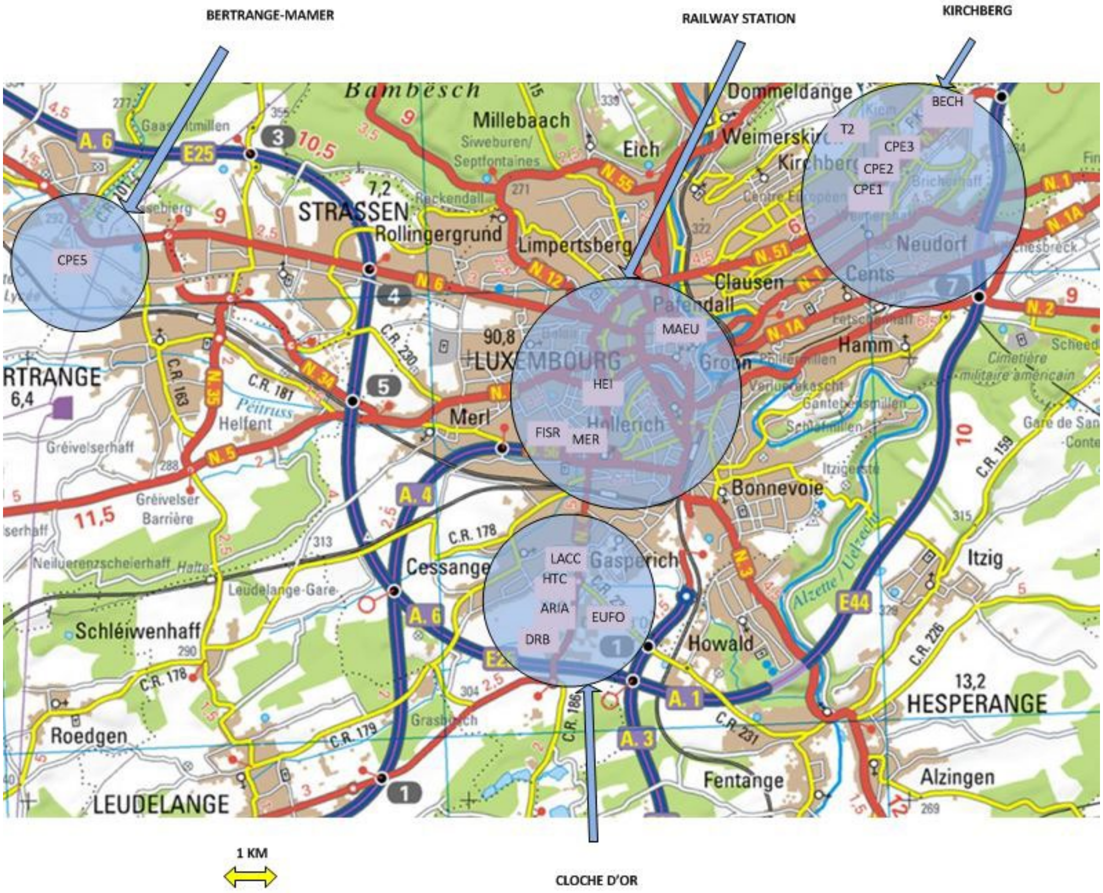
B2 Luxembourg activities, context and key stakeholders, environmental aspects

B2.1 Activities

Most of the Commission's activities in Luxembourg are administrative and are supported by canteens, restaurants, cafeterias, archives, a vehicle fleet, medical services, a day nursery and study centre. The Publications Office manages its own printshops and DG ENER a radiation protection laboratory.

Luxembourg hosts most of the Commission data and telecom centres, in Windhof, Hitec and Betzdorf. Figure B1 shows the location of Commission buildings in Luxembourg.

Figure B1: Location of EMAS and other buildings in Luxembourg



Most buildings are located in the Kirchberg area, in the centre of the City of Luxembourg or to the South of the city at Cloche d'Or. However, CPE 5 is 15 km West of Luxembourg in Bertrange-Mamer (close to the European school II) while Windhof is close to the Belgian border. The Hitec (HTC) data centre is located in the Cloche d'Or area and is situated in the basement of the Hitec office building. The lease contract for HTC data centre will end at the end of 2022. Betzdorf data centre is located North-East of Luxembourg City. On 30 June 2021, the lease of the Maison de l'Europe was terminated, with the Commission'representation in Luxembourg moving to the KAD building of the European Parliament.

Commission services in the Cloche d'Or and Kirchberg area serve typical administrative functions. The Euroforum (EUFO) building also accommodates a radiation protection laboratory (DG ENER). CPEs cater entirely to children of staff with inter-institutional crèches, after school and study centres. The renovated Fischer building in central station area hosts the Commission's training and learning centres in Luxembourg.

Other than the *Foyer Européen*, which is owned by the European Union, and the EUFO, CPE3 and CPE5 buildings, for which the Commission has long-term leases with purchase options, all Commission buildings are leased. The buildings and the year when they were or are scheduled to be EMAS registered are listed in the table B3 below.

Table B3: Commission buildings in Luxembourg

EMAS Surface
Non-EMAS Surface

Number	Building	EMAS year	Surface occupied for activities (m2)	% of EMAS surfac of total surface	Staff **	Year of construction	Year of acquisition or leasing	Occupation type
1	HELIOS (ex -Drosbach)	2012	27.124	14,94	949	2003	B: 2006; A: 2009; D: 2010	Rental
2	HITEC (office)	2012	4.194	2,31	95	1996	2005	Rental
3	EUFO	2013	26.098	14,37	579	1995 and 2003	1995, 2003	Emphyteosis with purchase option
4	CPE 5	2014	10.895	6,00	70	2011	2011	Emphyteosis with purchase option
5	HITEC (data centre)	2015	252	0,14	0	2005-2007	2006	Rental
6	WINDHOF (data centre)	2015	1.206	0,66	6	2005-2007	2007, 2009	Rental
7	BECH	2016	34.060	18,75	892	1996 and 1999 F4	1998, 2005	Rental
8	ARIANE	2017	13.624	7,50	557	1999	2015	Rental
9	LACCOLITH	2017	11.292	6,22	419	1999	2015	Rental
10	T2	2017	15.342	8,45	472	2016	2016	Rental
11	CPE 3	2018	5.218	2,87	58	1996	1996, 2009	Rental with purchase option
12	FOYER (HEI)	2019	1.192	0,66	5	1920	2009	Owner
13	WINDHOF - Telecom Centre	2019	274	0,15	0	2005-2007	2015	Rental
14	BETZDORF (data centre)	2019	2.384	1,31	0	2010-2012	2016	Rental
15	FISCHER	2021	3.526	1,94	13	2004	2005	Rental
16	CPE 1 & 2	Will be replaced	4.370	2,41	46	avant 1984	1984	Rental
17	MERCIER	Will be replaced	19.626	10,81	691	1970, 1984	I: 1973, 1998; II: 1985	Rental
18	Maison de l'Europe (MAEU)	Abandonned on 30 June 2021	929	0,51	12	before 1974	2005	Rental
TOTAL			**181.606**	**100,00**	**4.864**			
EMAS TOTAL			**156.681**	**86,28%**	**4.115**			

* Most of the surfaces are above ground. Underground parkings are excluded. For data and telecom centres and for DRB storage, underground surface is also considered

** Building occupants on 30/11/2021 based on COMREF database, which is different from the data source used to establish the total staff occupied in Luxembourg

The main real estate project for the Commission in Luxembourg is the construction of a new seat, the JMO2, in the Kirchberg area. The initial delivery of this building is scheduled in two phases, end 2024 and summer 2025.

JMO2 will replace most of the rented office buildings: DRB, HTC, BECH, ARIANE, LACC and T2.

The Mercier building currently hosting the Publications office will be abandoned in 2023. The CPE 1 and 2 buildings dating from the 1980s, are coming to their life end. For these reasons, these buildings will not be included in the EMAS scope. The contract for “House of Europe”, ended on 30 June 2021. It remains in the EMAS scope for 2021.

B2.2 Context and Key Stakeholders

Following the EMAS regulations, OIL has carried out for the site of Luxembourg:

- A context analysis, with internal and external elements influencing the environment
- A stakeholders' analysis, with the internal and external entities, bodies, persons with whom the EC, and OIL in particular, has a link
- An inventory of the EC activities and their environmental impact, including a method to define which activities have the most significant aspects.

This analysis helps the EC in Luxembourg to define its objectives and actions concerning environmental issues. It has been carried out and is updated everytime it is necessary, at least once a year. This analysis defines the two main issues, more specifically detailed below: mobility and real estate.

Commission has prepared a new communication and an action plan on greening the Commission, which covers buildings and office space as well as behaviours, such as mobility. The EMAS scheme will play a role in its implementation.

Mobility

The Commission makes considerable efforts in negotiations with local stakeholders, both public and private, in order to improve the mobility of its staff (see B4 below). Since 1st of March 2020, public transport is free in Luxembourg. Starting from that date, the Commission put in place a scheme to reimburse the costs related to cross-border public transport.

Also, in 2021, based on an interinstitutional convention with the City of Luxembourg, OIL put in place a scheme offering Commission's staff a free subscription to the Vel'OH! bike network.

Real estate

The Luxembourg state's involvement in some Commission real estate projects influences where Commission sites are located. For example, when the Commission decided to leave the JMO, the authorities put the T2 office building and Betzdorf Data centres at its disposal, free of charge, for several years.

The Luxembourg state is also responsible as "Maître d'ouvrage" for the construction of the JMO2 building. The Luxembourg Public Building Administration and the Commission are in constant contact to implement this project ensuring that local legislation (for example concerning the number of parking places), the EU internal rules (manual of accommodation conditions, Manual of "Immeuble Type", etc.) and environmental considerations are addressed.

The Commission rents space in some buildings (Drosbach, Laccolith, Bech) that have other occupants. This can complicate the management of activities with an environmental impact such as the energy consumption, the waste sorting, the data collection.

An additional expectation since 2019 is to take into account recommendations in the EMAS Sectoral Reference Document for Public Administrations. The document was analysed, presented and discussed at successive EMAS site coordinators' workshops in 2019 and 2020. We consider that existing reporting at site level largely takes into account feasible recommendations.

B2.3 Environmental impact of Luxembourg activities

OIL reviews the site's environmental aspect analysis annually and updates its action plan as new buildings enter into the EMAS scope. A summary of the main aspects and measures that were undertaken or ongoing in 2021 is presented in Table B4 in section B12

In the mid-term, the flagship project for OIL is the construction of the new JMO2 building. The ambition for the future main seat of the Commission in Luxembourg is to obtain the BREEAM Excellent label. OIL team strives to reach this objective.

Other real estate projects also intend to have buildings with a higher environmental performance than the current ones: the relocation of the Publications Office, in a new building that will replace the Mercier building or the construction of a new Child Care facility in Kirchberg, accommodating the garderie and providing synergies with the study centre. .

B3 More efficient use of natural resources

B3.1 Energy consumption

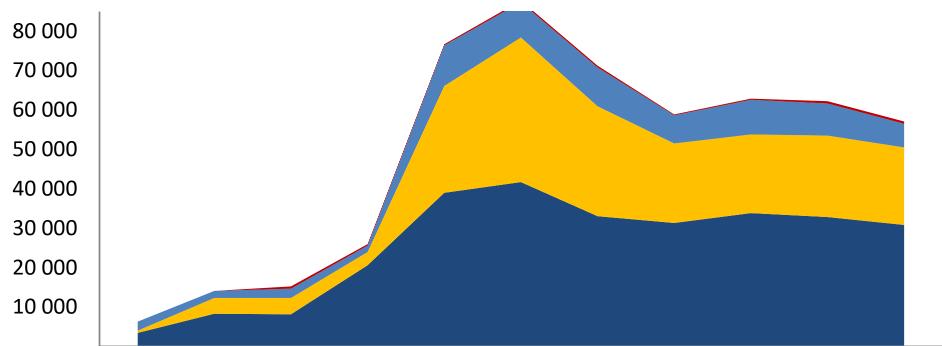
Apart from the pandemic crisis that continued in 2021, also climatic conditions influence buildings energy consumption data and should be taken into account. Winter season in 2021 saw fewer heating degree days as in 2020, with more heating required, and there were slightly more cooling degree days in 2021 as in 2020 (2518 compared to 2069).

B3.1.1 Energy consumptions in Buildings

The evolution of total annual energy consumption is presented in Figure B3. Up to 2015, it was influenced by the number of buildings incorporated in the EMAS perimeter. The peak in 2016 is mainly due to the rental of three new office buildings to replace the JMO end of 2015 and a new data centre in 2016.

Energy consumption in 2021 decreased marginally compared to the situation in 2020. The overall situation remained the same – staff working mostly from home, but buildings were open and functional. In addition, the impact of 100% fresh air ventilation due to health reasons increased further the energy consumption even while the staff worked from home.

Figure B3: Annual buildings energy consumption (MWh)
(EMAS registered buildings to 2014, all buildings from 2015 (indicator 1a)

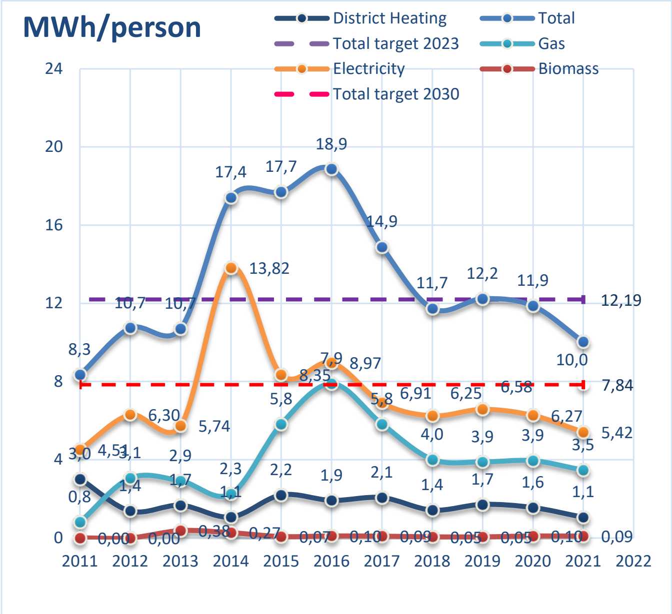


	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total energy buildings (MWh)	6 335	14 124	15 230	25 988	82 609	87 795	71 232	58 901	62 896	62 210	57 067
Biomass (MWh)	0	0	539	404,1	316,7	469,0	429,1	266,8	267,7	519	528
District heating (MWh)	2 292	1 815	2 375	1 603	10 244	8 929	9 867	7 140	8 822	8.148,3	6.007,2
Supplied Gas (MWh)	618	4 020	4 149	3 361	27 161	36 670	27 875	20 150	19 996	20 690	19 713
Supplied Electricity (MWh)	3 425	8 289	8 167	20 620	38 958	41 727	33 058	31 343	33 804	32 847	30 813

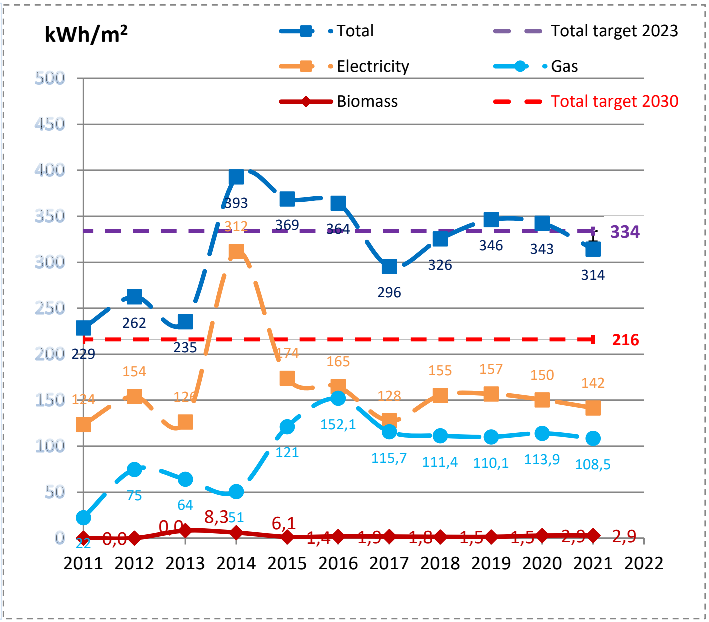
Data for biomass were corrected for 2019 and 2020. Data for district heating show a reduction in 2021 because a new system for cold production powered by electricity rather than by district heating was installed in the Mercier building, hosting the Publications Office. District heating data were also corrected for 2020 and 2021 to reflect that in Mercier, cold was produced with district heating.

Figures B4 and B5: Evolution of total annual energy consumption (per capita and per square metre)

B4



B5



Diesel consumption is not included as it is negligible.

Per capita consumption has decreased slightly and per m² consumption is rather stable, both remaining below the 2023 targets.

The peak in 2014 in both graphs is due to the inclusion of data centres in the scope. For data centres, the figures of electricity consumption include only electricity used by the Commission's IT equipment installed in specific rooms. The energy used to cool the relevant rooms/space is not included as the owners of the data centres do not communicate such data.

Actions prioritising the reduction of energy consumption (indicator 1a) are included in the annual action plan (see table B4). Most actions in this field focus on technical improvements for heating and cooling systems where possible.

B3.1.2 Vehicles

At the end of 2021, the Luxembourg site had a fleet of 31 vehicles (including DG ENER vehicles). Two Publications Office vehicles were included in the fleet in 2018.

The vehicles are used to transport people and goods within Luxembourg City, for longer missions mainly between to Brussels or Strasbourg, but also throughout EU countries. OIL made 28 missions in 2021 for DG ENER transporting equipment to nuclear premises across Europe.

OIL's missions mainly cover longer distances and relatively few kilometres are accumulated in Luxembourg.

Table B5 Summary vehicle energy consumption (indicator 1b)

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total (MWh/yr)	535	560	592	698	645	703	648	298	338
MWh/person	0,38	0,38	0,13	0,15	0,13	0,14	0,13	0,06	0,06
Diesel used (m^3)	48,5	50,5	53,3	62,8	58,6	61,3	54,0	24,5	23,7
Petrol used (m^3)	0,7	1,0	1,3	1,5	0,7	3,8	7,9	4,1	9,2

In 2021, the per capita consumption of Commission service vehicles remained the same as in 2020 (0,06 MWh per person) due to the pandemic situation. There was a moderate increase in missions. However, the total kilometres travelled by cars remained low compared to pre-covid time – 408 831 km (781 919 km in 2019).

In May 2019, the Commission signed a service level agreement with the European Parliament to enable Commission staff to use the Parliament's shuttle between Luxembourg and Brussel. The service is also open to colleagues working in Brussels. Staff is satisfied with the service. During the pandemic crisis, the service was put on hold in 2021.

B3.1.3 Renewable and non-renewable energy use in buildings

Table B6: Renewable and non-renewable energy use in the buildings (indicator 1c)

Source of renewable and non renewable energy	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Electricity from renewables (%)	100	100	100	89	97	95	93	90	84	83	83
Electricity from renewables (MWh)	3 425	8 289	8 167	18 352	37 945	39 698	30 758	28 072	28 475	27 330	25 714
Site biomass (% renewable)			100	100	100	100	100	100	100	100	100
Site biomass (MWh)			539	404	317	469	429	267	268	519	528
Renewables (MWh)	**3 425**	**8 289**	**8 706**	**18 756**	**38 262**	**40 167**	**31 187**	**29 074**	**28 743**	**27 848**	**26 242**
Renewables (% of total energy)	**54**	**59**	**57**	**72**	**46**	**46**	**44**	**49**	**46**	**45**	**46**
Electricity from non-renewables (%)				11	3	5	7	10	16	17	17
Electricity from non-renewables (MWh)				2 268	1 013	2 029	2 300	3 271	5 329	5 517	5 099
Mains supplied gas (% non renewable)	100	100	100	100	100	100	100	100	100	100	100
Mains supplied gas (MWh)	618	4 020	4 149	3 361	27 161	36 670	27 875	20 150	19 996	20 690	19 713
District heating and cooling (% non renewable)	100	100	100	100	100	100	100	90	100	100	100
District heating and cooling (MWh)	2 292	1 815	2 375	1 603	10 244	8 929	9 867	6 404	8 822	8 148	6 007
Non renewables (MWh)		**5 835**	**6 524**	**7 232**	**44 347**	**47 629**	**40 045**	**29 827**	**34 153**	**34 362**	**30 825**
Non renewables (% of total energy)		**41**	**43**	**28**	**54**	**54**	**56**	**51**	**54**	**55**	**54**

Renewable electricity (indicator 1c) accounted for 83% of total supplied electricity in 2021. The Commission contracted for electricity from 100 % renewable sources since 2013. Data for electricity from renewables were corrected for 2019, 2020 and 2021 to reflect that all the electricity used by the owner of the Drosbach building for the cold production is non-renewable. The situation will improve in 2022, as the owner shifted to a green electricity contract. The electricity supply for all data and telecom centres – directly purchased by the property owners from the energy companies – comes also from 100 % renewable sources. Biomass is used in the wood-fuelled boiler at CPE5. The urban heating system in CPE 1&2 also partly works with biomass energy.

The sudden increase in renewable energies from 2014 to 2015 is a result of including the data centres (with 100% renewable electricity) into the EMAS scope. However, in 2015, OIL started reporting data on all the buildings, which explains the drop in the ratio.

The proportion of renewable energy should increase in the future, as district heating and cooling systems will increasingly be supplied by renewable energy sources.

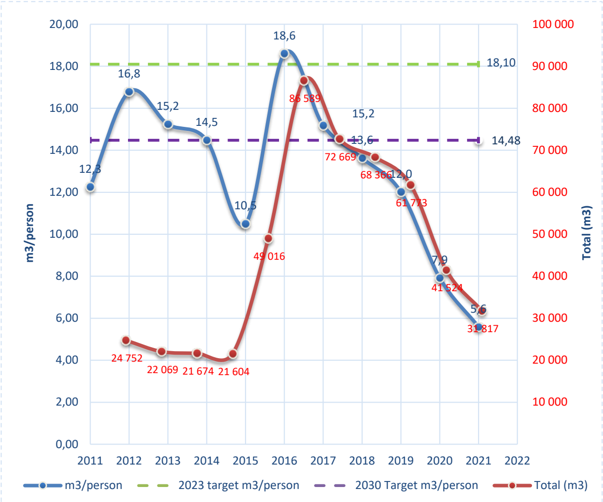
B3.2 Water consumption

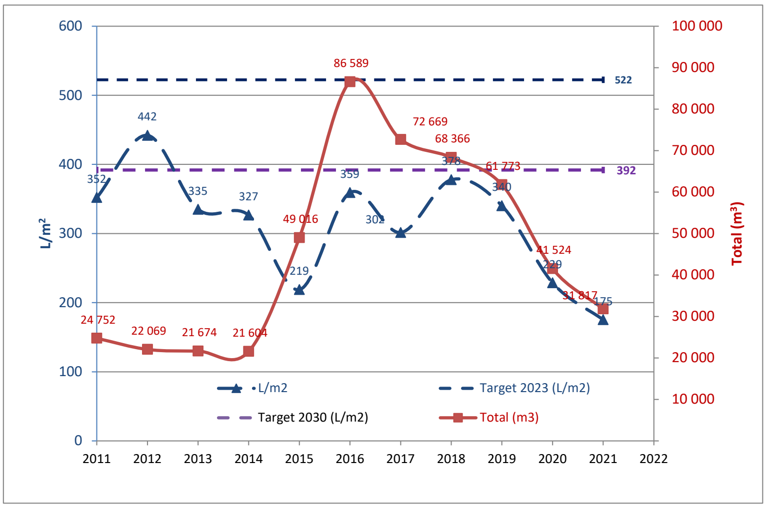
The figures presented in this section are for Commission buildings only and do not include domestic water consumption due to homeworking under the COVID pandemic, and which is estimated to be 30,274 m³/yr or 47 % of the water consumption in Luxembourg Commission's buildings in 2019 (last year of full presence in the office) and almost 100% of that consumption for 2021[4].

[4] Historically reported for total Commission staff.

Figures B6 and B7: Evolution of total annual water consumption for buildings (indicator 1d)

Figure B6 Figure B7





All buildings are considered for the first time in 2015 (only EMAS buildings until then), which explains the increase between 2014 and 2015. In 2015, the staff previously hosted in the JMO building had to move to three new rented buildings with a considerable increase in consumption in 2016.

Data for 2019 and 2020 were corrected to show the actual consumption. Data for 2021 include an estimation based on 2020 data for the consumption of the BECH and the Lacollith buildings, as the actual consumption is not yet available.

The total water consumption shown by the red line of figures B6 and B7 show a stable decrease until 2020, with a more important decrease in the last 2 years, marked by the high increase of home working and weak presences of staff in the office buildings. Both indicators are well below 2023 targets.

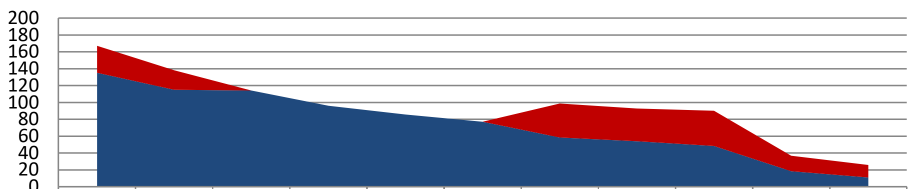
B3.3 Office and printshop paper

The figures presented in this section are for Commission buildings only and do not include domestic printing due to homeworking under the COVID pandemic, and which is to be estimated to be 0.5 sheets/person/day or 25 % of that for Commission buildings[4].

The evolution of office paper in Luxembourg and per capita breakdown is presented below.

Figures B8 and B9: Evolution of paper consumption (totals, and per capita)

B8



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
A4 sheets equivalent x 1 Mil	27,06	23,06	22,85	20,52	18,32	16,36	12,42	11,53	10,34	3,95	2,30
Total paper consumption (tonnes)	167	138	114	96	86	77	99	93	90	37	26
Printshop paper (tonnes)	32,0	23,1	0,0	0,0	0,0	0,0	40,31	38,78	41,63	18,19	14,61
Office paper (tonnes)	135	115	114	96	86	77	58,34	54,01	48,44	18,53	11,07

B9

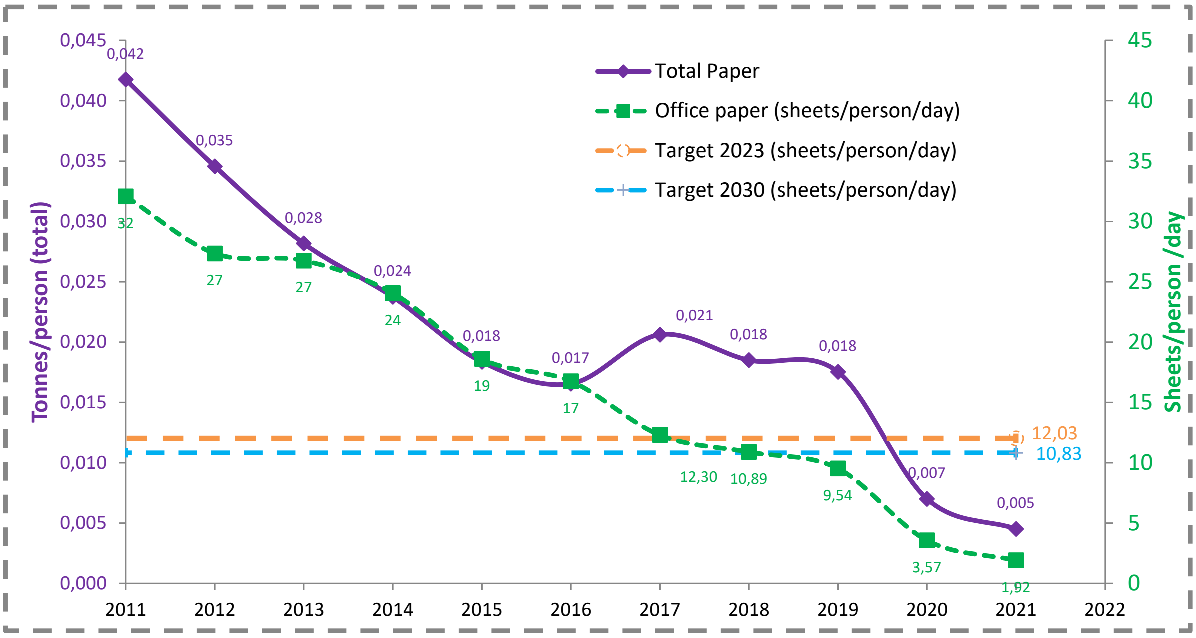


Figure B8 shows how office paper use has reduced over time. The Commission started to report separately on paper used in the printshops of OIL and OP starting from 2017. Paper for OP is reported on the basis of the real number of copies registered on the printers.

In 2021, the office paper consumption was around 2,3 million equivalent A4 pages for office paper, which is still considerably less than in 2019 due to extensive teleworking. The number of pages per person per day shown in figure B9 has decreased from 10 to 1,92. The A4 paper density has been decreased from 80 to 75g/m² since 2014 contributing to the reduction of the global tonnage. OIL is considering the possibility of further reducing the paper density.

Paper used by the Publications Office print shop is considered for the total paper consumption in tons but not for the number of office sheets.

Since 2019, OP is managing the two printshops in Luxembourg. Their publications are directed to the public, therefore using a paper with a higher density and weight than the normal office paper. In 2021, the paper consumption continued to decrease, with a significant drop in orders for printing from Commission’s DGs and other European institutions and bodies, due to teleworking and cancellation of on-site meetings and conferences. Also, OP has decided to reduce its in-house printing activities, with a continued reduction of the printing capacity.

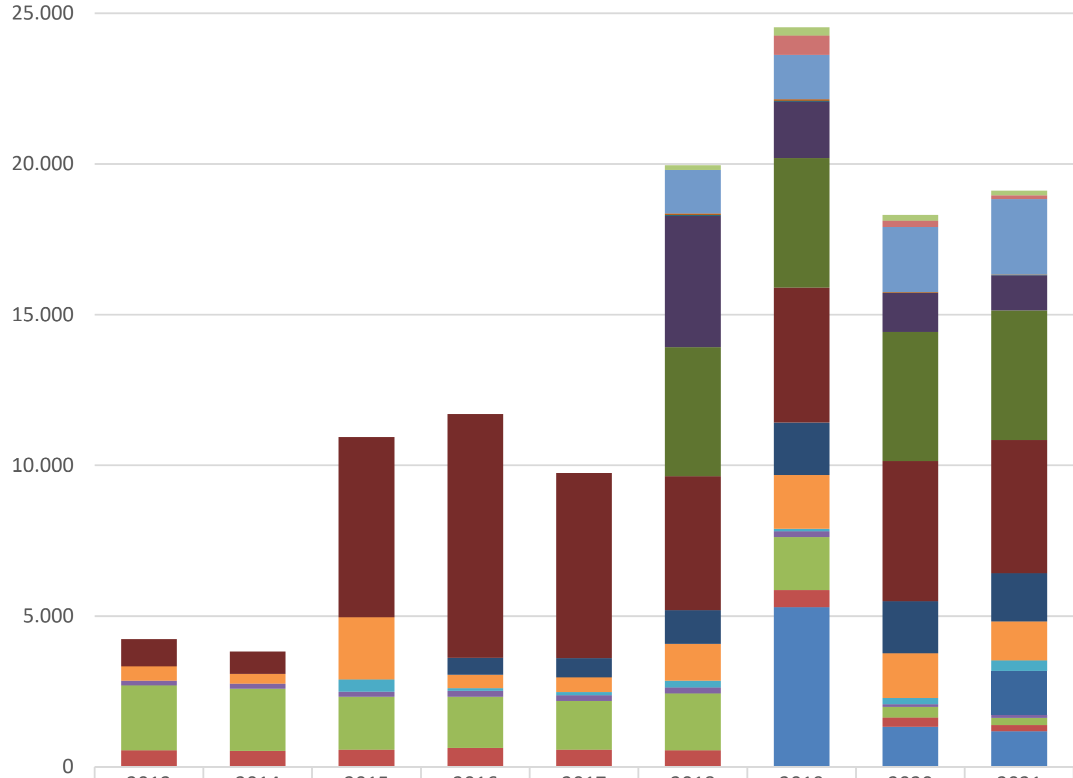
B4 Reducing air emissions and carbon footprint

B4.1 Overall Carbon footprint

Figure B10 shows the contribution of components of the Commission’s carbon measures as equivalent tonnes of CO_2 emissions for Luxembourg[5]. Starting from this year, teleworking emissions are included as a component of the carbon footprint. Per capita emissions for these categories are contained in Table B12.2 in section B12.

[5] Air travel emissions are calculated using RFI = 2; Conversion factor used to calculate equivalent emissions for fuel consumption include combustion (scope 1) and small upstream component (scope 3)

Figure B10: Carbon footprint contributors for Luxembourg (Tonnes CO_2)



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	4.245	3.822	10.940	11.702	9.755	19.959	24.534	18.310	19.122
Own waste	0	0	0	0	0	158	276	191	163
Catering	0	0	0	0	0	0	642	213	132
Service contracts	0	0	0	0	0	1.441	1.464	2.160	2.494
Paper supply	0	0	0	0	0	54	48	19	11
Fixed assets - Commission vehicles	0	0	0	0	0	41	39	16	20
Fixed assets - IT	0	0	0	0	0	4.350	1.868	1.277	1.161
Fixed assets -buildlings	0	0	0	0	0	4.279	4.298	4.298	4.298
Buildings - fuel for heating	914	740	5.981	8.082	6.146	4.442	4.479	4.643	4.424
Buildings - electricity	0	0	0	564	639	1.118	1.729	1.727	1.601
Buildings - district heating/cooling	477	322	2.059	445	491	1.224	1.788	1.481	1.287
Buildings coolant losses	0	0	407	85	108	218	89	211	353
Teleworking emissions						0	0	0	1.457
Vehicle fleet fuel consumption	155	163	172	203	187	204	193	89	101
Missions air (RFI=2)	2.149	2.067	1.752	1.691	1.611	1.878	1.749	347	231
Missions excluding air	550	530	570	633	573	554	575	311	211
Experts' travel	0	0	0	0	0	0	0	0	0
Staff commuting	0	0	0	0	0	0	5.296	1.329	1.180

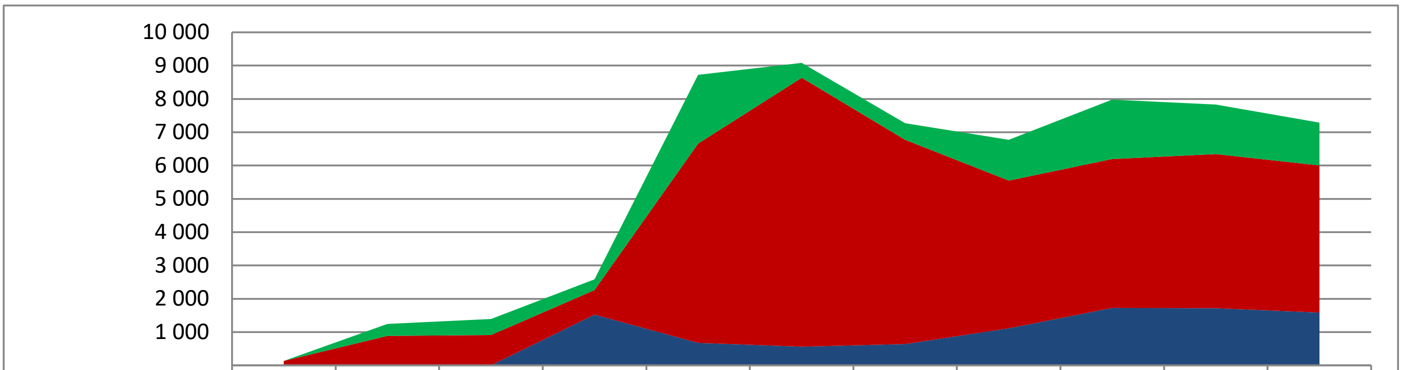
As can be seen, buildings are the main component of the carbon footprint. Until 2018 the buildings portfolio evolved each year (two Data centres incorporated in 2014, one in 2016, three new office buildings in 2015, JMO abandoned in 2017) and figures were difficult to compare but since then, the situation is more stable.

For CO_2 emissions due to commuting, OIL has made a high-level assumption based on statistics. The calculation will be refined once a detailed mobility study can be carried out. Since the 2019 environmental statement (data 2018), OIL collects data on indirect emissions (scope 3) linked to the construction of the buildings EC occupies, IT equipment, service contracts (guards, cleaning…) and food consumption Indirect emissions linked to buildings count for the biggest part. Buildings older than 30 years are not included in the calculation as their construction is considered amortised in terms of carbon footprint.

B4.1.1 Buildings' emissions from energy use (7311 in 2021, 38.2%)

Figures B11 to B13: CO_2 emissions from buildings heating, tonnes (B11) and tonnes/person (B12), kg/m² (B13), (indicator 2a)

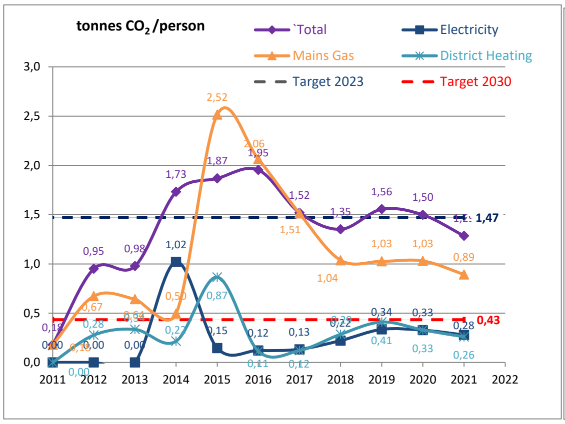
B11



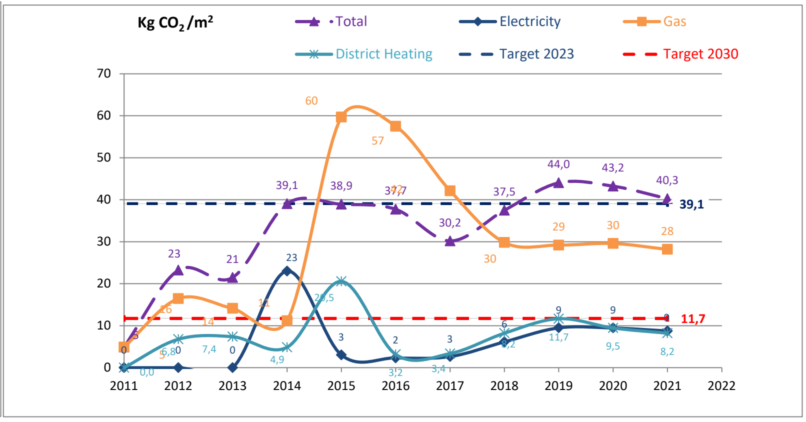
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	136	1 250	1 391	2 584	8 720	9 090	7 276	6 783	7 996	7 851	7 311
District Heating	0	365	477	322	2.059	445	491	1.224	1.788	1.481	1.287
Mains Gas	136	885	914	740	5 981	8 075	6 138	4 437	4 473	4 633	4 414
Electricity	0	0	0	1521,96	679,66	563,63	638,71	1.113	1.724	1.717	1.589

Figure B12 and B13: CO_2 emissions from buildings' energy consumption (tonnes/person, and kg/m²)

B12



B13



CO_2 emissions per capita sightly decreased in 2021. Electricity data was corrected for the period 2019, 2020 and 2021, to reflect that cold production in the Drosbach building is produced from non-renewable electricity (owner's contract). Estimates based on 2020 consumption data were used for the electricity contract in the Betzdorf Data Center and BECH building as well as for the gas consumption in the Laccolith building. The CO2 emission conversion factor for district heating takes into account its energy mix.

CO_2 emissions reductions are generally considered a consequence of actions targeting a reduction in energy consumption. In the future, more renewable energy sources might be used to provide district heating as well as to produce cold, therefore probably decreasing CO_2 emissions.

B4.1.2 Emissions from household energy use (1457 tonnes in 2021, 7.6%)

Homeworking emissions were estimated for the first time in 2021 in response to the change in behaviour under the COVID pandemic and comprise emissions from i) work and domestic appliances used while teleworking ii) energy consumption from space heating and cooling, and iii) from the embodied energy of IT fixed assets that the Commission financed (see fixed assets section below).

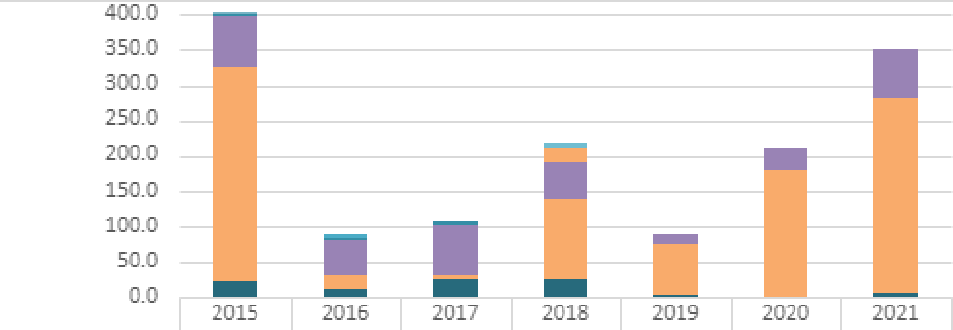
For Luxembourg, homeworking emissions were estimated at 1457 tCO2e.

The Commission seeks to influence staff behaviour in relation to teleworking consumption by appropriate communication.

B4.1.3 Fugitive emissions from Commission buildings (refrigerant/coolants) (353 tonnes in 2021, 1.8%)

The HVAC[6] installations containing Hydrofluorocarbons (HFCs) are managed by the building owners who, at the Commission's request, provide inspection results relating to refrigerants. Losses have been registered for five types of gases.

Figure B14: Total losses from gases



	2015	2016	2017	2018	2019	2020	2021
Total CO2eq	406.72	84.96	108.39	217.83	88.64	210.53	352.59
R407D		0.0	0.0	8.1	0.0	0.0	0.0
ISCEON89		0.0	0.0	19.0	0.0	0.0	0.0
R417A	0.0	4.5	0.0	0.0	0.0	0.0	0.0
R407C	9.48	4.05	4.21	0.00	0.00	0.00	0.00
R404A	69.58	50.04	72.50	51.22	12.61	31.52	69.24
R134A	304.72	18.88	5.47	113.53	73.15	179.01	278.07
R410A	22.94	12.00	26.21	25.92	2.88	0.00	5.28
R22	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Installations with other HFCs gases like R22 have all been decommissioned.

The increase in losses of R134A is due to a defective installation in the Ariane building, which has been replaced, to avoid further leaks.

B4.1.4 Staff travel missions by Commission vehicle (101 tonnes in 2021, 0.5%)

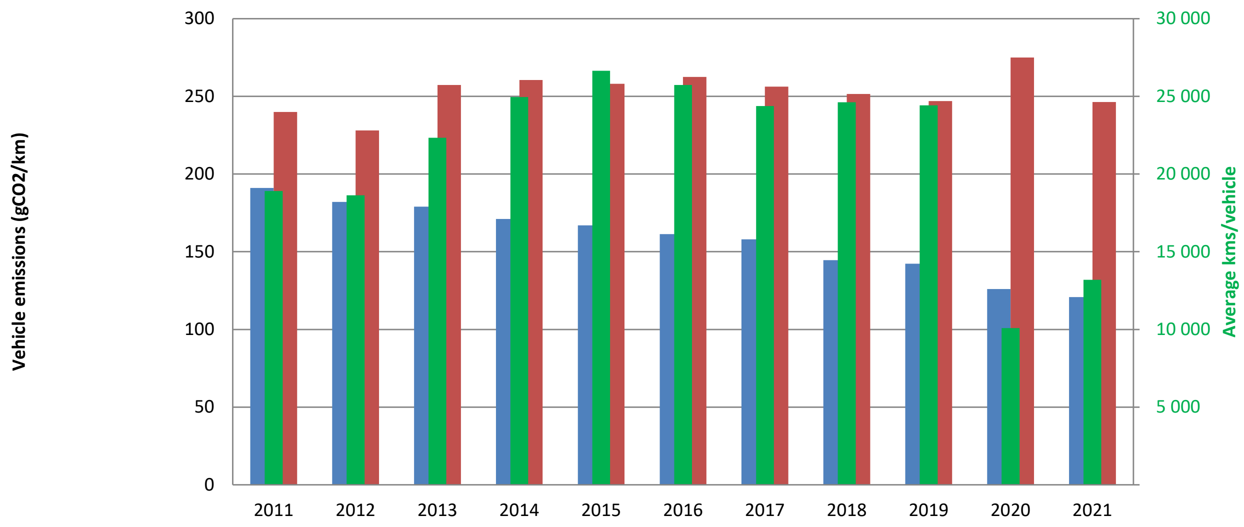
Table B8: Total emissions from the Luxembourg vehicle fleet

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Site vehicle CO2 emissions (tonnes)	155	163	172	203	187	204	193	89	101
tonnes CO2/person	0,038	0,040	0,037	0,044	0,039	0,041	0,038	0,017	0,018
i) from diesel (tonnes)	153	160	168	199	185	194	171	77	75
ii) from petrol	2,0	2,9	3,6	4,1	2,0	10,6	22,2	11,6	25,7

There is a considerable decrease in CO_2 indicators for Commission's vehicle fleet in 2021 compared to 2019 as fewer missions were performed in 2021, due to the COVID-19 pandemic, even if the number of missions increased slightly compared to 2020.

[6] HVAC : Heating Ventilation Air Conditioning

Figure B15 Emissions per km and distance travelled per vehicle



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
gCO2/km (manufacturer)	191	182	179	171	167	161	158	144,54	142,26	126,00	120,78
gCO2/km (actual)	240,0	228,0	257	260	258	263	256	251	247	275	246
km/vehicle	18 899	18 626	22 331	24 956	26 640	25 727	24 369	24 611	24 424	10 090	13 188

There has been a relatively steady downward trend in manufacturer emissions, reflecting the improved performance of newer vehicles (with the best performance in their class) replacing old ones.

The decision has been to gradually replace all Commision owned fleet cars by less polluting leased cars. The first two hybrid and first two electric cars were integrated into the fleet in 2018. The advantage of leasing fleet vehicles is that newer, less polluting, vehicles can regularly replace older cars. In 2021, there were 10 hybrid and 4 electric cars in the fleet (out of 31 vehicles in total at the end of the year). The average km/vehicle is calculated on the basis of the number of vehicles in use at the end of the year. When a vehicle is replaced by another one during the year, and both have the same plate number, it is counted as a single vehicle.

B4.1.5 Missions and local work-based travel (excluding Commission vehicle fleet) (442 tonnes in 2021, 2.3%)

Further to a service level agreement signed in May 2019, Commission staff can use the Parliament’s shuttle between Luxembourg and Brussel. The service is also open to colleagues working in Brussels. Staff is satisfied with the service. Due the pandemic crisis, the service put on hold in 2021.

B4.1.6 Commuting (1,180 tonnes in 2021, 6.2%)

Even if the pandemic did not end in 2021 and staff worked mostly from home, OIL continued with measures to promote more environmentally friendly transport means for staff. These measures included the following:

- Since 1st of March 2020, when all public transport became free of charge in Luxembourg, OIL put in place a scheme to partially reimburse the public transport ticket for staff members living abroad (Germany, France or Belgium). In 2021, there were 71 requests reimbursed in the sum of 10 259.48€ which is less than in 2020.
- Providing buildings with bicycle parking and showers to encourage staff to cycle to work.
- Providing and ensuring the regular maintenance of a fleet of service bikes to be used between Commission buildings. There were only 135 service bicycle journeys in 2021 as most of the staff still worked from home.
- Participating in campaigns to promote public transport use and soft mobility (for more details, please see below).

- The European Commission - together with the other European institutions in Luxembourg - offers free subscription to Vel'OH!, the self-service bike rental system of Luxembourg City.. In 2021, 595 staff members benefited from this measure.

B4.1.7 Fixed assets (5,459 tonnes in 2021, 28.5%)

Embodied emissions are associated with:

- Buildings, (4,298 tCO2e, 22.4%): these depend on building's design life and the type of construction.
- IT office equipment (1,161 tCO2e, 6.1%)

B4.1.8 Goods and services (2,637 tonnes in 2021,13.8 %)

Corresponding to:

- Service contracts (2,494 tCO2e, 13%), based on the value of contracts in cleaning, security and other services, which is increasing
- Paper purchase (11 tCO2e, 0.06 %), decreasing
- Catering (132 tCO2e, 0.7 %) – based on consumption of 7 food types, has decreased in 2021 but mainly because of the closure of cantines and cafeteriats, due to the pandemic situation.

B4.2 Total air emissions of other air pollutants (SO_2, NO_2, PM)

These are currently not evaluated.

B5 Improving waste management and sorting

From 2019 on, OIL has started to record waste generated by contractors not directly managed by the OIL waste manager. This mostly concerns oil and fat from degreasers, garden waste and kitchen waste from child-minding facilities. These data were not fully available for the years 2017-2018 and are therefore not included in the figures.

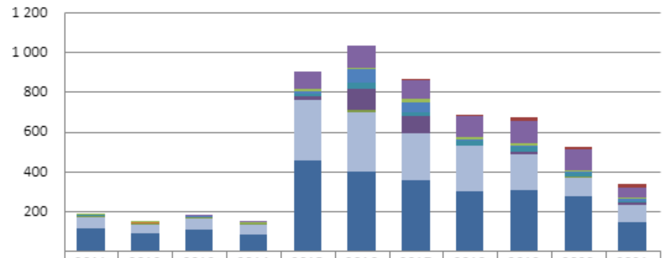
2021 was marked by the fact that the majority of staff still worked from home for almost the whole year. The buildings were however not completely closed, some services continued (for example catering), therefore the drop in waste quantities is not so remarkable. In addition, starting from 1st of January 2021, the contractor for residual and organic waste changed from Luxembourg City to Lamesch, which is now providing real statistics. Luxembourg City only provides estimation of weight based on the standard number of containers evacuated per week (except for BECH and EUFO buildings).

The figures presented in this section are for Commission buildings only and do not include domestic waste due to homeworking under the COVID pandemic. Such Domestic waste is estimated to 86 tonnes per year or 18% of combined hazardous and non-hazardous waste in Commission buildings[7].

[7] Historically reported for total Commission staff.

B5.1 Non-hazardous waste

Figure B16: Evolution of total non-hazardous waste in Luxembourg (tonnes)



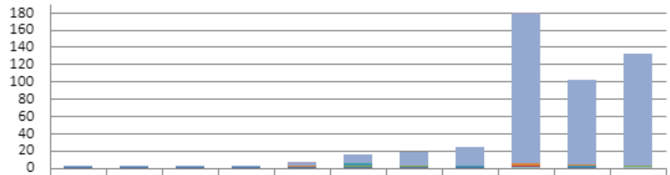
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	186.15	145.14	176.81	152.99	903.61	1,031.97	860.40	680.75	670.81	520.72	336.14
Total (tonnes/person)	0.245	0.110	0.124	0.103	0.194	0.222	0.180	0.136	0.131	0.099	0.059
Contractors (mainly garden waste 200201*)					0.00	0.00	4.28	4.10	17.78	12.37	18.88
Kitchen waste (200108)			1.15	9.52	91.72	112.40	93.66	102.17	109.66	104.20	51.05
Valorlux (150102)	1.19	1.03	1.98	2.49	7.14	6.71	13.68	11.45	11.21	5.13	3.73
Metal drink cans	0.10	0.22	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood (200138)	3.08	1.50	1.39	0.84	13.80	67.56	51.84	6.59	10.62	8.11	13.62
Storage Tins	1.08	0.81	0.62	0.43	0.07	1.50	0.00	0.00	0.00	0.00	0.00
Glass (150107)	4.08	3.60	3.36	3.19	10.77	27.32	21.23	25.47	24.28	17.45	2.19
Metals (170405)	0.72	0.38	0.51	0.41	19.77	109.25	84.02	0.43	10.07	1.98	14.05
Plastics (150102, 200139)	3.87	3.06	3.00	1.68	4.23	8.91	1.31	2.07	3.36	1.35	3.00
Paper and cardboard (200101)	56.15	48.53	57.60	48.63	300.60	298.48	232.72	225.86	179.85	97.58	83.20
Unsorted Waste (200301, 200307)	115.88	86.01	106.83	85.81	455.53	399.84	357.67	302.61	303.97	272.54	146.41

Since 2020, data support, plastic wrap, polystyrene and ceramic waste are classified as non-hazardous waste, in accordance with the applicable legislation.

The quantity of non-hazardous waste measured on a per capita basis has continued to decrease from 222 kg in 2016 to 59 kg in 2021. However, the low figure for 2021 must be analysed in the light of low presence in the office because of the pandemic.

B5.2 Hazardous Waste

Figure B17: Evolution of total hazardous waste in Luxembourg (tonnes)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	1.32	1.66	1.48	2.17	5.95	15.22	18.25	23.28	178.55	101.46	132.13
Total (tonnes/person)	0.002	0.001	0.001	0.001	0.001	0.003	0.004	0.005	0.035	0.019	0.023
Other Hazardous Waste (160107...)	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.06	0.00	0.00
Oil and fat (200125)	0.65	1.07	0.71	1.25	3.67	10.66	15.33	21.04	173.15	98.15	130.17
Electrical cables (200136)	0.00	0.00	0.00	0.14	0.69	0.00	0.00	0.02	3.06	1.62	0.10
Cartridges (080312)	0.00	0.00	0.00	0.00	0.38	1.69	1.31	0.72	0.20	0.15	0.18
Used containers (150110)	0.05	0.05	0.00	0.04	0.34	1.78	0.97	0.45	0.48	0.27	0.19
Used batteries (200133)	0.28	0.29	0.35	0.36	0.02	0.48	0.12	0.42	0.24	0.00	0.00
Medical waste (180103)	0.35	0.26	0.27	0.38	0.70	0.62	0.53	0.63	0.59	1.17	1.34
Contractors waste (misc. mainly 200125)					0.0	0.00	0.00	0.00	0.76	0.11	0.15

The total quantity increased slightly in 2021 from 19 kg per person to 23 kg per person but the quantities are still negligible.

B5.3 Waste sorting

Table B9: Percentage of waste sorted at the Commission in Luxembourg

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Percentage of waste unsorted	61,8	58,6	59,9	55,3	50,1	38,2	40,7	43,0	35,8	43,8	31,3
Percentage of waste sorted	38,2	41,4	40,1	44,7	49,9	61,8	59,3	57,0	64,2	56,2	68,7

There has been an increase in the waste recycling rate in 2021, thanks to various improvements. The main improvement measure for waste management was the replacement of private bins with sorting stations in all office buildings in Luxembourg.

A major improvement was also achieved in the field of data collection for waste. As mentioned above, with the new contractor for waste collection, organic and residual waste is systematically weighted before being collected, therefore the data is more accurate.

B6 Protecting biodiversity

The total use of land of the EC in Luxembourg, taking into account the part occupied by the EC in shared buildings, amounts around 138 000 m². 75% of this surface is sealed (buildings, parkings, roads ...) while 25% can be considered as nature-oriented (lawn, garden, green patios, etc.).

In the contract for maintenance of lawns, patios and outdoor plantings, the contractor is encouraged to use eco-friendly products. The current contractor is ISO-14001 certified.

The BREEAM Excellent label that OIL and the Luxembourg authorities want to reach for the new JMO2 building also includes criteria concerning the biodiversity.

In 2021, OIL prepared its biodiversity action plan by analysing the current situation and collecting necessary information. OIL also contacted local Luxembourgish environmental NGOs for discussion and see how we can monitor existing biodiversity in our buildings and what measures OIL can take to improve for example the rooftop of the Euroforum building (pilot building for the biodiversity).

B7 Green Public Procurement (GPP)

B7.1 Incorporating GPP into procurement contracts

OIL aims to integrate environmental criteria into its contracts. Out of 12 contracts signed in 2021, each worth more than 60 000 euros, all contracts included green criteria.

B7.2 Office supplies

Office supplies are delivered by a unique provider. In 2021, 55% of the products in the catalogue are considered green.

B8 Demonstrating legal compliance and emergency preparedness

The EMAS regulation requires EMAS certified organisations to provide evidence of legal compliance with environmental legislation, including permits. Such compliance is necessary for the release of the environmental permits from the Luxembourgish authorities for each building of the European Commission in Luxembourg.

In 2021, following the 2020 analysis of the operating and environmental permits in relation with the new Luxembourg law "Commodo-Incommodo" , OIL has prepared a mini audit procedure to improve the processes and the detection of the root cause of a deficiency.

B8.1 Management of the legal register and checking/establishing legal compliance

OIL used an external contractor to put in place a legal compliance system. Changes in legislation are communicated to relevant parties, which ensures a follow up through an action plan.

In 2021, OIL continued to participate in the "*Atelier Veille réglementaire*" under the supervision of DG HR. It is a way to mutualise the resource and to cross check the legal information. During the workshop, the external technical office in charge explains how to implement the legislation and which actions must be taken into account. The workshop takes place 4 times a year.

In March 2021, the management of OIL decided to set up a new OIL procedure on mini audit and legal compliance, to verify the application of the specific conditions included in the operating permits and to strengthen the dissemination of information within OIL concerning the regulatory requirements.

DG ENER undertakes its own regulatory monitoring.

B8.2 Prevention, risk management and emergency preparedness

In 2021, 18 fire drills were carried out on the Luxembourg site.

- 2 fire drills in each CPE building (1, 2, 3 and 5)
- 1 fire drill each in other buildings (ARIA, BECH, DRB, EUFO, FISR, HEI, HTC, LACC, MAEU, MER)

In 2021, OIL organised

- EPI: 18 theoretical training sessions and 18 practical training sessions, for a total of 187 staff members

- ECI: 6 theoretical training sessions and 6 practical training sessions for a total of 53 staff members.

- 1 awareness raising day about fire prevention in Drosbach, T2 and BECH, for a total of 40 staff members .

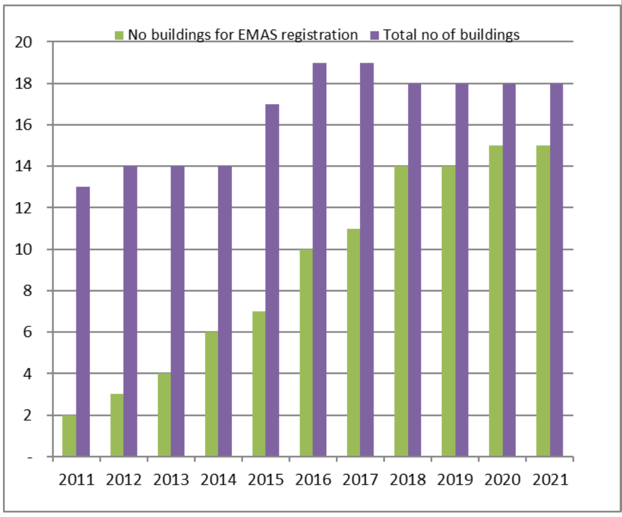
Due to the COVID-19 health crisis, no training for first aid took place in 2021.

B8.3 Integrating more buildings in the EMAS registration

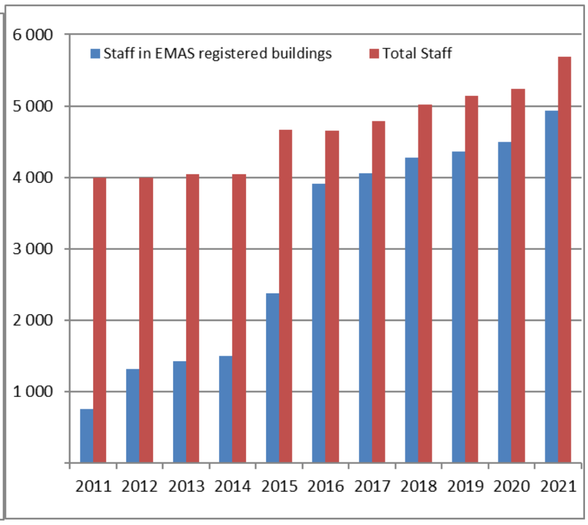
Figures B18 and B19 below represent respectively the evolution in the number of buildings in Luxembourg that will be included in the next update of the EMAS and the number of staff they accommodate.

Figure B18 and 19: Evolution of number of buildings in EMAS and the number of staff accommodated within

B18



B19



With the registration of the Fischer building, the buildings included in the EMAS registration account for 86 % of the surface area and 87% of staff in Luxembourg (see tables B2 and B3 above). The EMAS scope is now complete for Luxembourg until new buildings enter Commission’s real estate portfolio, i.e., the new building for OP in 2023 and JMO2 starting from 2025.

B8.4 Conformity with the EMAS system

OIL monitors the EMAS internal audit and verification audit findings in collaboration with DG HR and is responsible for addressing them (non-conformities, scopes for improvement, observations). In 2021, continued efforts were made in closing non-conformities. Only one non-conformity was detected in 2021.

B8.5 Compliance with environmental and other permits

The Luxembourg authorities issue environmental permits for each Commission building in Luxembourg.

In 2021, continuous improvements were made in the following topics:

- further review and tracking of permits and legal requirements, while monitoring adoption of new legislation, for a good legal monitoring.
- Completion of the file concerning the update of the operating permit for the DROSBACH Building Wing E, to be submitted by the owner to the Luxembourg authorities, in accordance with the Lease Agreement.
- Adaptation of the cooling system of the Fischer Building in progress, in order to make it compliant with the building permit.
- DG ENER has its own operating authorisation issued by the Ministry of Health for nuclear activities in EUROFORUM.

Based on these elements, we can conclude that the Luxembourg site is compliant with the applicable legislation and engages in regular dialogue with the relevant stakeholders (building owners and local authorities) on this subject.

B9 Communication and training

B9.1 Internal communication

In 2021, OIL launched a new web site dedicated to environmental issues – MyOIL EMAS site (https://myintracomm.ec.europa.eu/dg/OIL/emas/Pages/default.aspx). The topics covered are as follows:

- Green communications
- EMAS@OIL
- EMAS Building Performance
- Green Energy
- Waste
- Green Legislation

Two new topics, biodiversity and circular economy, will be added. They are directly related to the Green Deal and the new Communication on Greening of the Commission.

A summary of the main communication events and messages during 2021 is included in section B12.

B9.2 External communication and stakeholder management

The Commission has regular contacts with the Luxembourg authorities, particularly the Ministry of Mobility and Public Works, the Ministry of the Environment, Climate and Sustainable Development and Luxembourg City. In addition, there have been regular contacts with associations playing an important role in the field of waste management, energy efficiency, biodiversity and mobility.

In particular, the Commission is in contact with the SuperDreckskëscht (SDK) – a body that operates for the Luxembourg Ministry the Environment, Climate and Sustainable Development in the field of waste management and prevention as well as disposal of hazardous substances. SDK delivers a quality label for buildings of entities complying with their waste management specifications. The Commission is labelled SDK since 2007 and by 2019, every building managed by OIL with a waste room obtained the SDK label.

The Commission maintains close working relationships with other institutions in Luxembourg via the inter-institutional working group EcoNet. Main participants are the European Parliament, European Court of Justice, Court of Auditors and European Investment Bank. The group shares experiences, coordinates actions and strives for having a common approach towards the local authorities on environmental issues. Nine EcoNet meetings were held in 2021.

B9.3 Internal and external training

Training sessions for newcomers at the Commission are held by DG HR in full cooperation with OIL. There were 6 online sessions with total of 45 participants in 2021.

Also, in 2021, 13 Commission drivers have benefited from a training session, organised by an external contractor.

B10 EMAS Costs and saving, conversion factors

B10.1 Costs and savings

Calculations showing the costs associated with running EMAS in Luxembourg (OIL) in terms of staff, energy, water, paper and waste disposal are presented in table B10 in section B12.

The total direct EMAS coordination costs have increased slightly in 2021. Energy is the largest single resource cost.

B10.2 Conversion factors

Conversion factors, most of which apply to all sites, are shown in table B11, in section B12.

B11 Site breakdown: building's characteristics and performance (selected parameters, indicative data)

Building	Main occupants	Office	Data and telecom centre	Creche/ child care	Depot, large storage	Caféteria	Self restaurant	Printing and mail sorting	Medical service	Workshop	Sports/ recreation centre	Electricity	Mains gas	Urban heating	Water (m3)	Non hazardous waste (tonnes)
1) Building essential details		2) Building use										3) Main energy sources and amount (MWh)			4) Water and waste consumption	
ARIA	OIL DGT	X				X	X					1.437,09	1.372,09		297,12	17,59
BECH	ESTAT	X				X	X					2.790,29	5.274,44		3.892,80	34,30
CPE 1 et 2	OIL			X		X			X			228,99	-	840,74	1.583,09	27,43
CPE 3	OIL			X		X	X		X			375,25	764,18		757,89	54,15
CPE 5	OIL			X		X	X		X			523,26	929,21		6.501,00	35,47
DRB	DIGIT PMO ECFIN HR BUDG	X			X	X	X	X	X	X	X	7.996,03		2.531,76	3.899,59	79,40
EUFO	ENER CNECT	X				X	X					3.736,00	3.080,47		2.502,00	38,25
FOYER (HEI)		X				X	X				X	96,63	100,34		69,06	5,04
HTC	SANTE	X				X						46,34	1.044,62	515,96	335,80	
LACC	DGT	X				X						276,16	6.111,21		9.474,34	3,58
T2	DGT	X				X	X					423,33	766,78		321,87	10,93
MAEU	COMM	X				X						33,80	185,61		255,00	
MER	OP	X				X	X	X				1.841,71		2.118,70	1.750,67	26,68
FISR		X				X						260,92	84,35		176,37	1,42
HTC (DC)	DIGIT		X									447,75			-	
WIND (DC)	DIGIT		X									3.874,37			-	
WIND - Telecom Centre	DIGIT		X									485,70				
BETZ (DC)	DIGIT		X									5.939,22			-	
Building not identified																1,90
TOTALS												**30.812,84**	**19.713,30**	**6.007,16**	**31.816,60**	**336,14**

For the Laccolith building, gas and water consumption are estimates, based on 2020 consumption data

Electricity consumption for the Betzdorf Datac Center and the BECH building is an estimate, based on 2020 consumption data.

B12 Annexes

B12.1 Summary of significant environmental aspects and mitigating measures in 2020 for the Luxembourg site

Table B4

Aspect group	Environmental aspects	Environmental impact	Measures and actions
Resource consumption (Energy)	Building heating, lighting, wood chip heating generator, steam generators, data centres	Pollution, climate change, exploitation/ depletion of natural resources	• In certain buildings, diminishing the temperature during the closing week of the offices at the end of the year (272) • Replace classic light by LED in all buildings (492)
Resource consumption (water)	Water for sanitation and installations, water consumption	Reduced potable water sources potable impact on aquatic diversity	• More efficient taps were installed in the Helios building (ex-Drosbach)(73)
Resource consumption	Office furniture, equipment and services	Depletion of resources	• Promotion of purchase of more eco-friendly furniture in the catalogue (494) • Reuse unused office supply items (493) • Green selection/award criteria in procurement procedures
Air	Building heating and cooling, transport for missions and logistics, commuting	Air Pollution Risks for biodiversity and climate change- Destruction of the ozone layer	• Free subscription of staff to the Vel'OH network of the City of Luxembourg (404) • Replacement of petrol cars with two electric cars and five hybrid-cars. In total, on 31/12/2021, OIL has 4 electric vehicles, 10 hybrid cars and 3 mild hybrid cars (497) • Since public transport is free of charge in Luxembourg the Commission subsidises public transport subscriptions for cross border commuting staff (535) • Creation of 2 bike parkings by using external car parking spots (534) • OIL maintains a fleet of service bikes • OIL – in cooperation with DG HR – has organised the VeloMai campaign to promote bike to work. • Promotion of various corporate and/or local events on soft mobility and participation in working groups (403)
Air	Air emissions from the nuclear laboratories	Radioactivity	DG ENER's radiation protection laboratory ISO 17025 accredited since 2016. No specific measure in 2021.
Waste	Generation of various household waste (for example packaging, paper, cardboards, metals)	Odours, greenhouse gases, pollution of the air, water and/or soil Impacts on biodiversity	• Since 2016, every new maintenance contractor of OIL takes care of its waste (147) and OIL.03 controls (149) • Introduction of electronic clocking system for building management contractors (540) • Only electronic version of contractors' documents and reports (537) • All new contracts include an obligation of contractors to deal with and report on the waste they produce in the course of their activities for the Commission (546) • Reduction of single use plastic items in the catering, notably by introducing Ecobox system (419) • Continuous information of cleaning contractor on the needs for better waste sorting (148)

Aspect group	Environmental aspects	Environmental impact	Measures and actions
			• Waste sorting islands in all buildings and withdrawal of individual bins (487) • Communications on waste sorting / management for staff • Awareness raising in CPEs, with increased use of recycled items in activities for children (449) • Donation of dismantled IT equipment (implemented by DIGIT)
Waste (waste Water discharge)	Water discharged nuclear laboratories	Water pollution, risks of eutrophication reduced potable water sources potable-Impact on aquatic biodiversity	No waste water was discharged by DG ENER in 2021.

( ) = Number of action included in the Commission's EMAS Global Annual Action Plan (GAAP)

B12.2 Per capita CO2 or equivalent (CO2e) emissions 2013 to 2020 by scope (tonnes)

Table B7

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Scope 1: Fuel consumption and fugitive emissions									
Fuel for bldgs: mains gas	0,53	0,41	2,06	1,69	1,24	0,85	0,85	0,85	0,74
Fuel for bldgs: tanked gas (1)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Biomass	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Commission vehicle fleet	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,01	0,01
Refrigerants	0,00	0,00	0,17	0,02	0,03	0,05	0,02	0,05	0,07
Scope 2: Purchased energy									
External electricity supply (grey),	0,00	0,00	0,00	0,13	0,15	0,20	0,31	0,31	0,26
External electricity supply contract (renewables), combustion	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
District heating (combustion) (2)	0,07	0,05	0,19	0,10	0,10	0,25	0,35	0,28	0,23
Scope 3: Other indirect sources									
Fuel for bldgs: mains gas (upstream)	0,12	0,09	0,46	0,37	0,27	0,19	0,18	0,18	0,16
Fuel for bldgs: tanked gas (upstream) (1)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel (upstream)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Commission vehicle fleet (upstream)	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,00	0,00
Site generated renewables (upstream) (3)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
External grey electricity supply, line losses	0,00	0,00	0,00	0,01	0,01	0,02	0,03	0,03	0,02
External 'renewables' electricity contract (upstream with line loss)	0,00	0,00	0,00	0,00	0,00	0,05	0,05	0,04	0,03
District heating (upstream) (2)	0,26	0,17	0,68	0,02	0,02	0,04	0,06	0,04	0,04
Business travel: air (combustion)	0,53	0,51	0,38	0,36	0,34	0,37	0,34	0,07	0,04
Business travel: rail (combustion)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Business travel: hire car (combustion)	0,10	0,10	0,09	0,10	0,09	0,08	0,08	0,05	0,02
Business travel: private car (combustion)	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,01	0,02
Experts' travel: air emissions	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Experts' travel: rail emissions	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Commuting (combustion) (4)	0,00	0,00	0,00	0,00	0,00	0,00	1,03	0,25	0,21
Fixed assets - buildings	0,00	0,00	0,00	0,00	0,00	0,85	0,84	0,82	0,76
Fixed assets - IT	0,00	0,00	0,00	0,00	0,00	0,87	0,36	0,24	0,20
Fixed assests - Commission vehicles	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,00	0,00
Paper supply	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,00	0,00
Service contracts	0,00	0,00	0,00	0,00	0,00	0,29	0,29	0,41	0,44
Catering	0,00	0,00	0,00	0,00	0,00	0,00	0,12	0,04	0,02
Own waste	0,00	0,00	0,00	0,00	0,00	0,03	0,05	0,04	0,03
Teleworking emissions (equipment electricity use)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02
Teleworking emissions (fixed assets, equipment)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
Teleworking emissions (space heating)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,22
(Other category) - Ispra									
Sum	**1,7**	**1,4**	**4,1**	**2,9**	**2,3**	**4,2**	**5,1**	**3,7**	**3,6**

B12.3 Internal communication: main events and messages in 2021

- Communication on the installation of sorting stations in all buildings in Luxembourg in March 2021 and removal of all the individual bins. Sorting instructions were provided.

- Panel discussion (April) on Lessons-learnt during the COV19 lockdown that can help us reach climate neutrality in 2030.

- Communication on VeloMai 2021 (28 April and 5 May). Recording and publication of 4 videos on soft mobility in Luxembourg, featuring the Luxembourg rail (CFL), ProVelo, Visit Luxembourg and the "*Fédération luxembourgeoise de marche populaire*".

- Online talk on 1 June about biodiversity: "What is the EU doing and what can you do to help restore ecosystems?

- Online event on sustainability (2 June): "Sustainability in everyday life: Bridging the cognitive gap between good intentions and actions"

- Poster on electronic screens on new recycling stations (start 2 June).

- Communication on free subscription to the Vel'OH! bike network of the City of Luxembourg for staff in Luxembourg (9 July).

- Communication on European Waste Reduction Week (16 November) and campaign on waste reduction. Recording of 3 videos presenting the fields of activity, the functioning and the philosophy of three organizations that treat or reuse waste in Luxembourg.

- regular information on transport issues: road and train works, reorganisation of bus lines

- management of the OIL EMAS, OIL MOBILITY and the new Vel'OH! functional mailboxes to respond to staff enquiries on environment and mobility topics

B12.4 Costs and conversion factors

Table B10: EMAS administration and energy costs for buildings in the EMAS area

Parameter	2 012	2 013	2 014	2 015	2 016	2 017	2 018	2 019	2 020	2 021
Total Direct EMAS Cost (EUR)	396 000	462 000	462 000	469 000	469 000	483 000	370 000	375 000	380 000	392 500
Total Direct Cost per employee	99	114	114	100	101	101	74	73	73	69
Total buildings energy cost (Eur)		1 755 676	3 091 906	2 559 940	2 637 907	1 848 159	1 686 966	2 214 420	2 138 785	1 763 871
Total buildings energy cost (Eur/person)		434	765	549	567	386	336	431	408	310
Total fuel costs (vehicles) (Eur)		49 328	51 752	54 780	64 574	59 496	65 798	63 540	29 394	34 744
Total energy costs (Eur/person)		12	13	12	14	12	13	12	6	6
Total water costs (Eur)		92 115	91 817	208 318	368 001	308 841	290 556	262 537	176 477	135 220
Water (Eur/person)		65	62	45	79	65	58	51	34	24
Total paper cost (Eur)		82 102	69 120	61 690	59 521	83 261	84 624	84 125	33 893	23 804
Total paper cost (Eur/person)		20	17	13	13	17	17	16	6	4
Waste disposal (general) - unit cost/tonne		335	342	342	342	321	390	382	372	313
Waste disposal (general) - Eur/person		42	35	66	76	58	53	50	37	18

Table B11: Conversion factors used in calculations for Luxembourg reporting

Parameter and units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
kWh of energy provided by one litre diesel [(1)]	0,00	0,00	10,89	10,89	10,89	10,89	10,89	10,89	10,62	10,58	10,58
kWh of energy provided by one litre petrol [(1)]	0	0	9	9	9	9	9	9	9	9	9
Office Paper Density (g/m2)	80	80	78	75	75	75	75	75	75	75	75
Kgs CO_2 from 1 kWh of electricity [(2)]	0,000	0,000	0,000	0,671	0,671	0,256	0,256	0,256	0,256	0,256	0,256
Kgs CO_2 from 1 kWh natural gas with upstream [(4)]	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,220	0,224	0,224	0,224
Kgs CO2 from 1 kWh tanked gas [(4)]	0,000	0,000	0,000	0,000	0,204	0,204	0,204	0,204	0,230	0,230	0,230
Kgs CO2 from 1 kWh diesel - fioul for buildings with upstream [(4)]	0,330	0,330	0,330	0,330	0,330	0,330	0,330	0,330	0,324	0,324	0,324
Kgs CO_2 from 1 kWh from district heating with upstream [(3)]	0,083	0,201	0,201	0,201	0,201	0,201	0,201	0,323	0,333	0,315	0,343
GWP of R410A [(4)]	0	0	1.920	1.920	1.920	1.920	1.920	1.920	1.920	1.920	1.920
GWP of R134A [(4)]	0	0	1.300	1.300	1.300	1.300	1.300	1.300	1.300	1.300	1.300
GWP of R404A [(4)]	0	0	3.940	3.940	3.940	3.940	3.940	3.940	3.940	3.940	3.940
GWP of R407C [(4)]	0	0	1.620	1.620	1.620	1.620	1.620	1.620	1.620	1.620	1.620
Kgs CO2 from one litre of diesel with upstream (car fleet) [(4)]	3,16	3,16	3,16	3,16	3,16	3,16	3,16	3,16	3,16	3,16	3,16
Kgs CO2 from one litre of petrol with upstream (car fleet) [(4)]	2,81	2,81	2,81	2,81	2,81	2,81	2,81	2,81	2,81	2,81	2,81

Notes:
(1) www.carbontrust.com, Conversion factors 2016 - harmonized values for European countries
(2) Only for the small part of electricity not coming from renewable sources. Source : supplier
(3) Ponderated value of energy sources used in district heating
(4) Source: note ADEME Base Carbone, emissions for energy consumption include both combustion and upstream components

EUROPEAN COMMISSION

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ANNEX C: JRC-PETTEN – Administrative and research activities

Reporting and the COVID pandemic:

Reporting for 2022 retains the same approach for continuity, as previous years, and is therefore based on site activity and total staff numbers.
The data will therefore reflect the impact of a very significant staff absence on facilities operation.

The EMAS corporate coordination team has made 'high level' estimates of home consumption, due to telework under COVID, as described separately in the Corporate summary.

The mission of the Joint Research Centre (JRC)-Petten is to serve as the point of reference for the Commission, Member States and research organisations providing scientific and technical support to Energy, Transport and Climate policies. This is supported by conducting studies, installations for conducting long term tests and experimental research. The EMAS scope at JRC-Petten includes the entire site within the JRC boundary. This excludes the HFR (High Flux Reactor), which is not in the EMAS scope.

C1 Overview of core indicators at Petten since 2010

JRC-Petten have been collecting data on core indicators for the Petten site since 2010. Their values in 2010 and from 2014 to 2021 are shown in Table C1, along with performance trend and targets where applicable for 2023 and 2030.

Table C1: Historical data, performance and targets for core indicators for Commission level reporting

Table C1: Historical data, performance and targets for core indicators proposed for Commission level reporting

Physical indicators:	Historic data values						Performance since:		Future targets	Future targets		
(Number, desciption and unit)	2010 (1)	**2014**	2018	2019	2020	2021	2010	2014	2014-23	2014-30	2023	2030
							Δ %	Δ %	Δ % (2)	Δ % (2)	value(2)	value (2)
1a) Energy bldgs (MWh/p)	37.46	**23.99**	26.41	24.24	19.91	20.89	-44.2	-12.9	-7.5	-13.6	22.19	20.73
1a) Energy bldgs (KWh/m²)	472	**348**	328	302	246	251	-46.9	-27.9	-7.5	-13.6	322	300
1c) Non ren. energy use (bldgs) %		**97.8**	52.3	51.5	46.2	49.5		-49.4	-50.0	-55.0	48.9	44.0
1d) Water (m³/p)	11.50	**11.14**	8.00	9.83	8.99	5.62	-51.1	-49.5	-13.0	-14.0	9.69	9.58
1d) Water (L/m²)	145	**161**	99	122	111	68	-53.5	-58.2	-13.0	-14.0	140	139
1e) Office paper (Tonnes/p)	0.04	0.02	0.01	0.02	0.00	0.00	-89.4	-73.2	-13.5	-25.0	0.014	0.013
1e) Office paper (Sheets/p/day)	40	16	10	19	5	5	-88.7	-71.5	-13.5	-25.0	13.7	11.9
2a) CO_2 buildings (Tonnes/p)	14.85	**10.00**	3.14	2.88	2.15	2.40	-83.8	-76.0	-73.0	-76.0	2.70	2.40
2b) CO_2 buildings (kg/m²)	187	**145**	39	36	27	29	-84.6	-80.1	-73.0	-76.0	39.1	34.8
2c) CO_2 vehicles (g/km, manu.)		**168**	148	148	148	148		-11.7	-12.0	-21.0	147	132.4
2c) CO_2 vehicles (g/km, actual)		**357**	275	234	256	228		-36.2				
3a) Non haz. waste (Tonnes/p)	0.078	**0.105**	0.115	0.097	0.066	0.349	350.7	233.4	-7.5	-13.6	0.097	0.091
3b) Hazardous waste (Tonnes/p)	0.0032	**0.0034**	0.0036	0.0112	0.0000	0.0127	303.6	274.7				
3c) Unseparated waste (%)	27.1	**39.0**	51.3	44.9	45.6	6.9	-74.5	-82.3	-7.5	-13.6	36.1	33.7
3c) Unseparated waste (T/p)		**0.0**	0.1	0.0	0.0	0.0		-40.6	-7.5	-13.6	0.039	0.036
Economic indicators (Eur/p)												
Energy consumption (bldgs)		**1 225**	1 335	1 232	1 043	1 073		-12.4				
Water consumption	23.0	**22.3**	16.0	19.7	18.0	11.2	-51.1	-49.5				
Non haz. waste disposal	7.0	**9.4**	10.3	8.7	5.9	31.5	350.7	233.4				

Note: (1) Earliest reported data, for a reduced scope of buildings (and not directly comparable with current scope)
(2) Draft figures from the Global Anual Action Plan 2022

It is to be noted that the core indicators for 2021 are reported as in previous years based on site activity and total staff numbers. The data will therefore reflect the impact of a very significant staff absence on facilities operation due to the COVID pandemic.

The core indicators show that, since 2010, there has been substantial progress in reducing the environmental impact of building energy usage, with a reduction of the energy consumption by 49%. This reflects efforts from the last ten years to improve energy efficiency; installing insulation, more efficient heating and improved building management. The amount of non-renewable energy in buildings is on a plateau since 2015 as there were no new PV panels installed in recent years. Energy consumption slightly increased in 2021, which can be explained to a certain extent by the lower external temperatures in winter and consequently a higher energy demand, whereas an increase in heating degree days was recorded.

Water consumption is monitored per building and has generally decreased since 2010. In 2019, an increase, which could only be explained by research with steam production, was detected. All toilets are equipped with sensor controlled sanitary tapware that is used to prevent continuous water flow, by stopping the water supply after pre-set time.

Paper consumption slightly decreased in 2021 compared with last year. A significant decrease in office paper consumption in 2020 can be seen due to the transition to teleworking caused by the COVID-19 pandemic.

In 2021, the energy consumption decreased. Since 2018, JRC-Petten has purchased electricity through a consortium, which is active on the electricity market for large accounts. The contract for the delivery of electricity is for four years and guaranties of origin, greening the purchased electricity are included in the contract.

CO_2 emission per kilometer from site service vehicles performance generally decreased since 2010, there were no changes to the vehicle fleet. The manufacturer and actual emissions are below the target of 2020 due to past changes in the vehicle fleet.

Non-hazardous waste significantly increased in 2021 compared to 2020. The reason for the significant increase is the removal of two cranes and the cleaning of roofs/solar panels from seagull debris. The unseparated waste rate remarkably decreased compared to 2020. In 2021, a new waste contract went into force. Separation rate is the amount of sorted materials like paper, glass, wood, hazardous, plastic and electronic waste as part of the waste total with the category unsorted household waste. New waste stream bins were introduced on site in late summer 2020.

The evolution of the EMAS system baseline parameters in JRC-Petten is as shown below.

Table C2: EMAS baseline parameters

Table C2 EMAS baseline parameters

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Population: total staff	232	229	266	263	282	278	276	263	248	249	247	240
Total no. operational buildings	14	14	14	14	14	17	16	13	13	14	14	14
Useful surface area for all buildings (m^2)	18 400	18 400	19 150	19 150	19 458	21 397	20 502	20 842	19 996	19 996	19 996	19 996

In 2021, JRC-Petten staff numbers decreased slightly, the other parameters remained stable.

The total premises of JRC-Petten are EMAS registered. Buildings, which have water, electricity and gas consumption are reported as operational.

C2 Description of JRC-Petten activities and key stakeholders

The JRC is a Directorate-General of the European Commission employing over 3000 staff, including scientists and researchers as well as administrative and support staff from across the EU. Its offices and sites are located in Brussels (BE), Geel (BE), Ispra (IT), Karlsruhe (DE), Petten (NL) and Seville (ES).

On the JRC-Petten site, the European Commission conducts scientific research and delivers technical support and administrative activities for partners in relation to energy, transport and climate policies. Increasingly research is based on modelling studies, which generates a more administrative workload. The research is based on the results of laboratory work in facilities for hydrogen fuel cell testing, hydrogen storage tank testing and optimisation, battery testing and at several locations advanced material testing for nuclear and other high tech industries.

The JRC-Petten hosts EC staff from four different JRC directorates; C, G, I and R. There is the Account Management Centre, AMC8, from DG HR.

While JRC-Petten staff and AMC8 staff report to different Directors, the site operates under the responsibility of a site-Director, Piotr Szymanski, Director of the Directorate for Energy, Transport and Climate.

The scientific activities fall under the responsibility of:

Directorate C: the mission of the Joint Research Centre's Directorate for Energy, Transport and Climate is to provide support to Community policies and technology innovation related to:

- **Energy** – to ensure sustainable, safe, secure and efficient energy production, distribution and use
- **Transport** – to foster sustainable and efficient mobility in Europe
- **Climate** – to provide scientific and technical analyses in support to integrated air quality, climate and related policies

Directorate C: Energy, Transport and Climate

- **Unit C.1:** the Energy Storage Unit performs scientific research into energy storage technologies in support of European energy and transport policies. This includes battery technologies, hydrogen storage, distribution and sensing, and electrochemical conversion in fuel cells. Particular attention is given to the establishment of harmonized methods for characterizing the performance of the technologies in terms of efficiency, emissions, reliability and safety.
- **Unit C.3:** the mission of the Energy Security, Distribution and Markets Unit is to aid and inform the European Institutions, Member States and relevant stakeholders on issues relevant to ensuring the proper design and functioning of the energy markets and the digitalization of energy systems, as well as the uninterrupted physical availability of energy products and services at an affordable price for all consumers. The unit assesses how different policy options help shape an energy system resilient to shocks, disturbances, and adverse trends, whilst satisfying European society's energy needs.

- **Unit C.7:** knowledge for the Energy Union Unit. Their mission is to support EU policies related to the Energy Union through knowledge management.

Directorate G: Nuclear Safety and Security

- **Department I: Nuclear Safety**
  - **Unit G.I.4:** the mission of the Nuclear Reactor Safety and Emergency Preparedness Unit is to provide fundamental knowledge, scientific and technological data for materials innovation, physical model development and numerical simulations and to contribute to the development of nuclear codes and standards, with the aim to contribute to the safe operation of current and future innovative and advanced nuclear reactor systems.
- **Unit G.9:** the mission of the Knowledge for Nuclear Safety and Decommissioning Unit is to manage and disseminate knowledge generated by the scientific units of Directorate Nuclear Safety and Security (Dir. G) by mapping, collating, analysing, quality checking and communicating in a systematic and digestible way all the relevant scientific data, methods, tools and to monitor knowledge available worldwide. Attention to be given to anticipating knowledge needs, mapping knowledge gaps and suggesting research topics to be carried out in the JRC.

Support services are provided by the following units:

Directorate R: Support Services

- **Unit R.2:** the mission of the Site Support Petten Unit is to support and coordinate the implementation of support service functions on the Petten Site in a client responsive manner and in compliance with all applicable rules and regulations, acting as a focus of service support to the Directorates of the Petten Site. Unit R.2. also provides technical support for the scientific programmes of the site and develops and maintains the infrastructure of the site.

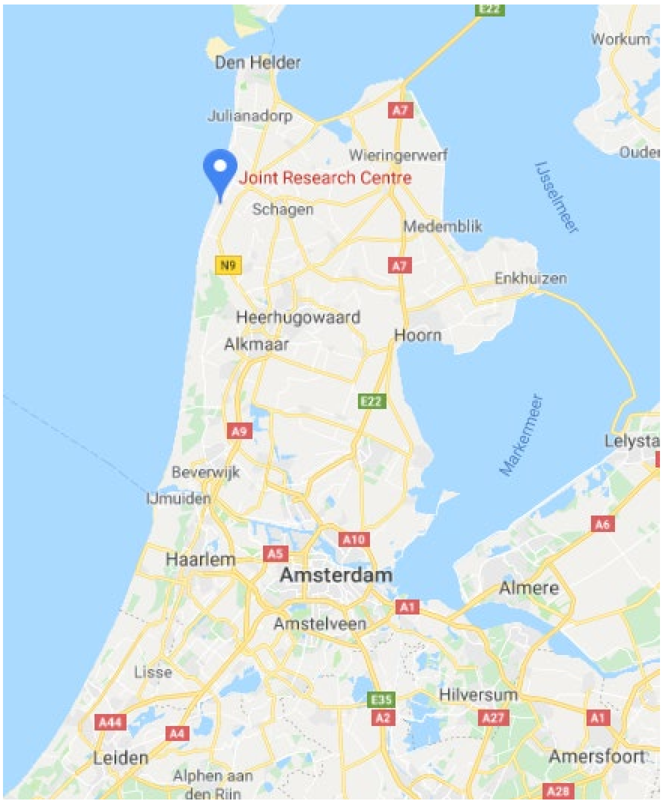
Directorate I: Competences

- **Unit I.5:** the mission of Directorate I is to set up and operate Competence Centres which will develop, provide and apply analytical tools, methods and integrated solutions to better support all Commission Services for the conception, implementation and evaluation of EU policies.
- **Directorate general HR, AMC8:** the mission of AMC.8 is to ensure effective local HR services for the JRC, with a high level of customer service and in full respect of the rules in place.

Figure C1: Petten-site photo

The site is located in an extensive area of coastal dunes in Noord-Holland, the Netherlands, and 50 kilometres North West of Amsterdam.

Figure C2: map of the north west of the netherlands



The premises contain 26 buildings of which three administrative ones; the other buildings are laboratories, workshops, storage and utility installations for research and the support of research.

The site is located on the Petten Research Centre Campus together with TNO (formerly ECN) and the Nuclear Research and consultancy Group (NRG) which is operator and license holder of the High Flux Reactor. Curium (formerly Mallinckrodt Medical B.V.) is the fourth occupant of the campus and produces medical isotopes. The scope of this report is only for JRC-Petten. The research activities on-site, test installations and laboratories make the site a type C premise under Dutch legislation "activiteitenbesluit", requiring that activities and emissions are permitted. The site environmental permit was renewed in 2016 in good cooperation with the authorities. The new permit requirements are mainly goal oriented and well manageable.

Due to the COVID pandemic, an active communication with interested environmental stakeholders was extremely difficult and partly suspended. Until 2019, the interested environmental stakeholders with whom JRC-Petten actively communicated with were:

- National forestry: There were several communications held with the national forestry to discuss a nature management plan for the Natura 2000 area outside the active research location.
- Flora and Fauna Committee: Participation to several meetings of this Committee.
- Energy and Health Campus (EHC): The EHC is an initiative of the province of North-Holland, whose aim is to stimulate the Petten campus as Development Company, which in turn stimulates restructuring, innovation projects, research, and marketing for economic development. JRC-Petten participates in the Steering Committee.
- Schagen Municipality: Communication with the municipality about a permit for a fence renewal.

C2.1 Stakeholders' analysis

For the development of the context of the organisation, an analysis is made of the stakeholders who interact with JRC-Petten. The figure below is a graphical representation of the found distribution in the defined quadrants. This figure is a result of the ranking of stakeholder groups based on summation of the scores from individual stakeholders. The relation of stakeholder groups and individual stakeholders is visible in table C3.

Figure C3: Stakeholder analysis

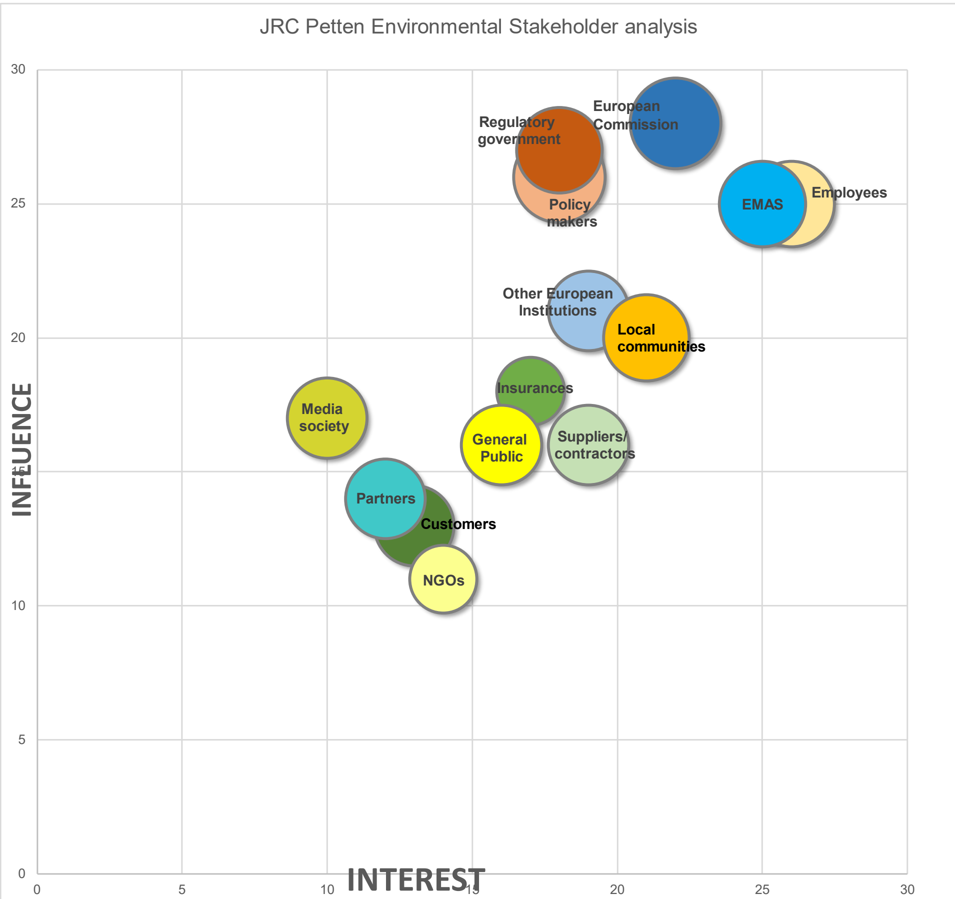
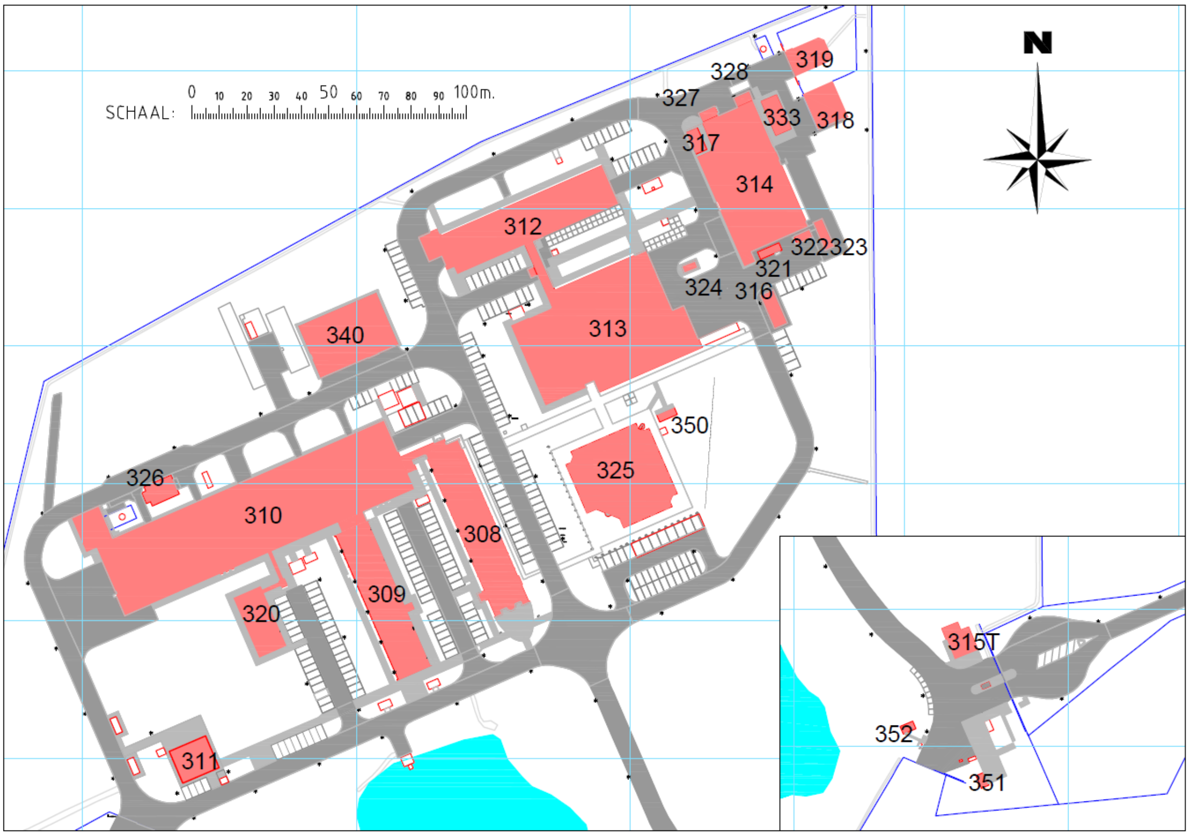


Table C3: JRC-Petten summary of stakeholders

Stakeholder group	Stakeholder identification	Interest, needs and expectations
Other European Institutions	- Council & parliament - Member states - Commission panels - EC citizens	- Services responding well to DGs' demands - Minimal costs on energy/waste/soil - Rely on founded research for policy making - Multi-annual investment plans: they decide on investments: refurbishment, construction, etc. - Site development plan
European Commission	EC, DG JRC	JRC Petten is getting funded by the EC and are obliged to report and to provide scientific support for drafting policies
Policy makers	- European Commission - Dutch national legislation - Province North-Holland	Contribution to environmental policy and COP 2030 targets on energy
Suppliers / contractors	- Products: e.g. lab chemicals, lab instruments, - Services: e.g. maintenance companies, cleaning, catering, gardening, waste company, architects and consultants,, construction companies	Maintaining their contracts, continue their delivery
Employees	- Employees & workers councils	Safe and modern working environment, trust and respect, be kept informed on environmental policy, targets and performance, employer that is caring about environment and sustainability
Customers	DGs: ENER, RTD, DEVCO, TRADE, TAXUD, HOME	Timely and correct delivery of policy support, no specific requirements on environmental criteria.
Local communities	- Research campus partners (ECN, NRG, Curium, EHC) - Neighbours - Flora and Fauna committee	No calamities, minimized transports and waste. Coordination in area development. Local communities want to be timely informed about incidents / calamities. They want to know the installations and their risks.
Regulatory government	Regulatory bodies: - RUD, province NH, Hoogheemraadschap Hollands noorderkwarier - Safety region NHN - Inspectie SZW	Compliance with regulations
EMAS	EMAS verifiers, EMAS organization	Improve the environmental performance, receive the EMAS registration, transparency, Training of staff members, awareness-raising of environmental topics
Media and society	- Press/TV/radio - Society in general / public opinion	News value (when something goes wrong or outstanding projects). Indirect influence on impact through image effects.
Partners	- Policy advisors - Other JRC sites - OECD	Knowing our competences (to partner or compete)
NGOs	- NGO: e.g. Natuur & Milieu	Nature protection, no pollution
Insurances	- Fire insurances - Nuclear liability insurance	Minimized risk on incidents or calamities,
General Public	- Citizens	Transparency

Figure C4 presents the floorplan of the JRC-Petten site and gives a brief description of the buildings usage. Detailed information about the activities in buildings is presented in table C17.

Figure C4 : JRC-Petten site plan



Building	
308, 309, 315T	Offices
310, 311, 312, 313, 314, 320, 325, 333, 340	Experimental hall, laboratories, offices
316, 317, 318, 319, 321, 322, 323, 324, 326, 327, 328, 350, 351, 352	Storage, distribution, infrastructure

C3 Environmental impact of JRC-Petten activities

Table C4: Summary of significant environmental aspects for the Petten site

Aspect group	Environmental aspect	Environmental impact	Activity, product or service
Resources	Electricity & fossil fuel consumption	Reduction in natural resources	Heating, cooling, ventilation, electrical equipment and transport
	Paper consumption		For office activities, printing, training and communication requirements
	Water consumption		For sanitary and technical installations
Air	CO_2, NO_x, VOC emissions	Air pollution, climate change	Energy consumption, Internal transport Transport: work-related travel and journeys to and from work (organisation and personal)
	HFC gas emissions	Global Warming	Used in refrigerators and cooling systems

Aspect group	Environmental aspect	Environmental impact	Activity, product or service
Local aspects	Noise	Disturbance of neighbourhood	Ventilation
Waste	(Hazardous) waste production	Air, water and/or soil pollution, biodiversity risks	Laboratories, sanitary installations, cleaning, maintenance, office activities, IT and catering
Water	Wastewater discharge	Risk of eutrophication, water pollution	Sanitary and technical installations
Bio- diversity	Choice of products and their origin	Destabilisation of ecosystems	For catering and gardening
	Choice of sites and type of buildings	Destruction of natural habitat, relief, visual pollution	In the context of the Commission's buildings policy (Life cycle approach)
Environmental Risks (legal compliance and emergency preparedness)	Load losses, malfunctions, leakages, spills of chemicals, gas, waste, etc	Air, water and/or soil pollution.	In the context of delivery, storage and use of chemicals/fuel. Research installations, laboratories, technical installations
(Indirect) financing	Indirect environmental aspects linked to programmes to be financed	Environmental impact caused by third parties	Taking the environment into account in project selection and evaluation
(Indirect) public procurement	Environmental performance of contractors. Sustainability and impact of products and services selected.	Environmental impact caused by third parties	Integration of environmental clauses in contracts: influence of contract through 'sustainable' purchases, life cycle approach

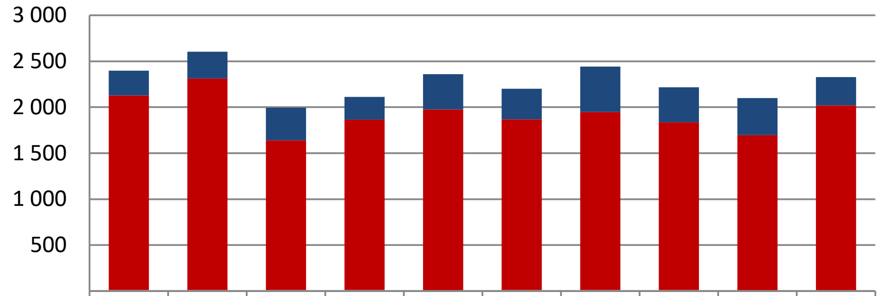
C4 More efficient use of natural resources

C4.1 Energy consumption

Buildings energy consumption data should be considered in the context of climatic conditions. Analysis of degree data[1] shows that the energy for building heating and cooling need would be expected to be about 10 % more than in the reference year 2014

Figure C5: Total annual degree days at Petten, 2012-2021

[1] Monthly data for INHALKMA1 station (15,5C reference temperature), www.degreedays.net; using buildings energy consumption data for Petten. (Caution: Temperature is one variable affecting buildings' energy requirement, others include humidity and wind conditions).

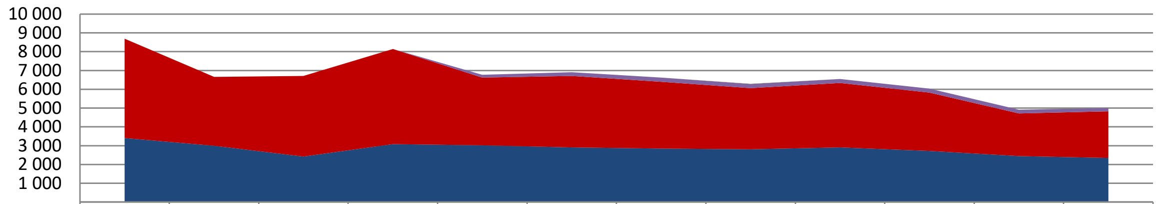


	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total degree days	2 389	2 591	1 983	2 102	2 351	2 190	2 431	2 205	2 089	2 318
Cold degree days, cooling required	272	290	354	250	386	333	494	381	401	305
Hot degree days, heating required	2 117	2 301	1 629	1 852	1 965	1 857	1 937	1 824	1 688	2 013
kWh/person/degree day	10.55	11.95	12.10	11.83	10.21	10.93	10.87	10.99	9.53	9.01

C4.1.1 Buildings

The evolution of total annual energy consumption is presented in Figure C6. The energy consumption per person and consumption per square metre is presented in figures C7 and C8.

Figure C6: Annual buildings energy consumption (MWh) in the EMAS perimeter (indicator 1a)

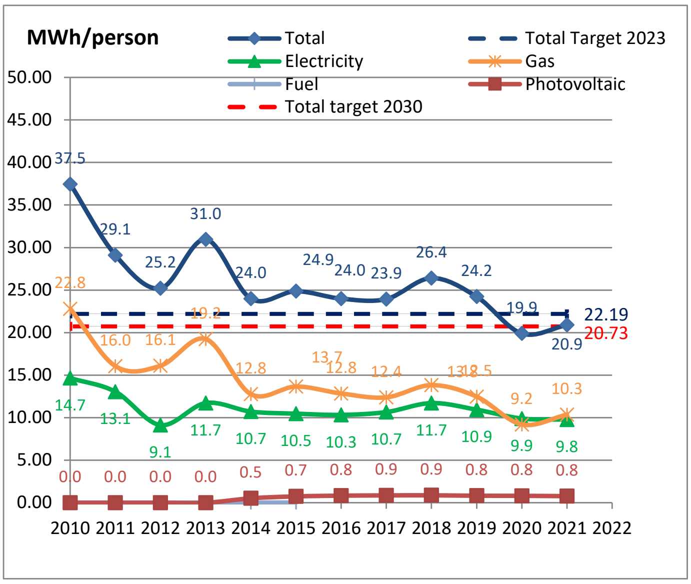


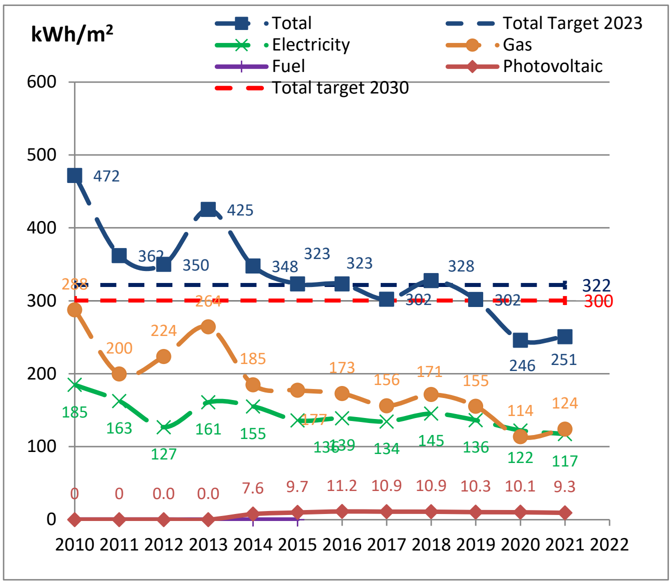
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total energy buildings, (MWh)	8 690	6 665	6 707	8 143	6 766	6 913	6 623	6 298	6 551	6 035	4 918	5 015
Diesel	0	0	0	0	0	0	0	14	0	0	0	0
Solar PV	0	0	0.0	0.0	147.6	208.2	229.7	227.0	217.0	205.0	201.3	186.0
Mains supplied gas	5 290	3 675	4 281	5 061	3 598	3 795	3 543	3 255	3 427	3 105	2 271	2 482
Electricity	3 400	2 990	2 426	3 082	3 020	2 910	2 850	2 802	2 906	2 724	2 444	2 345

Due to the COVID pandemic, a decrease of energy consumption was seen in 2020. Compared to 2020, a slight increase was recorded in 2021. In general a decrease is recorded in line with the heating degree data. It is to be noted that the total energy consumption (MWh) also includes the energy from the geothermal pumps (1.3 MWh in 2020), which is not illustrated in figure C6.

Figures C7 and C8: Evolution of total annual energy consumption for Petten EMAS buildings

C7 **C8**





The plateau in overall energy consumption for buildings, identified in the previous exercise, continues. The JRC-Petten EMAS targets for 2020 (5% reduction for the period by 2014 to 2020) were reached. Due to periodical operational changes, some annual variation in per capita, and per square metre consumption are seen.

Photovoltaic production declined in 2021 as there were no new panels installed, but a small loss in efficiency.

The most significant action prioritising the reduction of energy consumption (indicator 1a) in the Annual Action Plan are summarised below.

Table C5: The most important action targeting indicator 1a (buildings energy consumption)

Action	Building(s)	Description of latest progress
Action: Insulation panels on the outside of building 310	INFRA	Contractual issues resolved, new company to be found, currently in progress.

C4.1.2 Site Vehicles

Table C6: Vehicle energy consumption (indicator 1b)

Table C6: Summary vehicle energy consumption										
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total (MWh/yr)	6.24	6.12	5.42	29.49	50.05	55.77	53.02	35.65	18.83	28.37
MWh/person	0.023	0.023	0.019	0.106	0.181	0.212	0.214	0.143	0.076	0.118
Diesel used (m^3)	0.400	0.010	0.097	1.499	2.702	3.409	3.243	2.118	1.489	2.317
Petrol used (m^3)	0.200	0.638	0.463	1.398	2.189	1.979	1.879	1.397	0.325	0.408

Total annual vehicle energy consumption, illustrated above, is less than 1% of that for buildings. There are 4 site service vehicles which are used for internal goods transport, missions, taxi support to Schiphol and Petten. Vehicle efficiency has not changed, as there were no changes to the vehicle fleet. A decline of 20% compared to 2019 is the result of a decrease of usage of vehicles for missions, due to the pandemic. In comparison with 2020, an increase of 50% was recorded in 2021 due to the restarting of activities on the site.

C4.1.3 Renewable energy use in buildings and vehicles

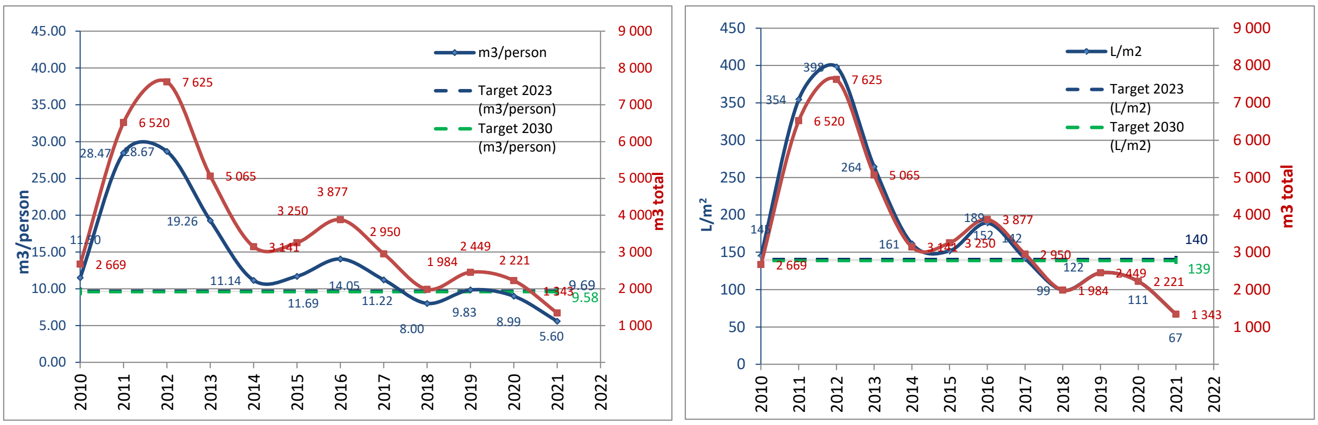
Table C7: Non-renewable energy use in the buildings

Table C7: Non-renewable energy use in the buildings												
Source of energy	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Main supplied electricity (MWh)	3 400	2 990	2 426	3 082	3 020	2 910	2 850	2 802	2 906	2 724	2 444	2 345
from non renewables (%)	100	100	100	100	100	100	100	100				
Mains supplied gas (MWh)	5 290	3 675	4 281	5 061	3 598	3 795	3 543	3 255	3 427	3 105	2 271	2 482
from non renewables (%)	100	100	100	100	100	100	100	100	100	100	100	100
Site generated PV (MWh)												
from renewables (%)	100	100	100	100	100	100	100	100	100	100	100	100
Total renewables (MWh)					**148**	**208**	**230**	**227**	**3 124**	**2 930**	**2 647**	**2 532**
Total renewables (%)			**0.0**	**0.0**	**2.2**	**3.0**	**3.5**	**3.6**	**47.7**	**48.5**	**53.8**	**50.5**
Total energy use, (MWhr/yr)			**6 707**	**8 143**	**6 618**	**6 705**	**6 393**	**6 071**	**3 427**	**3 105**	**2 271**	**2 482**
Toal non ren energy as part of total, (%)			**100.0**	**100.0**	**97.8**	**97.0**	**96.5**	**96.4**	**52.3**	**51.5**	**46.2**	**49.5**

The portion of electricity generated by renewables on-site solar panels is significant (7,34%). On sunny days, buildings receive all of their electricity from the solar panels. In 2018, JRC-Petten greened the mains supplied electricity by purchasing Guaranties of Origin from sustainable resources (Dutch biomass). As a result, since 2018, nearly half of the site's energy consumption has been from renewable sources.

C4.2 Water consumption

Figures C9 and C10: Evolution of total annual water consumption for JRC-Petten (indicator 1d)

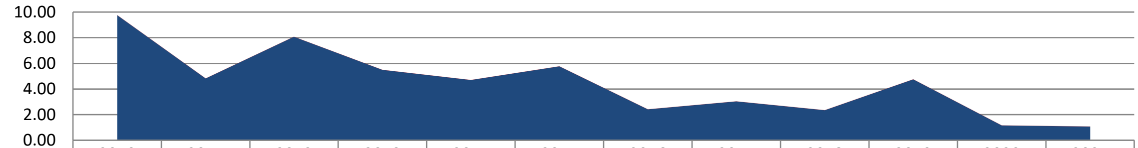


In general, a decrease in water consumption can be seen. On-site water consumption decreased to a historical low number in 2021. However, it is important mentioning that JRC-Petten has scientific activities which can affect the water usage for example the production of Hydrogen.

C4.3 Office and print shop paper

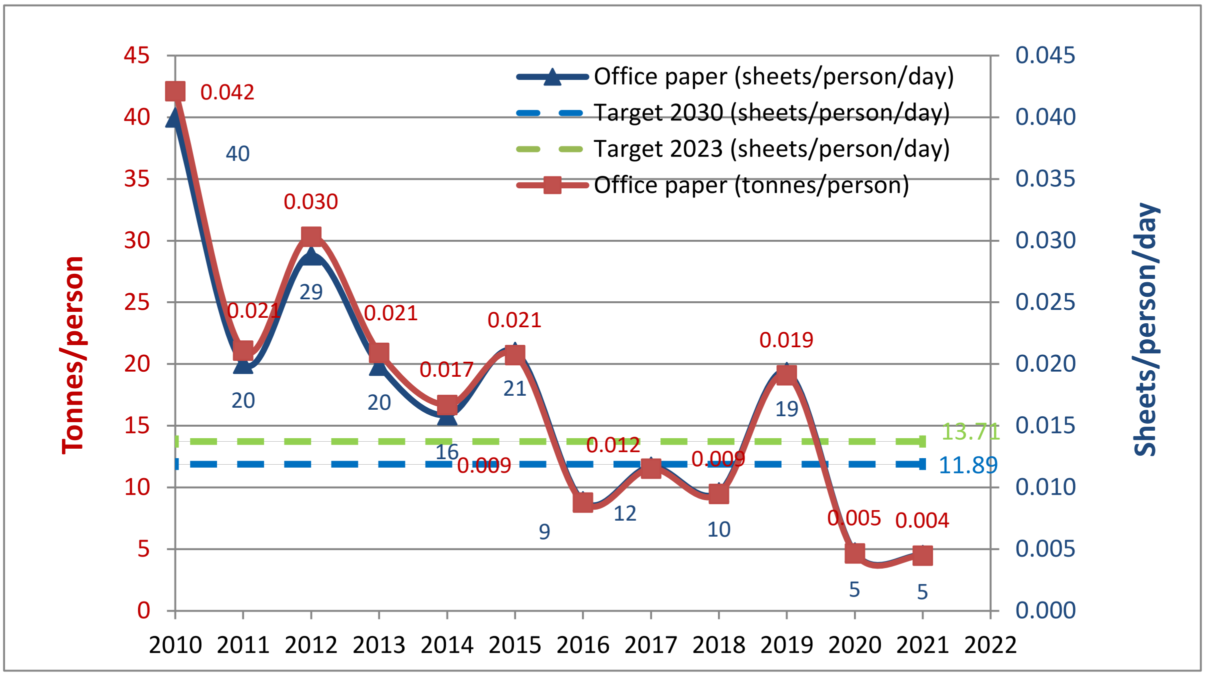
The evolution of office paper consumption (overall and per capita) is presented below.

Figure C11: Evolution of paper consumption based on printed sheets at JRC-Petten (totals)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Office (A4 sheets eq) x 1Mil	1.96	0.97	1.62	1.10	0.94	1.23	0.52	0.65	0.50	1.02	0.25	0.23
Total paper consumption (tonnes)	9.77	4.83	8.07	5.50	4.71	5.76	2.42	3.03	2.35	4.76	1.15	1.07
Offset paper (tonnes)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office paper (tonnes)	9.77	4.83	8.07	5.50	4.71	5.76	2.42	3.03	2.35	4.76	1.15	1.07

Figure C12: Evolution of paper consumption based on printed sheets in tonnes/person and sheets/day

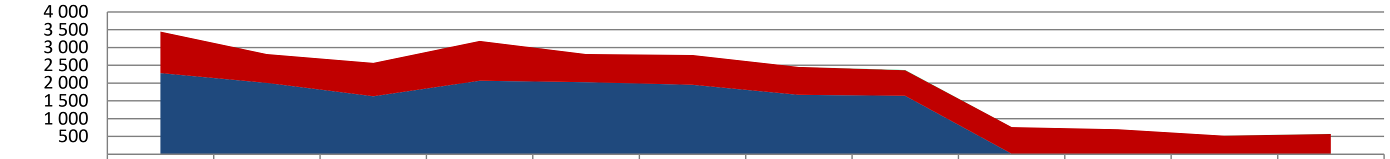


Paper use at JRC-Petten site has a long-term downward trend. The calculation of paper consumption was based on purchased paper, which changed in 2020 to printed sheets. In 2021, the paper consumption dropped to a historical low level. This drop can be explained by the teleworking transition of the majority of staff members, due to the COVID pandemic.

C5 Reducing air emissions and carbon footprint

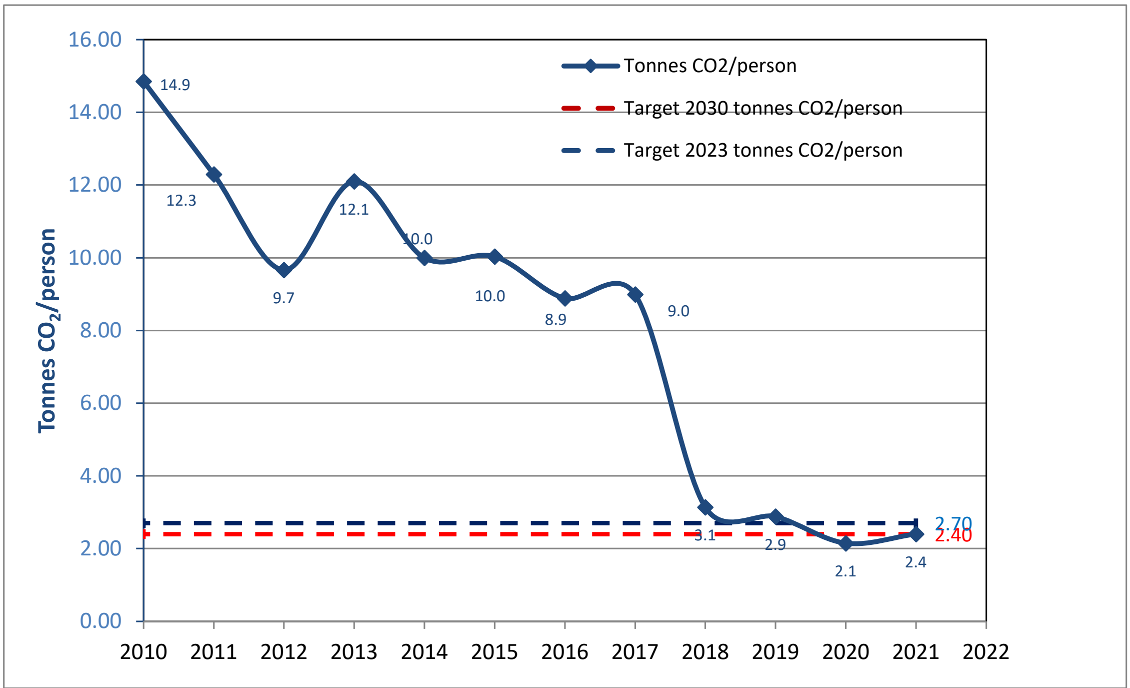
C5.1 CO_2 emissions from buildings a) Buildings (energy consumption)

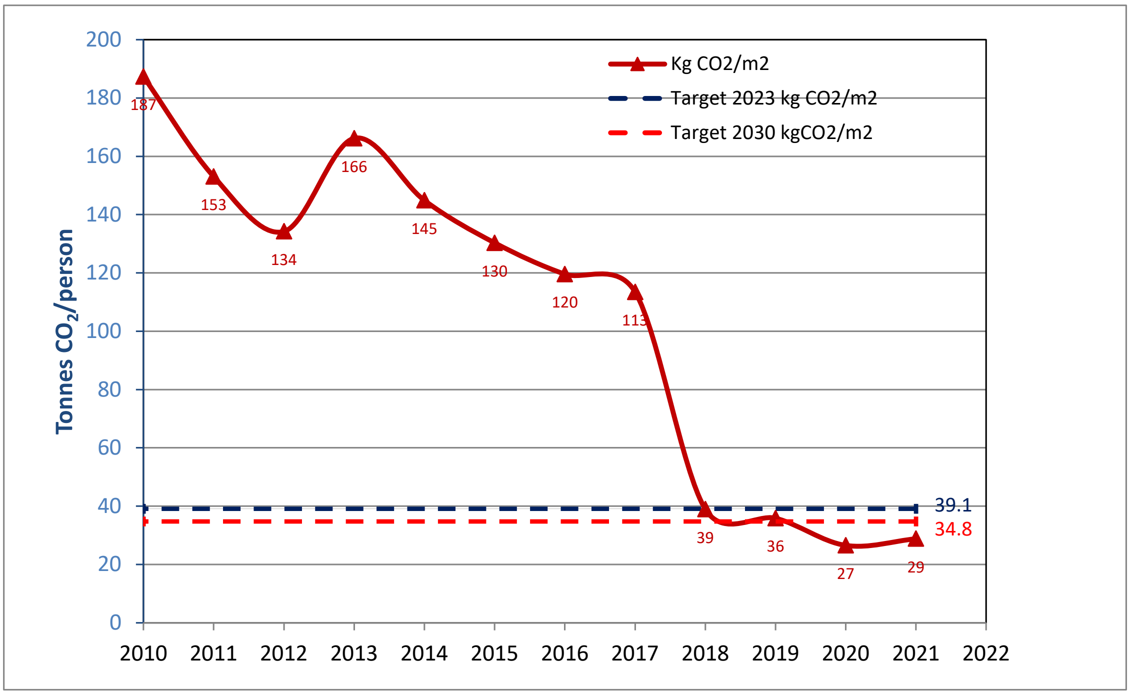
Figure C13: Total emissions from buildings' energy consumption, tonnes (indicator 2a)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	3 446	2 816	2 571	3 182	2 819	2 788	2 451	2 364	779	717	531	576
Diesel	0	0	0	0	0	0	0	4.5	0.0	0.0	0.0	0.0
Mains Gas	1 165	809	943	1 114	792	836	780	717	755	695	508	556
Electricity	2 281	2 006	1 628	2 068	2 026	1 953	1 671	1 643	12	11	11	10

Figure C14: CO_2 Emissions per capita and square metre





CO_2 emissions from buildings energy consumption were massively reduced in 2018 due to greening the electricity by certificates of origin.

The EMAS indicators 2a and 2b show the 2023 and 2030 targets. The positive trend is continued in 2021 and indicates the continuous reduction of CO_2 for buildings energy consumption, aiming to reach the 2023 and 2030 EMAS target. In the total carbon footprint, this is significant as it can be seen in figures C17 and C18.

C5.1.1 Buildings other greenhouse gases (refrigerants)

Table C8: Emissions of equivalent CO_2 emissions (tonnes) from cooling installations (indicator 2b)

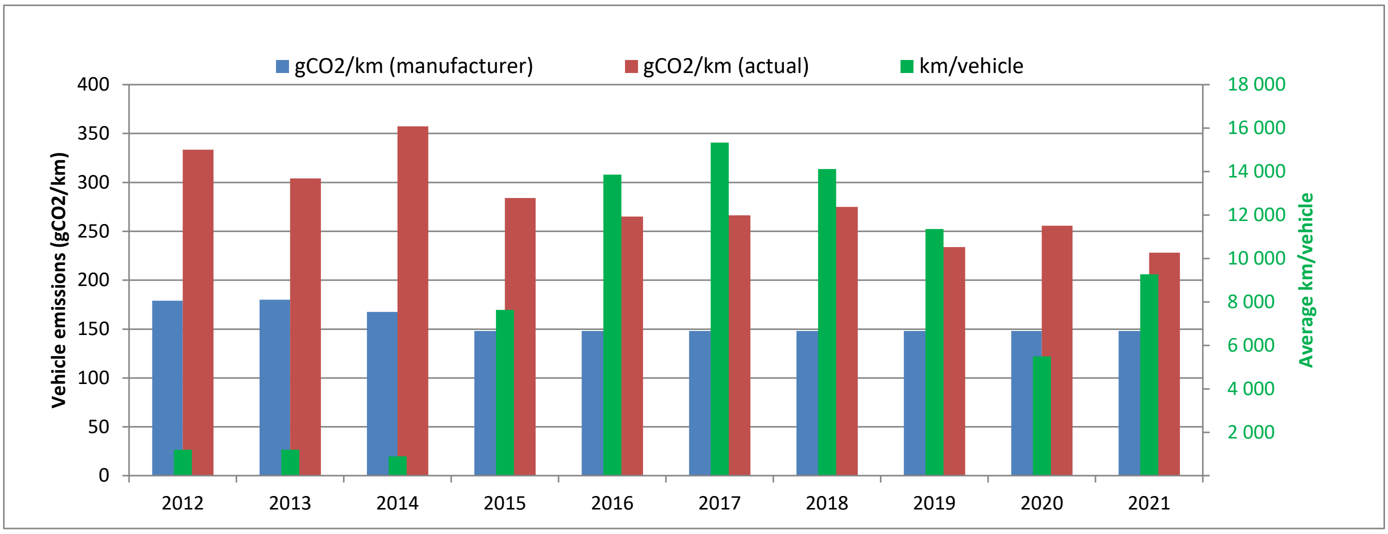
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
R410a (t CO2 e)	2.51	0.00	0.00	0.00	82.56	48.07	0.00	28.34	2.40	28.44
R407C (t CO2 e)	0.00	5.33	11.98	0.00	5.25	0.00	0.00	13.93	0.00	0.00
R507A (t CO2 e)	0.00	0.00	0.00	16.50	0.00	55.41	27.95	0.00	0.00	0.00
Total (t CO2 e)	**2.51**	**5.33**	**11.98**	**16.50**	**87.81**	**103.48**	**55.11**	**42.27**	**2.40**	**28.44**
Total Tonnes CO2e /person	**0.01**	**0.02**	**0.04**	**0.06**	**0.32**	**0.39**	**0.22**	**0.17**	**0.01**	**0.12**
Total Tonnes CO2e /m^2	**0.000**	**0.000**	**0.001**	**0.001**	**0.004**	**0.005**	**0.003**	**0.002**	**0.000**	**0.001**

In 2021, there was an increased loss from cooling installations. In the building 310 losses of refrigerant R410a were discovered.

C5.2 CO_2 emissions from vehicles (indicator 2c)

C5.2.1 Commission vehicle fleet

Figure C15: Fleet CO_2 emissions and fleet usage



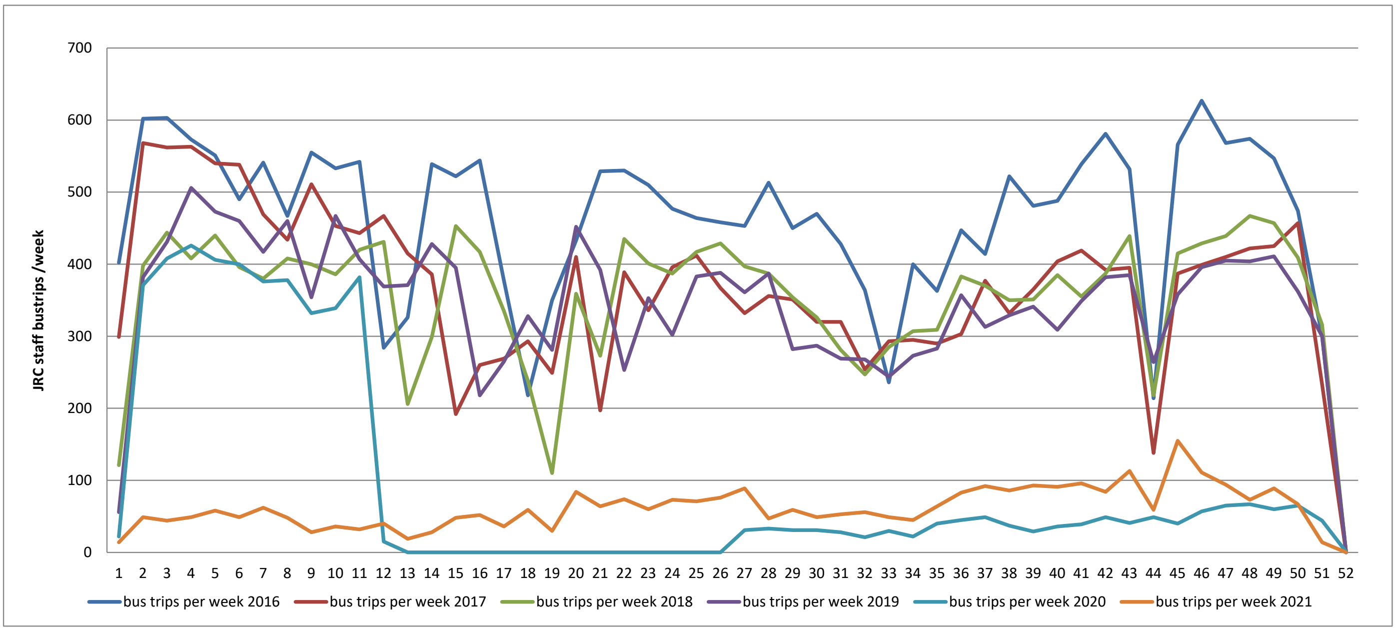
Compared to 2020, the use of the site vehicle fleet increased significantly in 2021 to an average of 9277 km per vehicle. There were no changes in vehicle fleet in the last five years and therefore manufacturer emissions per km were unchanged. The 'actual' values include upstream emissions from fuel supply and add about 25% to the total.

C5.2.2 Missions and local work based travel (excluding Commission vehicle fleet)

Missions and commuting emissions fall under scope 3 – a broad category of emissions, which includes emissions from manufacture of products procured (e.g., paper production, IT, buildings), services provided by subcontractors, and emissions generated in the extraction, production, and distribution of energy carriers. Figures C17 and C18 present the emission in total tonnage for the JRC-Petten site and the tonnage per person annually.

C5.2.3 Commuting

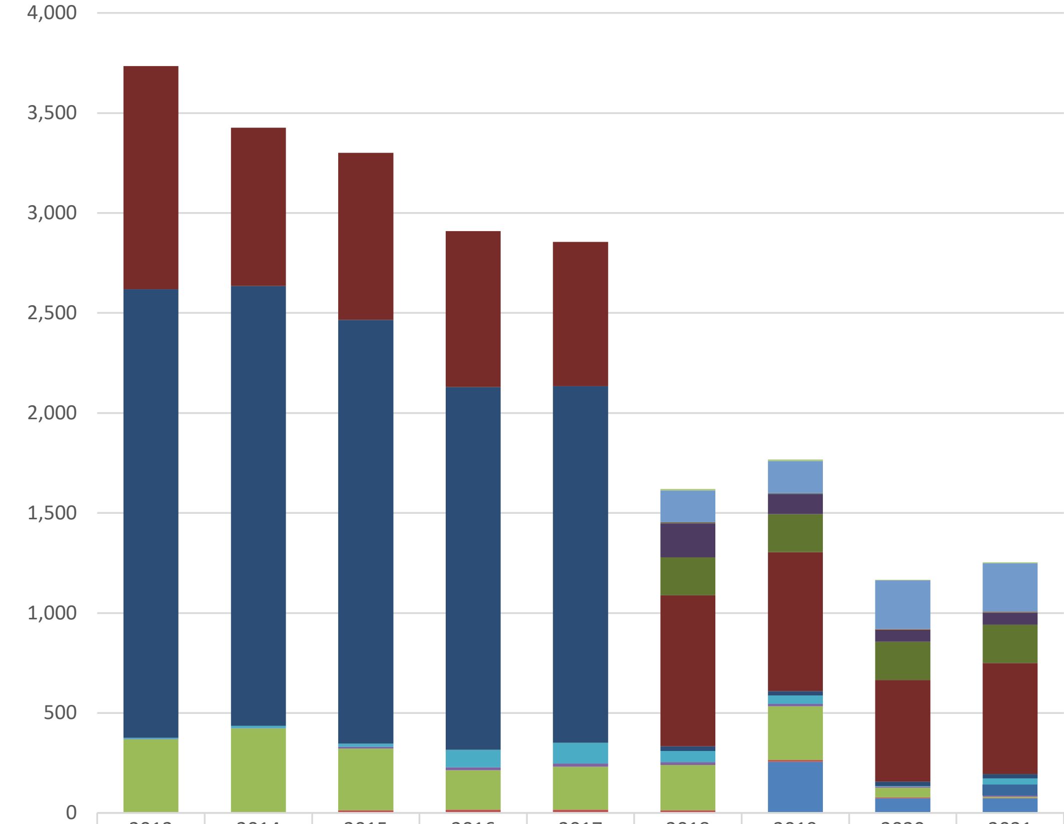
Figure C16: Petten bus service weekly usage



Due to the COVID pandemic and teleworking, the bus usage dropped in general. Compared to 2020, a slight increase in the usage of the bus service can be seen in 2021.

C5.3 Carbon footprint

Figure C17: Carbon footprint elements (Tonnes CO_2 or equivalent)



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	3,734	3,427	3,301	2,909	2,855	1,620	1,767	1,166	1,254
Own waste	0	0	0	0	0	6	6	3	5
Catering	0	0	0	0	0	0	0	0	0
Service contracts	0	0	0	0	0	160	160	244	244
Paper supply	0	0	0	0	0	2	2	2	3
Fixed assets - Commission vehicles	0	0	0	0	0	3	2	1	2
Fixed assets - IT	0	0	0	0	0	169	101	60	60
Fixed assets -buildlings	0	0	0	0	0	190	190	190	190
Buildings - fuel for heating	1,114	792	836	780	721	755	695	508	556
Buildings - electricity	2,244	2,199	2,119	1,813	1,783	24	23	22	22
Buildings - district heating/cooling	0	0	0	0	0	0	0	0	0
Buildings coolant losses	5	12	17	88	103	55	42	2	30
Teleworking emissions						0	0	0	53
Vehicle fleet fuel consumption	2	2	9	15	16	16	11	6	8
Missions air (RFI=2)	366	418	308	197	216	226	269	48	6
Missions excluding air	2	4	13	17	16	14	9	4	2
Experts' travel	0	0	0	0	0	0	0	0	0
Staff commuting	0	0	0	0	0	0	256	74	74

The carbon footprint in 2021 has slightly increased compared to 2020.

The carbon footprint summary is extended with extra scope 3 environmental impacts from waste, IT and contracting of external support. The addition of "Fixed assets - buildings" is the carbon emission made during construction divided by 35 for the yearly amount of CO_2. “Fixed assets- IT” is the collection of equipment we use, the annual CO_2 load is based on a five-year amortization. “Services contracts” are the external experts and services such as security guards and cleaning.

Table C9: Carbon footprint per scope (tonnes of CO_2/person)

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Scope 1: Fuel consumption and fugitive emissions									
Fuel for bldgs: mains gas	3.47	2.30	2.46	2.31	2.23	2.49	2.30	1.70	1.91
Fuel for bldgs: tanked gas (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel for bldgs: diesel	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Biomass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commission vehicle fleet	0.01	0.00	0.02	0.04	0.05	0.05	0.03	0.02	0.03
Refrigerants	0.02	0.04	0.06	0.32	0.39	0.22	0.17	0.01	0.12
Scope 2: Purchased energy									
External electricity supply (grey),	7.86	7.19	7.02	6.06	6.25	0.00	0.00	0.00	0.00
External electricity supply contract (renewables), combustion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
District heating (combustion) (2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scope 3: Other indirect sources									
Fuel for bldgs: mains gas (upstream)	0.77	0.51	0.55	0.51	0.50	0.55	0.49	0.36	0.40
Fuel for bldgs: tanked gas (upstream) (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel for bldgs: diesel (upstream)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commission vehicle fleet (upstream)	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01
Site generated renewables (upstream) (3)	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.04
External grey electricity supply, line losses	0.67	0.61	0.60	0.51	0.53	0.00	0.00	0.00	0.00
External 'renewables' electricity contract (upstream with line loss)	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.04	0.04
District heating (upstream) (2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Business travel: air (combustion)	1.39	1.48	1.11	0.71	0.82	0.91	1.08	0.20	0.02
Business travel: rail (combustion)	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00
Business travel: hire car (combustion)	0.00	0.01	0.01	0.02	0.01	0.00	0.00	0.00	0.00
Business travel: private car (combustion)	0.01	0.00	0.02	0.04	0.05	0.05	0.03	0.02	0.00
Experts' travel: air emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Experts' travel: rail emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commuting (combustion) (4)	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.30	0.31
Fixed assets - buildings	0.00	0.00	0.00	0.00	0.00	0.77	0.76	0.77	0.79
Fixed assets - IT	0.00	0.00	0.00	0.00	0.00	0.68	0.41	0.24	0.25
Fixed assests - Commission vehicles	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01
Paper supply	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
Service contracts	0.00	0.00	0.00	0.00	0.00	0.65	0.64	0.99	1.02
Catering	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Own waste	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.01	0.02
Teleworking emissions (equipment electricity use)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Teleworking emissions (fixed assets, equipment)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Teleworking emissions (space heating)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
Sum	**14.2**	**12.2**	**11.9**	**10.5**	**10.9**	**6.5**	**7.1**	**4.7**	**5.2**

Note: excludes commuting

C5.4 Total air emissions of NO_x

Table C10: NO_x emission

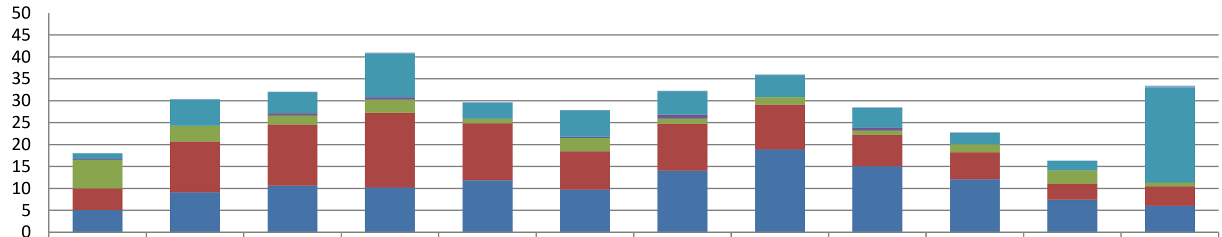
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total NOx emission (tonnes)		0.772	0.540	0.660	0.779	0.564	0.613	0.564	0.425	0.448	0.417	0.308	0.320
Change %			-30	22	18	-28	9	-8	-25	5	-7	-26	4

NO_x is generated by heating installation as by-product of the combustion, especially when the temperatures are high. In 2017, there has been a significant decline due to the new low temperature heating installation in building 310. Compared to 2020, a slight increase was recorded in 2021. .

C6 Improving waste management and sorting

C6.1 Non-hazardous waste

Figure C18: Evolution of total non-hazardous waste in Petten (tonnes)



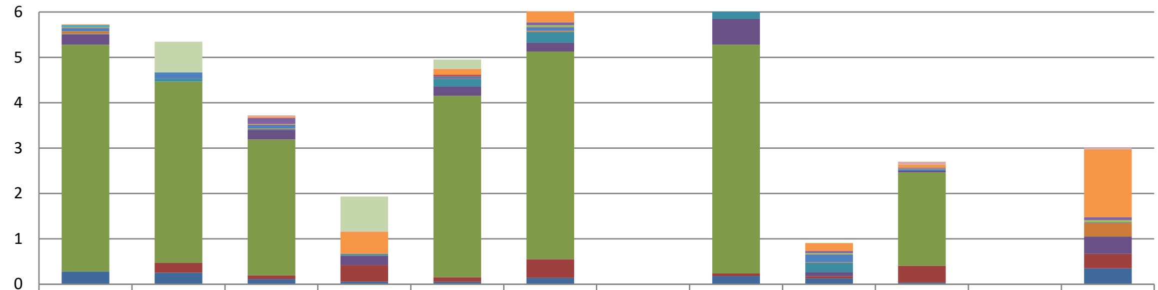
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	18.0	30.3	32.0	40.8	29.6	27.8	32.2	35.9	28.4	24.2	16.3	83.9
Total (tonnes/person)	0.078	0.132	0.120	0.155	0.105	0.100	0.117	0.136	0.115	0.097	0.066	0.349
Metal	1.3	6.0	4.8	10.1	3.7	6.0	5.4	5.1	4.5	2.7	2.2	21.7
Glass	0.2	0.0	0.6	0.5	0.0	0.3	0.9	0.0	0.7	0.0	0.0	0.0
Wood	6.5	3.6	2.1	2.9	1.1	3.1	1.2	1.7	1.0	1.8	3.0	0.9
Paper and cardboard	4.9	11.6	13.9	17.1	12.9	8.7	10.7	10.2	7.1	6.2	3.7	4.4
Household waste	5.1	9.1	10.6	10.2	11.9	9.7	14.0	18.9	15.0	12.1	7.4	6.0

In 2021 a remarkable increase in non-hazardous waste was recorded. The reason for the significant rise is the removal of two cranes and therefore, the increase of metal waste. The graph does not contain the value for “other waste” like removal of bird debris, which in 2021 was 51 tonnes. Furthermore, it can be seen that the amount of household waste further decreases.
It is to be noted that the waste collection company was not able to deliver the waste invoices for several months. Therefore, the waste data is based on waste tickets.

Also, in 2021, a new waste contract went into force at JRC-Petten leading to the separation of additional waste streams.

C6.2 Controlled waste

Figure C20: Evolution of total hazardous waste in Petten (tonnes)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	0.731	1.346	0.722	1.934	0.957	2.888	0.000	6.549	0.904	2.794	0.000	3.052
Total (tonnes/person)	0.003	0.006	0.003	0.007	0.003	0.010	0.000	0.025	0.004	0.011	0.000	0.013
Developer	0.000	0.665	0.000	0.769	0.200	0.741	0.000	0.237	0.000	0.000	0.000	0.000
Asbestos material	0.000	0.000	0.023	0.001	0.001	0.020	0.000	0.004	0.000	0.069	0.000	0.049
Mercury containing objects	0.000	0.004	0.000	0.006	0.009	0.010	0.000	0.004	0.000	0.000	0.000	0.000
Lead-acid battery	0.018	0.000	0.032	0.477	0.125	0.900	0.000	0.114	0.173	0.067	0.000	1.484
Fire extinguisher	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluorescent lamps	0.000	0.000	0.134	0.000	0.001	0.059	0.000	0.092	0.045	0.021	0.000	0.069
Medical waste	0.012	0.007	0.011	0.006	0.001	0.040	0.000	0.012	0.026	0.008	0.000	0.044
Spray cans	0.014	0.000	0.014	0.003	0.040	0.010	0.000	0.000	0.007	0.000	0.000	0.000
Solvent	0.064	0.144	0.072	0.000	0.050	0.076	0.000	0.031	0.172	0.040	0.000	0.015
Paint	0.060	0.001	0.018	0.010	0.010	0.026	0.000	0.000	0.011	0.000	0.000	0.302
Metal containing waste	0.007	0.056	0.015	0.035	0.164	0.234	0.000	0.207	0.201	0.000	0.000	0.000
Waste Oil	0.235	0.000	0.210	0.207	0.201	0.198	0.000	0.566	0.093	0.033	0.000	0.382
Electrical equipment (WEEE)	5.000	4.000	3.000	0.000	4.000	4.580	0.000	5.046	0.000	2.060	0.000	0.000
Laboratory mixed waste	0.000	0.216	0.080	0.365	0.104	0.414	0.000	0.059	0.048	0.373	0.000	0.320
Batteries	0.278	0.253	0.113	0.055	0.051	0.137	0.000	0.177	0.128	0.032	0.000	0.348

In 2020, there was no hazardous waste collected on site due to the renewal of the waste contract.

The amount of disposed hazardous waste increased in 2021. The main contributor were removal of “Lead-acid batteries”, “Waste Oil”, “Batteries” and “Laboratory mixed waste”.

C6.3 Waste sorting

Table C11: Percentage of waste sorted at JRC-Petten

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Percentage of waste unsorted	27.1	28.8	32.5	23.9	39.0	31.7	43.5	44.5	51.3	44.9	45.6	6.9
Percentage of waste sorted	72.9	71.2	67.5	76.1	61.0	68.3	56.5	55.5	48.7	55.1	54.4	93.1

The percentage of sorted waste increased significantly in 2021. In late summer 2020, new waste bins were installed on site, supporting the increased separation of different waste streams.

A new waste contract came into effect in 2021.

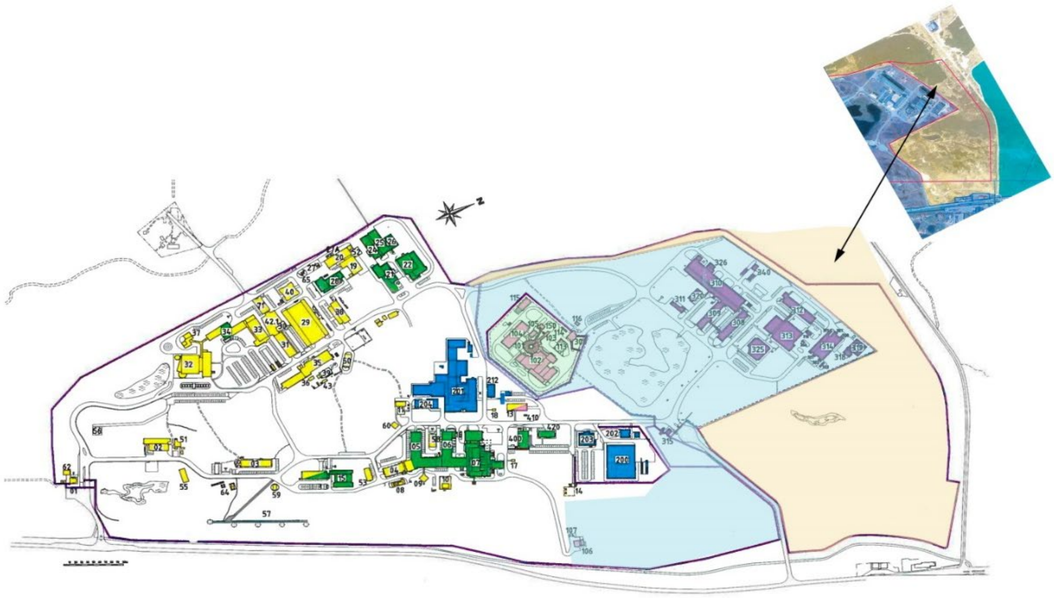
C7 Protecting biodiversity

Due to a new calculation of the different parts of surface required by Annex IV, the following values count for the JRC-Petten site:

1. Total use of land in m^2: 332.500 m^2
2. Total sealed area in m^2 59.909 m^2
3. Total nature-oriented area on site: 75.591 m^2
4. Total nature-oriented area off site 197.000 m^2.

Slightly over a third of the JRC-Petten site is designated under Natura 2000.

Figure C21: JRC Petten premises and Natura 2000 area



The map (figure C21) shows the Natura2000 area in beige, which lies within the outer fences of JRC-Petten.

According to Annex IV, land-use with regard to biodiversity is an important aspect. In 2019, an external company was asked to perform a nature management plan for the Nature oriented area, a Natura-2000 dune area adjacent to the JRC-Petten premises. The results were delivered in 2020 and three different scenarios to improve the biodiversity and protect endangered species and habitats were suggested.

In 2021, JRC-Petten received a budget to implement the advanced scenario for nature preservation and restoration in order to achieve the goal to sustain biodiversity on site. The same year, the site invited the responsible forester from the National Forestry (Staatsbosbeheer) to show the Natura 2000 area.

C8 Green Public Procurement

C8.1 Incorporating GPP into procurement contracts

No new specific actions have been undertaken in 2020 but environmental criteria have systematically been considered when defining selection and award criteria in procurement, where possible.

C9 Demonstrating legal compliance and emergency preparedness

C9.1 Management of the legal register

JRC-Petten maintains a register of legal requirements for environmental aspects, which is updated every six months. The site has a contract with an external legal consultancy filtering the applicable legislation in an online tool. JRC-Petten has access to the online tool and extracts the register of legal requirements from there. Additionally, the register is updated after having meetings (online) with the external legal consultancy informing about new and/or changing legislation. Any significant change with significant impact is communicated to the relevant staff. Examples of relevant changes were; labelling of lithium batteries during transport, authority changes in asbestos removal. The Environmental license for the JRC-Petten site was obtained on 24th of June 2016.

C9.2 Prevention and risk management

JRC-Petten site applies risk- based management for safety and environmental aspects; work place assessments, general risk inventories and risk assessments for specific tasks.

C9.3 Emergency preparedness

The organisation's emergency plans were revised in 2021 based on 55 identified emergency scenarios. They are based on risk management methodologies and also cover environmental risks. In 2021 there was an Emergency Drill exercise in order to practice and test all elements of the emergency plans. Contacts with the local quick response team (QRT, formerly fire brigade, operated by the neighbour organisation NRG) have been established in order to identify environmental risks. Due to the pandemic, no exercises for emergency preparedness could be performed.

C10 Communication

C10.1 Internal communication

In 2021, there were:

- 5 newcomer trainings
- 17 internal environmental communications focusing on the topics: Waste, EMAS Audit, Greening the Commission
- 2 presentation to the C.1 Energy storage unit

- 2 Safety and environmental tours

C10.2 External communication and stakeholder management

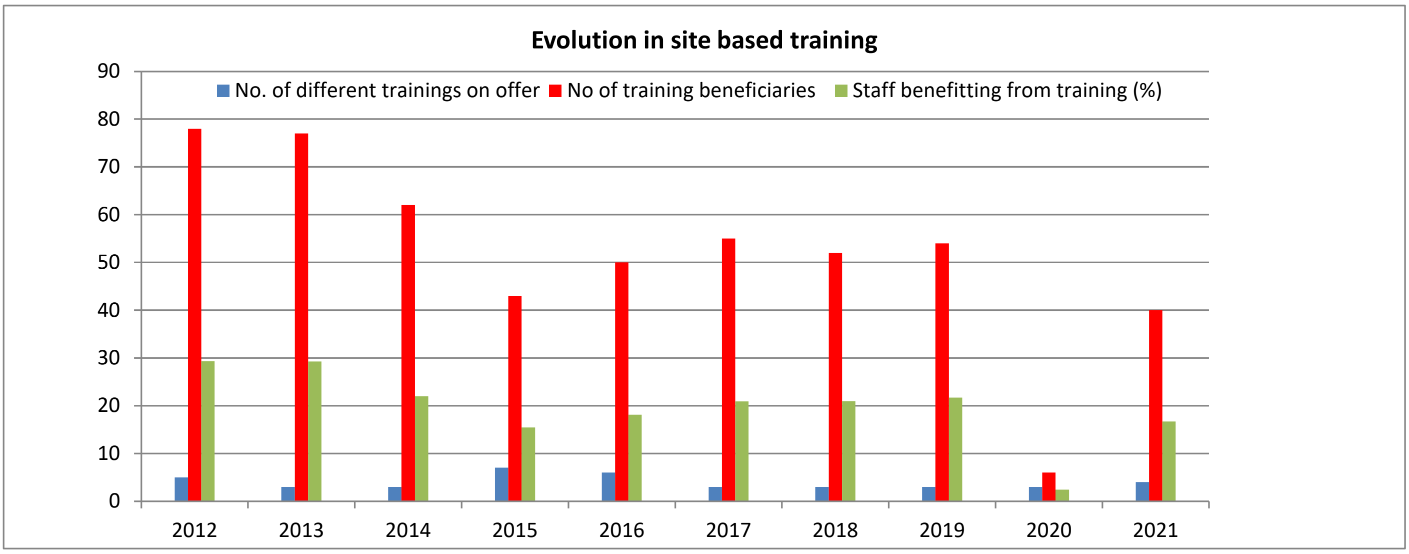
Table C13: External stakeholder communication

Stakeholder	Purpose
Municipality Schagen	In the context of the fence of the site (Omgevingsvergunning)
Province Noord-Holland	In the context of geothermal well, inspection of reported values
Hoogheemraadschap Hollands Noorderkwartier	In the context of wastewater pollution measurements
Omgevingsdienst Nordzeekanaalgebied	In the context of yearly notification with regard to heat storage in the geothermal system
AMART	Wastewater pollution measurements 'afvalwaterputten'
Flora & Fauna committee	Foster and stimulate bio diversity
Municipality Schagen (RUD)	Check on granted and planned permits
Energy and Health Campus (EHC)	In the context of the fence and zoning plan of the site
National forestry (Staatsbosbeheer)	Collaboration in nature management and biodiversity
JRC Ispra	Communication of stakeholders expectations

C11 Training

C11.1 Internal training

Figure C22: Evolution of site based training



In 2021, JRC-Petten organised five newcomer sessions, for a total of 40 newcomers. The drop of site based trainings can be explained by the COVID pandemic.

C11.2 External training

The JRC-Petten EMAS site coordinator and the JRC-Petten Environmental Officer participated to the following two EMAS site coordinators workshops.

- MS Teams, March 5/9/12, 2021
- MS Teams, November 30, December 3/10, 2021

C12 EMAS Costs and saving

Table C14: EMAS administration and energy costs for buildings in the Petten EMAS area

Item	Costs												Change in last year
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Total Direct EMAS Cost (EUR)	0	0	66,000	66,000	66,000	67,000	67,000	69,000	74,000	75,000	76,000	78,500	1,000
Total Direct Cost per employee	0	0	248	251	234	241	243	262	298	301	308	327	6
Total buildings energy cost (Eur)	430 950	345 762	324 714	399 680	345 359	343 937	330 934	678 460	331 126	306 750	257 700	257 587	-49,049
Total buildings energy cost (Eur/person)	1 858	1 510	1 221	1 520	1 225	1 237	1 199	2 580	1 335	1 232	1 043	1 073	-189
Total fuel costs (vehicles) (Eur)	0	0	820	970	821	4,046	6,796	7,400	7,034	4,849	2,423	3,624	-2,426
Total energy costs (Eur/person)	0	0	3	4	3	15	25	28	28	19	10	15	-10
Total water costs (Eur)	5 338	13 040	15 250	10 130	6 282	6 500	7 754	5 901	3 968	4 897	4 442	2 700	-455
Water (Eur/person)	23	57	57	39	22	23	28	22	16	20	18	11	-2
Total paper cost (Eur)	15 632	7 731	12 912	8 805	7 531	9 219	3 872	4 848	3 760	7 614	1 845	1 715	-5,769
Total paper cost (Eur/person)	67	34	49	33	27	33	14	18	15	31	7	7	-23
Waste disposal (general) - unit cost/tonne	90	90	90	90	90	90	90	90	90	90	90	90	0
Waste disposal (general) - Eur/person	6.98	11.90	10.82	13.98	9.43	9.00	10.50	12.28	10.31	8.74	5.94	31.45	-2.79
Waste disposal (hazardous) - unit cost/tonne	750	750	750	750	750	750	750	750	750	750	750	750	0
Waste disposal (hazardous) - Eur/person	2.36	4.41	2.04	5.52	2.55	4.12	4.12	4.12	4.12	4.12	4.12	4.12	0.00

C13 Wastewater quality

Table C15: Wastewater quality tested at JRC-Petten

Emissions to wastewater		2013	2014	2015	2016	2017	2018	2019	2020	2021
Substance	**Limit mg/m^3**									
Chloride (Cl-)	-	210	200	240	120	250	160	140	120	110
Release of heavy metals to the sewer system										
Mercury (Hg) - Limit 10mg/m3	10	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	<0.1	0.15	0.28
Cadmium (Cd) - Limit 20mg/m3	20	<0.4	<0.4	<0.4	<0.4	<0.4	0.53	0.46	0.56	<0.4
Zinc (Zn)	The sum of 5 metals < 5000	300	120	120	140	180	210	150	220	170
Copper (Cu)		160	180	170	160	220	330	210	290	200
Nickel (Ni)		5	5	5	8,2	7,9	19	5.3	7.3	<5.0
Chromium (Cr)		5	5.8	6.3	<5	<5	<5	<5.0	<5.0	<5.0
Lead (Pb)		5	5	0	<5	<5	<5	<5.0	8.8	7.2
Arsenic (As)		1.5	1.5	0	<1,5	1,5	1,8	<1.5	4.8	1.7
Metals: the sum of the 5 highest values - 5000 mg/m^3		475	316	301	308	408	565	365	531	379
EOX (plug monsters) organohalogen compounds -	1 000	<100	<100	<100	<100	<100	NR	<100	<100	<100
Silver and organic solvents										
Silver	1 000	330	330	300	310	-	-	-	-	-
organic solvents (sum Aromats + sum Chloranilifates)	1 000	2.5	2.5	2.5	2.5	0,626	NR	NR	NR	NR
Wastewater discharge (m^3)										
Wastewater from chemical laboratiries in 312 (m^3)*	-	not emptied	4	4	4	2,8	2,9	2,10	2,11	26.6
The total discharge of waste water to the sewers (m^3)	-	5 567	3 060	3 060	3 150	2 784	2 785	2 786	2 787	2 788

**Collected in separate tanks and emptied by an external certified company, in m3*

Wastewater discharge and quality is measured yearly during a week determined by the authorities and during which the discharge volume is measured along with concentration of heavy metals, organic solvents and chlorides. The data from this measurement is used as basis for taxation. For monitoring purposes, two separate investigations are conducted each year on four emission points, each located in different laboratories. These results give an indication of whether concentrations comply with legal limits for end of pipe discharge for the site.

C14 Conversion factors for JRC-Petten

Table C16: Conversion factors for JRC-Petten

Conversion factors	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
kWh of energy provided by one litre diesel	10.89	10.89	10.89	10.89	10.89	10.89	10.89	10.62	10.58	10.58
kWh of energy provided by one litre petrol	9.42	9.42	9.42	9.42	9.42	9.42	9.42	9.42	9.46	9.46
Paper Density (g/m2)	80.0	80.0	80.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Kgs CO2 from 1 kWh of electricity (if grid average..)	0.671	0.671	0.671	0.671	0.586	0.586	0.000	0.000	0.000	0.000
Kgs CO2 from 1 kWh natural gas	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Kgs CO2 from 1 kWh diesel fuel	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.324	0.324	0.324
Kgs CO2 from one litre of diesel	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16
Kgs CO2 from one litre of petrol	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.808	2.808
Annual cost of one FTE (EUR)	132 000	132 000	132 000	134 000	134 000	138 000	148 000	150 000	152 000	157 000

The conversion factors for CO_2 are adapted for values sourced by: Base Carbone, ADEME, 2017

C15 Site breakdown performance of selected parameters

Table C17: Site breakdown in building usage

Building	Address	Occupant	EMAS registration	Useful surface area (m^2)	Staff	Office	Café	Self rest	Creche/ child care	Printing and mail sorting	Medical service	Depot, large storage	Workshop	Sports/ recreation centre	IT Server centre	Power generation	Water treatment plant	Lab/experimental (non nuclear)	Nuclear lab/experimental
308	Office building	JRC-Petten	NL 2013/01	2227	75	x													
309	Office building	JRC-Petten	NL 2013/01	1994	75	x													
310	Large experimental hall	JRC-Petten	NL 2013/01	4083	0													x	x
311	Smart grid laboratory	JRC-Petten	NL 2013/01	340	0													x	
312	Office building with some smaller laboratories	JRC-Petten	NL 2013/01	4536	50	x												x	
313	Offices, central store, mechanical workshop, storage, library, gym	JRC-Petten	NL 2013/01	2668	40	x						x	x	x	x			x	
314	Office, laboratory,	JRC-Petten	NL 2013/01	1408	15	x												x	
315a	Temporarily reception building	JRC-Petten	NL 2013/01	82	2	x													
316	Gas storage	JRC-Petten		0	0							x							
317	Boiler room	JRC-Petten		0	0							x							
318	Gasses distribution	JRC-Petten		0	0							x							
319	laboratory "Bunker"	JRC-Petten		0	0													x	
320	Offices	JRC-Petten	NL 2013/01	240	5	x													
321322323	Small storage	JRC-Petten		78	0							x							
324	Chemical waste storage	JRC-Petten		13	0							x							
325	Office building with some smaller laboratories	JRC-Petten	NL 2013/01	1601	15	x												x	
326	Gasses distribution	JRC-Petten		40	0							x							
327, 328	Small storage	JRC-Petten		36	0							x							
329	Bicycle and motor garage	JRC-Petten		68	0							x							
333	Controlroom Bunker	JRC-Petten	NL 2013/01	65	0								x					x	
340	Storage (maintenance, cars, workshop)	JRC-Petten	NL 2013/01	752	0							x	x						
351, 352	Small infra buildings	JRC-Petten		30	0							x							

EUROPEAN COMMISSION

Environmental Management System

EMAS
VERIFIED ENVIRONMENTAL MANAGEMENT
BE-BXL-000003

Environmental Statement 2022

2021 results

Annex D: JRC-Geel

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ANNEX D: JRC-GEEL – Scientific Activities

JRC-Geel was founded in 1957 under the Treaty of Rome (the Treaty establishing the European Atomic Energy Community, Article 8) and started operating, in 1960, under the name of the "Central Bureau for Nuclear Measurements (CBNM)". In 1993, it was renamed the "Institute for Reference Materials and Measurements (IRMM)" to reflect the new mission of the Institute, covering a wider range of scientific domains including food safety and environmental protection. On 1 July 2016, as part of a major re-organisation of the JRC, the centre was renamed "JRC-Geel".

Over more than sixty years of its existence, the number of facilities on the JRC-Geel site has expanded to host new non-nuclear and nuclear activities. All facilities and infrastructure have been progressively and steadily renewed and maintained.

Since the EMAS registration of the European Commission (encompassing implicitly all its Directorates in 2011), JRC-Geel has started to develop environmental measures and strategies to involve in EMAS.

In 2021, the Commission adopted a Communication on Greening the Commission describing how it will become carbon neutral by 2030 and promote circular economy and biodiversity. Measures will be progressively implemented that will contribute towards a Commission wide reduction of 60 % emissions with remaining emissions to be subject to carbon removal credits.

D1 Overview of core indicators at JRC-Geel since 2011

Since 2011, JRC-Geel has been collecting data on its site, which are identified as core indicators. The data values compiled in 2011 and from 2014 to 2021 are shown in **Table D1**, along with performance trends and targets where applicable for 2021 and the establishment of new targets for 2023 and 2030.

Reporting and the COVID-19 pandemic:

Reporting for 2021 retains the same approach for continuity, as previous years, and is therefore based on site activity and total staff numbers.

The data will therefore reflect the impact of a very significant staff absence on facilities operation.

The EMAS Corporate Coordination Team has estimated the **environmental impact of teleworking** focussing particularly on energy consumption and CO2 emissions **(**with high level assumptions for paper, water consumption and waste disposal).

These impacts are referenced separately to regularly reported data for the buildings in the following sections of this report.

Table D1: Historical data, performance and targets for core indicators proposed for Commission-level reporting

Physical indicators: (Number, description and unit)	Historic data values 2011 (1)	2014	2018	2019	2020	2021	Performance since: 2011 Δ%	2014 Δ%	Future targets 2014-23 Δ% (2)	2014-30 Δ% (2)	Future targets 2023 value (2)	2030 value (2)
1a) Energy bldgs (MWh/p)	60.62	**51.21**	53.09	49.81	44.35	**47.72**	-21.3	-6.8	-6	-7.5	48.14	47.37
1a) Energy bldgs (KWh/m^2)	427	**363**	272	258	233	**248**	-42	-31.7	-29	-35	258	236
1c) Non ren. energy use (bldgs) %	0	**99.5**	31.8	28.9	30.5	**35.4**		-64.4	-71	-75	28.9	24.9
1d) Water (m^3/p)	79.57	**34.75**	28.97	28.61	22.74	**23.36**	-70.6	-32.8	-18	-20	28.5	27.8
1d) Water (L/m^2)	560	**246**	246	195	157	**142**	-74.7	-42.4	-40	-45	148	135
1e) Office paper (Tonnes/p)		**0.022**	0.012	0.013	0.004	**0.005**		-75.8	-55	-65	0.01	0.008
1e) Office paper (Sheets/p/day)		**20**	11	12	4	**5.3**		-74.2	-55	-65	9.2	7.1
2a) CO_2 buildings (Tonnes/p)	17.57	**14.83**	4.94	4.16	3.88	**4.92**	-72	-66.8	-78	-90	3.26	1.48
2b) CO_2 buildings (kg/m^2)	124	**105**	25	22	20	**26**	-79.4	-75.7	-82.5	-90	18.4	10.5
2c) CO_2 vehicles (g/km, manu.)		**Not avail**	0	0	0	**0**			0	0	0	0
2c) CO_2 vehicles (g/km, actual)		**Not avail**	Not avail	Not avail	0	**0**						
3a) Non haz. waste (Tonnes/p)	0.267	**0.479**	0.292	0.249	0.151	**0.225**	-15.7	-53	-50	-55	0.24	0.216
3b) Hazardous waste (Tonnes/p)	0.075	**0.079**	0.067	0.081	0.019	**0.056**	-25.2	-29.5				
3c) Unseparated waste (%)	16.427	**29.039**	28.642	24.908	33.93	**27.607**	68.1	-4.9	-14.5	-15	24.8	24.7
3c) Unseparated waste (T/p)	0.056	**0.162**	0.103	0.082	0.058	**0.078**	38.2	-52.2	-58	-64	0.068	0.058
Economic indicators (Eur/p)												
Energy consumption (bldgs)	5 181	**3 866**	4 029	4 811	3 826	**4 417**	-14.7	14.2				
Water consumption	84	**39**	87	90	72	**67**	-20.4	71.6				
Non haz. waste disposal			156	145	118	**136**						

Note: (1) Earliest reported data, for a reduced scope of buildings (and not directly comparable with current scope)

(2) Draft figures from the Global Anual Action Plan 2022

The evolution of the EMAS system in JRC-Geel is shown below in **Table D2**.

Table D2: EMAS baseline parameters

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Population: total staff	331	322	341	346	328	296	265	259	262	266	**263**
Total no. operational buildings	14	14	14	15	16	16	16	16	16	17	**17**
Useful surface area for all buildings, (m2)	46,996	46,996	46,390	48,815	50,538	50,538	50,382	50,499	50,525	50,651	**50,650**

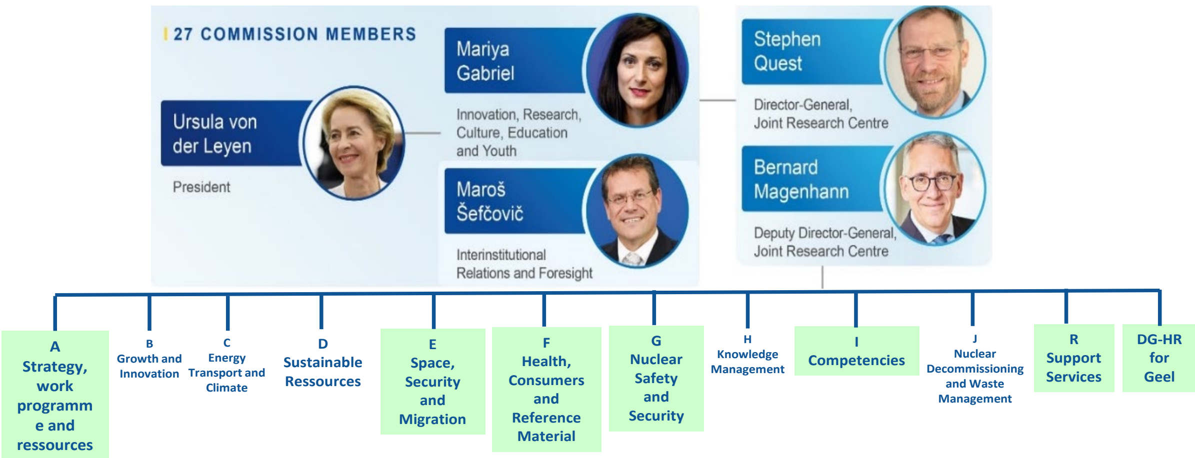
In 2021, JRC-Geel underwent a decrease in the number of employees (by -1,1 % compared to 2020) as well as a negligible reduction of its useful surface area for all buildings (1 m^2 less), as shown in **Table D2,** due to the building of a new high voltage cabine as well as a new pumping station and the demolition of the old one.

D2 JRC-GEEL activities[1], context, key stakeholders and environmental aspects

D2.1 Activities

The JRC, a Directorate-General of the European Commission (EC), is under the responsibility of Mariya Gabriel, Commissioner for Innovation, Research, Culture, Education and Youth. The JRC employs over 3,000 staff, comprising scientists, researchers as well as administrative and support staff coming from all over the EU.

JRC headquarters are located in Brussels while its research facilities are spread in 5 Member states: Belgium (Geel); Germany (Karlsruhe); Italy (Ispra); The Netherlands (Petten); Spain (Seville). The JRC is a key player in providing scientific and technical support to EU policies foreseen by the Horizon Europe Work Programme (2021-2027); the EU's programme for research and innovation.



JRC-Geel hosts EC staff from seven different Directorates (Directorates A, E, F, G, I and R of the JRC and DG-HR for Geel in 17 different buildings.

[1] NACE codes associated with Geel activities are: 99 – Activities of extraterritorial organisations and bodies; 71.2 Testing and technical analysis; 72.1 Research and experimental development in natural sciences and engineering

While JRC-Geel staff reports to different Directors, the site operates under the responsibility of a single Site Director, Guy Van den Eede, the acting Director of the F Directorate for Health, Consumers and Reference Materials since 16 November 2019.

The scientific laboratory activities fall under the responsibility of:

- Directorate E: Space, Security and Migration

  Unit E.5 Transport and Border Security's mission is to contribute to improving transport safety levels in the EU in a growing, and increasingly intermodal transport system; provide standards, tools and services which can be deployed throughout the transport sector and used for harmonised reporting for maritime, air and rail traffic as well as border security aspects; evaluate the impact of new technologies on the security of the shipping container supply chain and technological support to the EU's Maritime project on the Common Information Sharing Environment for maritime surveillance.

- Directorate F: Health, Consumers and Reference Materials with units F.4, F.5, F.6.

  - Unit F.4 Fraud Detection and Prevention's mission is to produce, collect and validate the evidence base necessary for detecting and preventing fraud in the food chain and contribute to the fight against illicit consumer products.
  - Unit F.5 Food and Feed Compliance's mission is to support the harmonised implementation of food and feed legislation through the provision of reliable measurement solutions and standards for evidence based decision-making concerning the safety of the food chain. Unit F.5 also supports EU policy makers in tackling upcoming policy initiatives in the field of food and feed market authorisations and controls, such as for food allergens, contaminants, feed additives, food contact materials and Genetically Modified Organisms (GMOs). JRC-F.5 additionally operates all JRC-hosted European Union Reference Laboratories related to food safety and GMOs.
  - Unit F.6 Reference Materials' mission is to perform pre-normative research, to provide science-based policy advice and to develop, disseminate and promote measurement standards in support of EU policies for biotechnology, health, environment, energy and engineering including advanced materials and nanotechnology.

- Directorate G: Nuclear Safety and Security

  Unit G.2 Standards for Nuclear Safety, Security and Safeguards' mission is to provide high-quality reference nuclear data, measurement standards, science-based policy advice and training in support of EU policies related to nuclear safety, security and safeguards. Unit G.2 operates two accelerator-based nuclear data facilities, an underground laboratory, radionuclide metrology and nuclear reference materials laboratories. The unit cooperates closely with international organisations and offers relevance-driven open access to its nuclear facilities for external researchers from EU Member States and countries associated to the Euratom Research Programme.

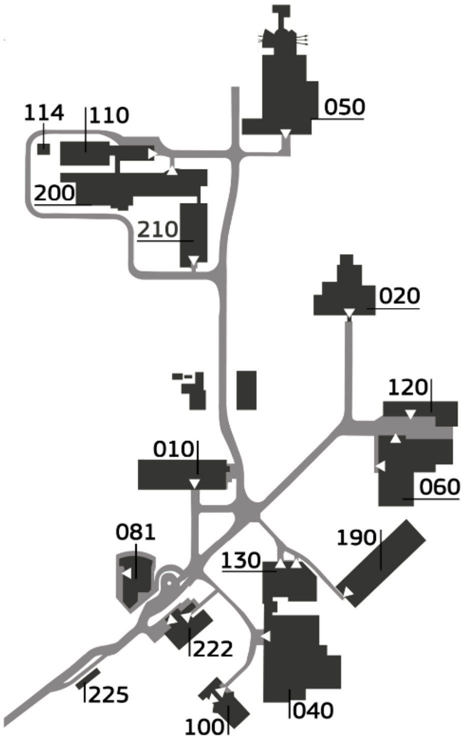
JRC-Geel's units of Directorates A (Strategy, Work programme and Resources), I (Competences), R (Support Services) carry out scientific, technical and support tasks without maintaining laboratories on the site.

JRC-Geel is located 80 km northeast of Brussels and 7 km north of Geel in Belgium, as shown in **Figure D1**.

Figure D1: Location of JRC-Geel (North of the city of Geel)

The facilities are spread throughout the site, as shown in **Figure D2**.

Figure D2: JRC-Geel site layout



JRC - GEEL SITE BUILDING'S NAME

010 ADMINISTRATIVE / SCIENTIFIC BUILDING
020 SCIENTIFIC BUILDING
040 SCIENTIFIC BUILDING
050 SCIENTIFIC BUILDING
060 ADMINISTRATIVE BUILDING
081 CAFETERIA
100 CONFERENCE BUILDING
110 SCIENTIFIC BUILDING
114 SCIENTIFIC BUILDING
120 GARAGES
130 SCIENTIFIC BUILDING
190 SCIENTIFIC BUILDING
200 SCIENTIFIC BUILDING
210 ADMINISTRATIVE BUILDING
222 ENTRANCE BUILDING
225 INCOMING GOODS BUILDING

D2.1.1 Analytical laboratories

JRC-Geel houses many analytical laboratories carrying out cutting edge chemical, biochemical, microbiological, biotechnological, and physical analytical work in fields such as food safety and quality, environment, clinical measurements, aviation and nuclear safety and security. The biotechnological and biochemical research are performed at JRC-Geel in biosafety levels 1 and 2 laboratories allowing work with hazardous materials.

These laboratories are equipped with sophisticated analytical instrumentation enabling multiple applications with a full range of spectrometric techniques including isotopic mass spectrometry, chromatography and hyphenated techniques and state-of-the-art sample preparation techniques.

JRC-Geel also owns mass metrology instrumentation enabling ultra-precise weighing.

D2.1.2 Reference materials processing and storage facility

JRC-Geel is a major certified reference material (CRM) producer, recognised worldwide and market leader in provision of GMO reference materials, among others. The range of reference materials produced at JRC-Geel varies from pure chemicals (including nuclear materials) to clinical, agricultural, food and environmental samples, so called matrix reference materials. To cope with the increasing world-wide demand for new reference materials for a broadening range of applications, JRC-Geel renewed its reference materials processing installations, in 2010, to create a unique scientific and technical facility among the major CRMs' producers. By combining specialised laboratories and its versatile pilot plant, this facility has been able to bridge the gap between laboratory and industrial scale and offers the capability to process simultaneously four different reference materials without any risk of cross-contamination.

JRC-Geel holds advanced storage facilities for keeping the reference materials, under the best conditions, before shipment. The CRM storage building accommodates refrigerated rooms (both cool and freeze) operating at temperatures ranging from 18 °C to

- 40 °C as well as ultra-low temperature freezers going down to - 80 °C. Storage conditions in JRC-Geel are monitored constantly. JRC-Geel has currently over half a million reference material samples in stock of more than 800 different CRM types.

D2.1.3 Nuclear laboratories

Measurements of neutron-induced reactions, cross-section standards and absolute measurements of radiation, i.e. radionuclide metrology, have been key activities at JRC-Geel since it started operating in 1960. Besides neutron data for standards, JRC-Geel has broadened its activities to nuclear management including safety of operating reactors, handling of nuclear waste and waste transmutation and investigating alternative reactor systems and fuel cycles. The preparation and production of certified nuclear reference materials made in restricted laboratories is an additional core activity in the nuclear area.

GELINA, the linear electron accelerator facility, has the best time resolution of its type combining i) a high-power pulsed linear electron accelerator, ii) a post-accelerating beam compression magnet system, iii) a mercury-cooled uranium target, iv) and flight path of 400 m. It is a multi-user facility serving up to 12 different experiments simultaneously. JRC-Geel also hosts the MONNET facility i.e. a 3.5 MV Pelletron Tandem accelerator for the production of continuous and pulsed ion beams. Furthermore, it operates a laboratory for ultra-sensitive radioactivity measurements inside the 225 m deep underground laboratory, HADES, located close to the premises of the Belgian Nuclear Research Centre. This shared facility is outside the EMAS scope.

Two nuclear areas are dedicated to the production of nuclear targets and certified nuclear reference materials. The controlled areas are equipped with multiple gloveboxes and dedicated equipment for the safe handling and preparation of the sample materials and targets.

D2.1.4 Explosives detection & transport security laboratories

JRC-Geel hosts the Commission's in-house experimental facilities for research on security screening equipment, comprising state-of-the-art detection equipment typically found at airport security check-points, such as X-ray screening equipment, security scanners and explosive-trace detection device. In that respect, JRC-Geel develops test materials and test methods to verify the performance of the specific equipment through technical assessments and methodology testing for priority applications, e.g. aviation security, first responders, border control and law enforcement.

D2.2 Context – risks and opportunities

JRC-Geel is located on a 38 ha site rented from the Belgian Centre for Nuclear Research SCK-CEN, on the territory of the municipality of Mol (Belgium Flanders Region). It is legally bound to the regional regulations on environmental protection as well as to Belgian federal regulations regarding the environmental aspects of its nuclear activities.

D2.2.1 External issues affecting JRC-Geel's environmental performance[2]

The analysis, looking at the main external issues affecting JRC-Geel's environmental performance, considering both risks and opportunities, was updated in 2021 and highlights five main domains with a notable impact.

1. Political and legal:

- ❖ Environment and climate changes are one of the highest political priorities of the European Commission having repercussions on the JRC-Geel environmental objectives. As the European Green Deal sets ambitious targets, going beyond the ones defined in the COP 2030 (at international level), it became the reference within the European institutions. The European Commission's aim to reach carbon neutrality by 2030 is a real challenge, in particular for scientific sites as JRC-Geel whose research activities are high energy consuming which could

[2] Identified using PESTLE criteria: Political Economic, Social, Technological, Legal, Environmental

prevent to reach the objectives set (waste segregation, CO_2 emissions etc.). This challenge can also be considered as an opportunity of improvement, as it triggers a reflection to find innovative ways to optimise the existing installation, putting in place greener solutions, identify new energy saving technologies or process alternatives. The action plan of the Greening the Commission and the HR strategy could provide ways to reduce the CO2 emission with the implementation of the new ways of working.

The entry into force of some stricter environmental legislation requiring the use of recycled waste plastic bags (80 % recycled) offer the possibility to limit the plastic use, reinforcing the single use plastic ban. However, the quality of the recycled plastic (lower resistance) could result in increased levels of recycled plastic use (due to lower resistance) lowering the expected impact.

2. Economic:

- The Brexit and the Euratom “reduction” leading to budgetary and resources restrictions can be an obstacle to investments planned for financing projects aiming at improving energy performance of the site (refurbishment, insulation, new buildings, etc…). The energy "constraints" (increase energy costs: electricity, gas etc.) have also negative consequences by decreasing the possibility to proceed with investments essential to meet EMAS targets. New projects could be developed looking at solutions to reduce the energy consumption.

- The COVID-19 pandemic, which has resulted in a general confinement, directly impacted the JRC-Geel targets. While the reduction of mobility and activity might be beneficial for reducing JRC-Geel carbon footprint, the need of extra resources and energy (higher ventilation, water, etc…) might reduce this benefit and have higher environmental impacts, when combined with the teleworking environmental impact.

3. Technological:

- To fulfill its EMAS targets, JRC-Geel has looked to innovating technologies such as the geothermal heat recovery currently developed by VITO (“Vlaamse Instelling voor Technologisch Onderzoek") for the forthcoming distribution of warm water for heating its premises. The implementation of this technology, due to the seismology activity, and the delays to become operational constitutes a risk for JRC-Geel to reach its defined targets. When installed, this technology will be a real opportunity to use a new green energy and a way to reduce the JRC-Geel carbon footprint.

- While the digitalisation of the processes helps JRC-Geel to lower its environmental footprint, it can also paralyse its activities in case of breakdown of IT connections.

4. Environmental:

- The climate changes (global warming, frequent heat waves, increased heavy rains, storms) affect the energy performance at JRC-Geel such as the need of higher energy from the HVAC systems for cooling.

5. Social:

- Developing "clear and transparent" communication of environmental impact on the society will increase its awareness and commitment to EMAS compliance.

- The pandemics has led to the development of a new straegy (HR strategy) looking at the new working norms with the increase in teleworking practices. These changes of working conditions are likely beneficial for the reduction of CO_2 emissions. The impact of teleworking shall be evaluated to determine if the combination of teleworking and facility operations does not increase the JRC-Geel CO_2 footprints.

D2.2.2 Internal issues affecting JRC-Geel's environmental performance[3]

The daily activities of JRC-Geel also trigger risks and opportunities influencing the environmental performance. The main internal issues are summarised below.

1. Activities:
   - The nuclear activities carried out at JRC-Geel require extensive operational control and safety measures. The frequent visits and expertise of the inspection bodies could be an opportunity to continuously improve environmental performance and minimise risks.
   - The different installations and activities of JRC-Geel are highly energy consuming, the main one being the GELINA facility. The high costs caused by running this core activity could be minimised by investing in improved insulation and heat recovery.
2. Strategic direction:
   - The EC decision for implementing EMAS affects positively the environmental management and performance of JRC-Geel.
   - Restructuration within the JRC can be critical to maintain the business continuity. On the other hand, it provides opportunity to develop new activities with less footprint to consolidate the compliance activities within a same entity (set up of the new Director office).
   - Strategic decisions, such as the reduction of the meat consumption at JRC-Geel and the implementation of actions on the biodiversity, are useful to reduce the JRC-Geel environmental impact.
3. Culture & employees:
   - The reduction and aging of staff are critical for the JRC-Geel performance since it implies potential risks in terms of business continuity and a potential lack of knowledge transfer as well as inability to ensure full compliance due to the lack of resources. It could be an opportunity to develop new strategies and prioritise the activities including the implementation of coaching and training for the transfer of knowledge.
4. Financial procedures, processes and system:
   - The externalisation of services on the JRC-Geel site requires sound contract management to avoid any incidents or non-compliance with EMAS/legal requirements. The implementation of a procedure dealing with the process to work with third parties, allows the follow up of the completion of the tasks and their compliance and allows to communicate on the environmental expectations.

[3] Identified using ASCPF criteria: Activities, Strategic Direction, Culture and employees, Processes and systems, Financial

D2.3 Stakeholders' (interested parties) compliance obligations

JRC-Geel environmental performance also directly depends on the influence and interest of its main stakeholders. The major stakeholders identified by JRC-Geel during the annual analysis review of 2021 are represented in **Figure D3**.

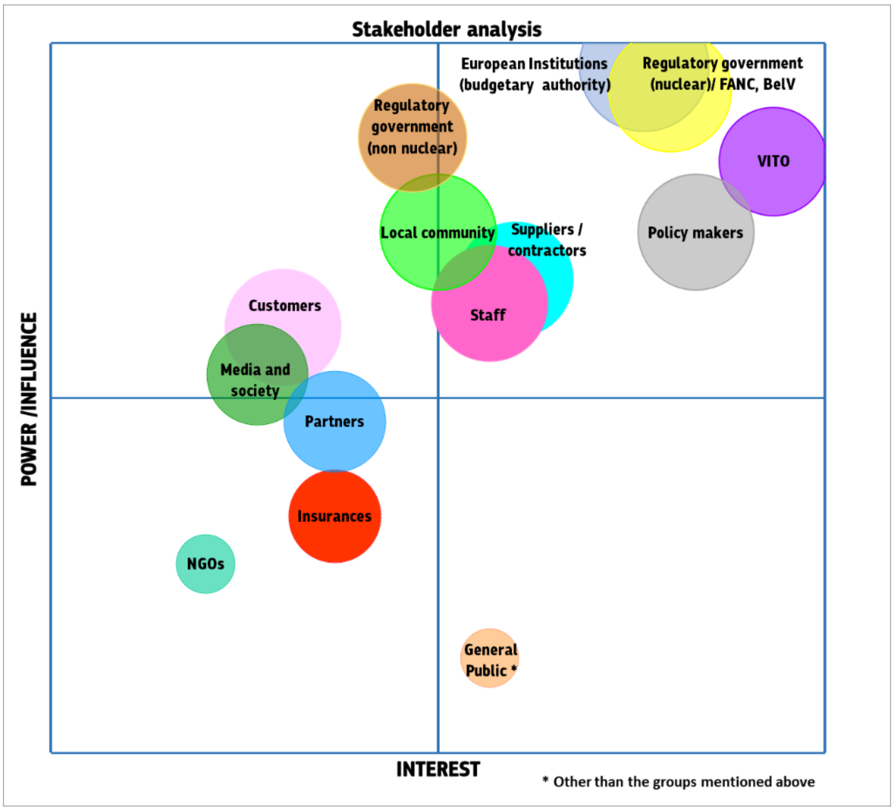


Figure D3: Stakeholders' analysis

Figure D3 shows that among the 14 identified stakeholders, eight present a determining influence and interest on JRC-Geel environmental performance.

- The European Institutions stays the main influencer of the JRC-Geel environmental performance since they are the budgetary authority and the promoter of EMAS. The Green Deal policy (end of 2019) being the leitmotif of the European institutions, this stakeholder raised its expectations towards the JRC-Geel's targets and results regarding its carbon neutrality.
- The nuclear activities at JRC-Geel make FANC (the Federal Agency for Nuclear Control), BelV (its technical subsidiary) and NIRAS (National Agency for Radioactive Waste and enriched Fissile Material) decisive influencers of JRC-Geel environmental performance with regards to the nuclear aspects. These important stakeholders have also a clear interest that JRC-Geel strives to fulfil the legal requirements.
- The regulatory authorities of the Flanders region are also key stakeholders who count on the full compliance with the applicable regulations. JRC-Geel demonstrates its adherence to the relevant laws through its annual declarations, reporting and the management of its environmental licence.
- VITO (Flemish Institute for Technological Research) has a major influence on the JRC-Geel's environmental performance since it is the provider of the "central heat" at JRC-Geel. The delay in the implementation of geothermal heat, rescheduled to 2024, has a direct impact on JRC-Geel's performance. When in operation, the geothermal heat should drastically improve JRC-Geel's energy efficiency and lower its carbon footprint.
- Policy makers, at EU level as well as national and regional level, have strict requirements defined in their established regulatory and policy standards that the JRC-Geel shall be in conformity with and impact its environmental performance. The Commission takes to heart leading by example and complying with these standards.

- The local community is attentive to the emergency safeguard measures JRC-Geel implements as well as the actions taken to mitigate local disturbances, in particular, noise in the direct neighbourhood as well as pollution. To comfort the local community, JRC-Geel invites the “neighbourhood” to a yearly meeting to address these concerns and also answers, in a timely manner, to the received complaints.
- Contractors are key players in the environmental performance of JRC-Geel as most of the infrastructure and/or maintenance work are outsourced. JRC-Geel looks to include in its contracts environmental criteria to mitigate its carbon footprint and use of resources.
- Staff has a critical role in the environmental performance of JRC-Geel since it is a major “resource consumer”. Its influence was raised as influencer in consequence of the pandemics and lock down. An increase involvement of JRC-Geel staff members, as foreseen in the EMAS-compliant management system, will improve the conscious consumerism and use of best environmental practices on site.
- Additional stakeholders with less direct influence: such as the NGO’s participate indirectly to the environmental performance of the JRC-Geel. The donation of IT devices contributes to promote the “circular” economy and sustainability and helps JRC-Geel decreasing its carbon footprint.

The analysis of the stakeholders' needs and expectations shows that, notwithstanding compliance with the European, Federal (Belgian) and Regional (Flemish) regulations, the major needs and expectations of JRC-Geel stakeholders are included in the EMAS regulations. This is particularly true for the requirements regarding communication and ensuring that JRC-Geel respects all relevant legislation.

The following environmental compliance obligations apply to JRC-Geel:

- Having an Environmental Management System (EMS) in line with the EMAS Regulation (Commission Decision C(2013) 7708 of 18/11/2013);
- Contributing to the objectives adopted by the EMAS Steering Committee, in particular the ones adopted for the period 2014-2020 (Note DG-HR/D.2/RV/CSM/MR of 24/01/2018);
- Using the core criteria of Green Public Procurement whenever applicable; and
- Ban the use of single use plastic.

D2.4 Environmental aspects

In the course of 2021, JRC-Geel updated its environmental aspects register. The aspects and the respective environmental impacts of the identified activities taking place on the site were assessed. Activities carried out in restricted areas were separately registered per building. The register includes the installations classified in the Environmental Regulation VLAREM II.

Table D3: Summary of significant environmental aspects for JRC-Geel

Aspect group	Environmental aspect	Environmental impact	Activity, product or service
Resources	Electricity & fossil fuel consumption	Reduction in natural resources	Heating, cooling, ventilation, electrical equipment and transport
	Paper consumption		For office activities, printing, training and communication requirements
	Water consumption		For catering, sanitary and technical installations
	Helium consumption		NMR[4]; mass spectrometers
Air	CO_2, SO_x, NO_x, CO, VOC emissions	Air pollution, climate change	Energy consumption, Internal transport Transport: work-related travel and commuting (organisation and personal)
	HFC gas emissions	Global Warming	Used in refrigerators and cooling systems
Local aspects	Noise	Disturbance of neighbourood	Ventilation, cars…
Waste	(Hazardous) waste production	Air, water and/or soil pollution, biodiversity risks	Laboratories, sanitary installations, cleaning, maintenance, office activities, IT and catering.
Water	Waste water discharge	Risk of eutrophication, water pollution	Sanitary and technical installations (cooling towers)
Biodiversity	Choice of products and their origin	Destabilisation of ecosystems	Catering and gardening, cleaning
	Choice of sites and type of buildings	Destruction of natural habitat, relief, visual pollution	In the context of the Commission's buildings policy (Life cycle approach)
Environmental risks (legal compliance and emergency preparedness)	Load losses, malfunctions, leakages, chemical spills, gas, waste, etc.	Air, water and/or soil pollution.	In the context of delivery, storage and use of chemicals/fuel used for maintenance of the technical installations, laboratory work, waste management, storage and fire prevention
(Indirect) financing	Indirect environmental aspects linked to programmes to be financed[5]	Environmental impact caused by third parties	Taking the environment into account in project selection and evaluation
(Indirect) public procurement	Environmental performance of contractors. Sustainability and impact of products and services selected[6].	Environmental impact caused by third parties	Integration of environmental clauses in contracts: influence of contract through 'sustainable' purchases Life cycle approach.

The evaluation of the environmental aspects register reveals that the main aspects for JRC-Geel consist of the use of energy, water and emissions to air and water. The Green Deal derived policies strengthen the environmental aspect of travel/mission and commuting and HFC gas emissions.

[4] NMR: Nuclear Magnet Resonance is a chemical analysis method, using high magnetic fields and radio waves. The high magnetic field is generated by electromagnets cooled with liquid helium

[5] To protect local biodiversity, to minimise natural resources losses and reduce emissions relating to construction/development projects, etc.

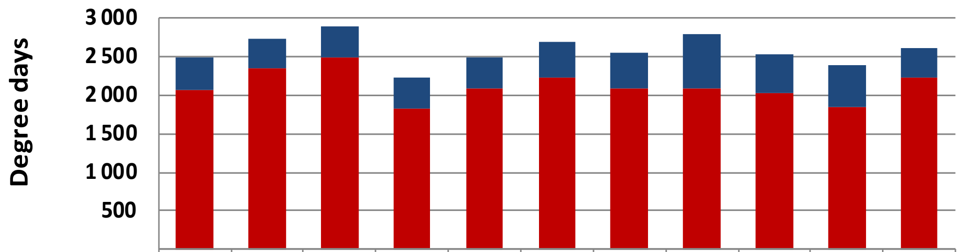
[6] For example: transport, use of natural resources, the lifecycle of the product, recycling, waste management, etc.

D3 More efficient use of natural resources

D3.1 Energy consumption of JRC-Geel buildings and vehicles

The general climate changes are having an impact on the buildings' energy consumption. Degree day data[7] presented in **Figure D4** shows an increase in 2021 of the total number of degree days linked to the rise of the number of hot degree days (necessitating heating), versus the number of cold degree days (requiring cooling).

Figure D4: Total annual degree days at JRC-Geel, 2011-2021

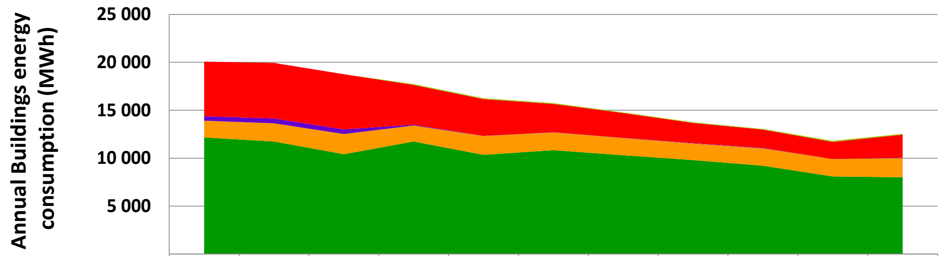


	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total degree days	2478	2 713	2 873	2 209	2 473	2 659	2 534	2 761	2 506	2 362	2 579
Cold degree days (CDD)	421	395	412	407	414	452	465	704	503	529	380
Hot degree days (HDD)	2057	2 318	2 461	1 802	2 059	2 207	2 069	2 057	2 003	1 833	2 199
kWh/person/degree day		22.82	19.14	23.18	20.02	19.99	22.01	19.23	19.87	18.78	18.50

D3.1.1 Energy consumption of Buildings

The evolution of total annual energy consumption is presented in **Figure D5** and both **Figures D7** and **D8** when expressed per capita and per square metre, respectively.

Figure D5: Annual buildings energy consumption (MWh) at JRC-Geel (indicator 1a)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total energy buildings, (MWh)	20 066	19 937	18 756	17 719	16 243	15 737	14 777	13 750	13 049	11 797	12 550
Electricity heat pumps	0	0	0	84	75	79	74	74	74	101	86
Hot water	5 700	5 799	5 747	4 153	3 837	2 937	2 579	2 113	1 913	1 779	2 414
Diesel	449	490	490	78	26	27	32	36	33	9	28
Mains supplied gas	1 759	1 902	2 108	1 673	1 963	1 860	1 791	1 718	1 827	1 812	2 007
Electricity	12 158	11 745	10 411	11 730	10 343	10 833	10 301	9 809	9 202	8 096	8 015

In 2021, activities restarted after the Covid-109 pandemic, explaining the observed increase in the total energy consumed by JRC-Geel buildings compared to 2020 (6.4 % increase). While the electricity consumption dropped, the amounts of used hot water, diesel and main supplied gas have increased. The higher consumption of diesel in 2021 is explained by the execution of the Easter shutdown that did not take place in 2020.

[7] Monthly data for Kleine Brogel station (15,5 °C reference temperature), www.degreedays.net using buildings energy consumption data for JRC-Geel.

When compared to 2019, a representative year with full activities, the profile of the energy consumption is slightly different: the total energy decreases by 3.82 % resulting from significant decreases of electricity (- 12.90 %) and diesel (-15.15%) and increases of main supply gas and hot water (respectively 9.85 % and 26.19 %).

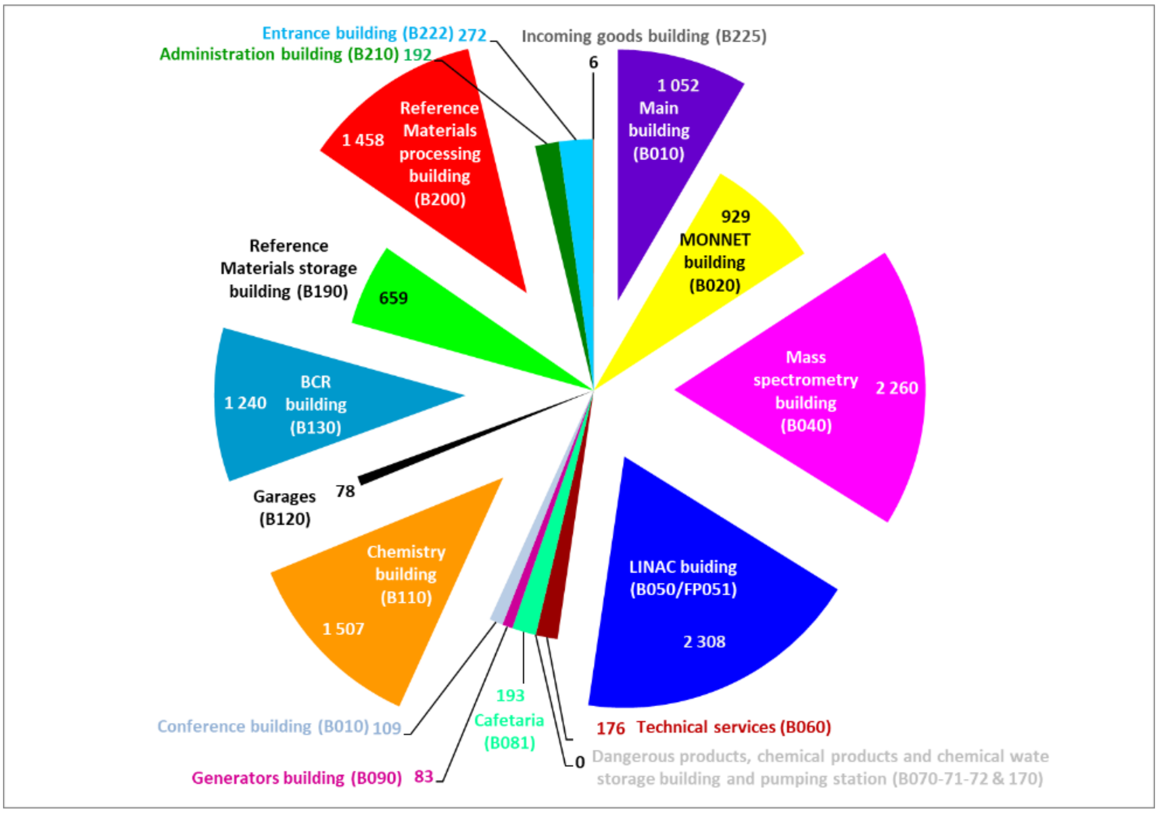
In 2021, around 80 % of the total energy is consumed by six out of the 17 buildings **(Table D4)**; both the Linac building - B050 (hosting the linear accelerator) and B040 (MS building) are the most intensive energy users (almost 40 %) as shown in **Figure D6** and **Table D4** listing the top 6 energy consumers. The classification of the main energy consumers remains almost the same as in 2020, B110 becoming more energy consuming than B200.

Despite the increase of activities, the energy consumption from buildings B050, B200, B010 is lower in 2021 than in 2020, in contrast to buildings B040, B110 and B130. Several technical breakdowns, in particular in B040, explain its noticeable higher energy consumption.

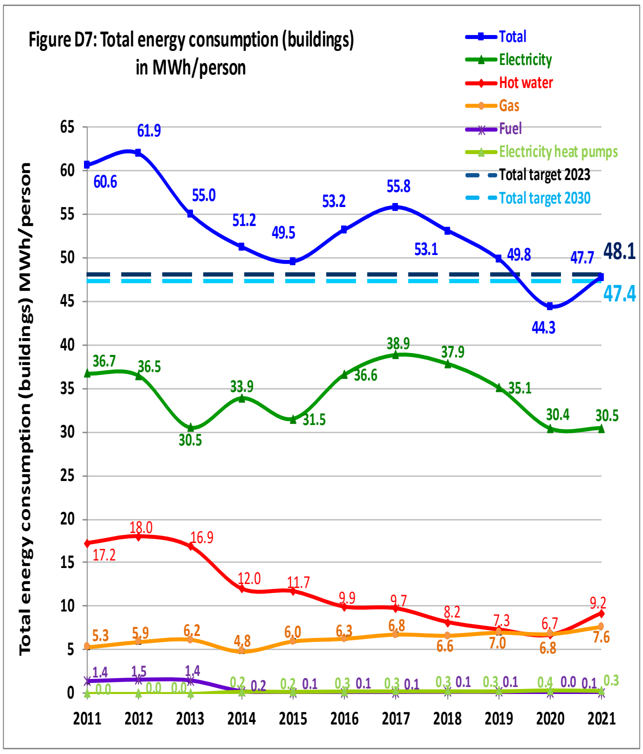
Table D4: JRC-Geel top 6 buildings' energy consumption

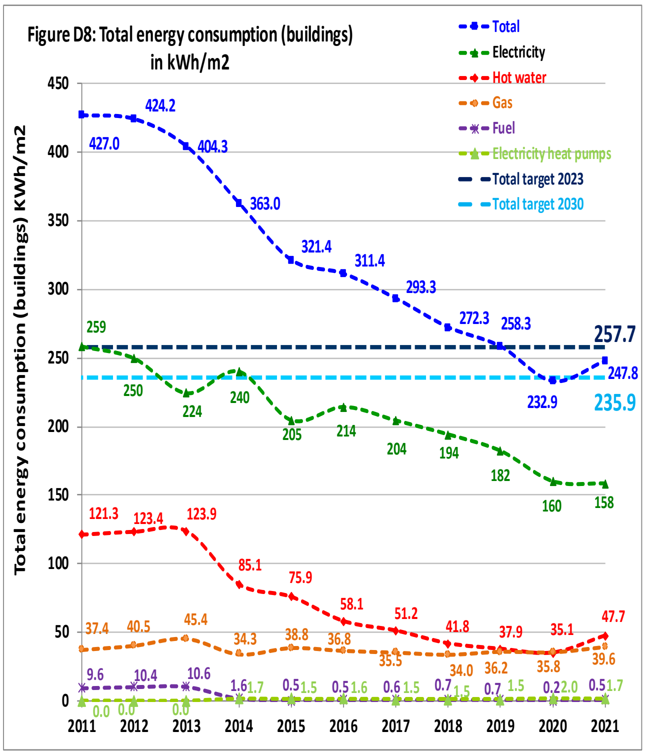
Building	**YEAR**	**B 050 Linac**	**B 040 MS**	**B 110 RMPB**	**B 200 Chemistry**	**B 130 BCR**	**B 010 Main**	**Total of 6**
% total energy consumed	**2021**	18.43	18.05	12.04	11.64	9.91	8.40	**78.46**
Building	**YEAR**	**B050**	**B040**	**B200**	**B110**	**B130**	**B010**	**Total of 6**
% total energy consumed	**2020**	19.74	15.92	13.41	11.35	9.17	8.54	**78.13**

Figure D6: Energy consumption distribution per building in 2021 (MWh)



Figures D7 and D8: Evolution of total annual energy consumption for JRC-Geel buildings





The total increase in energy consumption per capita in 2021 compared to 2020 (around 7.6 %) derived from the combined increase of consumption of district heating, main gas, diesel and electricity but not from the fuel which decreased. Almost the same pattern is observed for the energy consumption expressed per square meters. The energy consumption was somehow mitigated by some actions implemented in 2021 and listed in **table D5** such as the installation of new transformers with better efficiency.

However when compared to 2019, JRC-Geel has decreased its total energy consumption by 4 % and is in line with the target set for 2023.

Electricity consumption still remains the first contributor (almost 64 %) of the overall energy consumption of the buildings on the JRC-Geel site.

The most significant actions prioritising the reduction of energy (indicator 1a) in the Annual Action Plan are summarised in **Table D5**.

Table D5: Most important actions targeting indicator 1a (buildings energy consumption)

JIRA #[(1)]	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-455	R.6	2 buildings-JRC-Geel	2019	BMS optimisation B040 and B110.	Multi-stage	Completed 2021.
EMAS GAAP-551	R.6	2 Buildings-JRC-Geel	2020	BMS optimisation B050 and B200.	Multi-stage	2020: B200 completed – B050 to be finalised in 2022.
EMAS GAAP-552	R.6	2 Buildings-JRC-Geel	2020	Replacement of electric transformers.	Multi-stage	Completed 2021.
EMAS GAAP-573	R.6	5 Buildings JRC-Geel	2021	BMS optimisation of the air compressors running conditions to reduce the use of natural resources.	Multi stage	Works on going. To be completed end 2022.
EMAS GAAP-574	R.6	1 Building JRC-Geel	2021	Replacement of the MS-1 cooling collector	Single	Completed 2021.
EMAS GAAP-575	R.6	1 Building JRC-Geel	2021	Replacement of existing transformer with high efficiency one in B100	Single	Completed 2021.
EMAS GAAP-639	R.6	1 Building JRC-Geel	2022	Study of the thermal insulation B020	Single	To start in 2022

(1) JIRA is a workflow implemented by the EMAS corporate coordination to record and track response to internal and verification audit findings at EMAS sites.

D3.1.2 Energy consumption of fleet Vehicles

JRC-Geel has 7 fleet vehicles on site. The JRC-Geel owns 2 fork lifts, a fire engine and a tractor besides 3 other vehicles from which one is electrical and dedicated to the deliveries on site.

The fire engine (Unit F.001), tractor and Unit R.6's forklift utilise diesel while the second forklift (Unit G.2) consumes propane[8]. Both the Security services' vehicle used by the guards to perform their inspection rounds and escorting deliveries and the remaining car are conventional petrol based engines (Euro 2, and Euro 6).

Table D6 summarises the evolution of the fuel and energy consumption used by JRC-Geel's vehicles.

Table D6: Summary vehicle energy consumption (indicator 1b).

	2014	2015	2016	2017	2018	2019	2020	2021
Total (MWh/yr)	**30.42**	**29.67**	**27.71**	**28.53**	**25.30**	**21.33**	**18.44**	**14.51**
Diesel used (m3)	0.851	0.714	0.86	1.037	0.799	0.782	0.923	0.587
Petrol used (m3)	2.032	2.111	1.734	1.659	1.605	1.159	0.753	0.707
Propane used (kg)	157.5	157.5	157.5	126.0	116.0	165.0	121.0	126.0

The total energy consumption of vehicle continues to drop in 2021 (- 21.31 %) when compared to 2020. This reduction comes from the lower amounts of diesel (- 36.4 %) and petrol (- 6.1 %) consumed despite a 4 % increase in propane.

The total annual vehicle energy consumption measured represents about 0.12 % of that measured for the buildings.

The possibility to replace in the near future one of the cars with an electric or hybrid car is under analysis.

[8] Propane figures are based on the number of gas bottles ordered per year.

D3.1.3 Renewable energy use in buildings

Table D7: Renewable (and non-renewable) energy use in the buildings (indicator 1c)

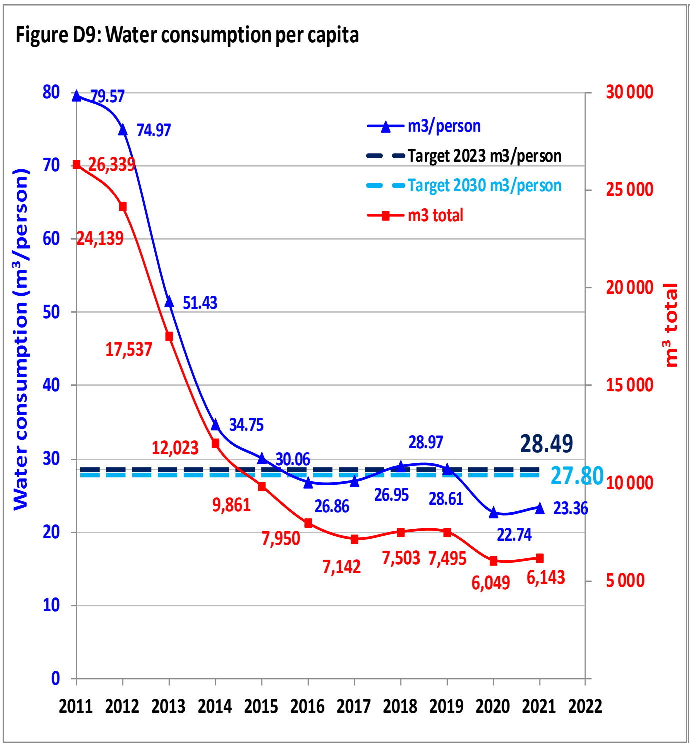
Energy source	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Electricty (MWh non-renewable)	12 158	11 745	10 411	11 730	10 343	10 833	10 301	500			
(% electricity from non-renewables)	100	100	100	100	100	100	100	5	0	0	0
mains supplied gas (MWh non-renewable)	1 759	1 902	2 108	1 673	1 963	1 860	1 791	1 718	1 827	1 812	2 007
(% mains gas from non-renewables)	100	100	100	100	100	100	100	100	100	100	100
supplied diesel (MWh non-renewable)	449	490	490	78	26	27	32	36	33	9	28
(% diesel from non renewables)	100	100	100	100	100	100	100	100	100	100	100
district heating/cooling (MWh non-renewable)	5 700	5 799	5 747	4 153	3 837	2 937	2 579	2 113	1 913	1 779	2 414
(% from non renewables)	100	100	100	100	100	100	100	100	100	100	100
Site geothermal (MWh renewable)				83.84	74.95	79.4	74	74	74	101.18	86.48
(% from renewables)	100	100	100	100	100	100	100	100	100	100	100
Total renewables (MWh)				83.84	74.95	79.4	74	9382.741	9276	8197.18	8101.531
(% from renewables)				0.47	0.46	0.50	0.50	68.24	71.08	69.49	64.55
Total non ren. energy use, (MWhr/yr)	0	19,936.51	18,755.99	17,634.73	16,168.19	15,657.16	14,702.71	4,366.87	3,773.35	3,599.60	4,448.67
(% from non renewables)	0	100	100	100	100	99	99	32	29	31	35

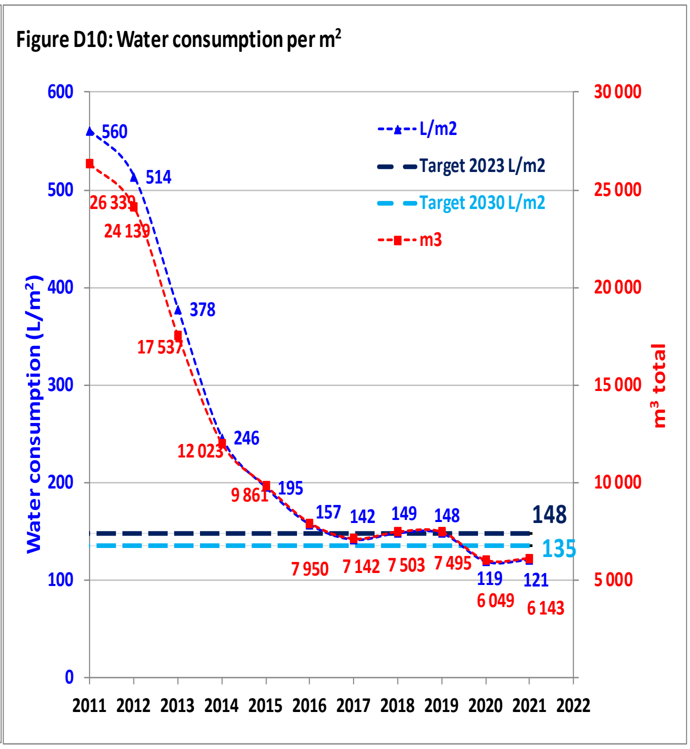
Besides the electricity of 100 % renewable origin implemented in 2019 and maintained with the 2021 renewed contract, JRC-Geel also uses geothermal energy (using heat pumps) as renewable energy. In 2021, the geothermal heat pumps went out of order explaining its lower consumption, taken over by the district heating which shows increased levels.

D3.2 Water consumption of Commission buildings

Figures D9 and **D10** show the evolution of total annual water consumption for JRC-Geel (indicator 1d) per capita and per square meter respectively.

Figures D9 and D10: Evolution water consumption (per capita and per per m²)





Since the first reporting in 2011, the water consumption has unceasingly decreased until 2016, both for per capita and per square meter data. Increasing needs of water for cooling installations to overcome the warm climatic conditions and several technical problems on equipment (water purifiers, cooling systems) resulted in an increase of water quantities in the two consecutive years (2017-2018). In 2019, a new reduction in water rates is initiated thanks to specific environmental improvement actions such as the gradual replacement of old water cooling towers by dry (air based) coolers and the exchange for more performant chillers. The connection of the water purifiers in all JRC-Geel buildings to the building monitoring system (BMS) which records on a regular basis the water consumption, detects any abnormal elevation of the water consumption triggered by a malfunction (e.g. defective valve) or a leak and generates a warning which helps to take faster corrective measures. The lock down in 2020 was associated with a significant decrease in water consumption (-20.5 %) as well as rain water use. The progressive return of people at JRC-Geel in 2021 contributed to a 2.7 % increase in water use but this corresponds to a – 18.4 % decrease when comparing to year 2019.

This reported data does not include the water consumption of staff during teleworking but only on JRC-Geel site.

Water saving is also performed since 2015, with the connection of the three most recently built buildings (B200, B210, B222) to the rain water tank. The quantities consumed are registered in **Table D8a** and are part of the water consumption per building highlighted Table D23. The consumption of the rain water contributes to less than 4 % of the total consumption in 2021.

Table D8a: Rain water consumption by three buildings

Year	2016	2017	2018	2019	2020	2021
Rain water consumption (m^3)	496	467	436	448	279	215
Percentage of Total consumption	6.24	6.54	5.81	5.98	4.61	3.50

Four main actions included in the EMAS annual action plan aim to reduce water consumption (see **Table D8**).

Table D8: Main actions to reduce water consumption in JRC-Geel

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-288	R.6	Building 040	2017	Replacement of B040 cooling towers.	Multi-stage	2022 – Technical specifications to be fine-tuned.
EMAS GAAP-457	R.6	Buildings 10, 110, 130 & 200	2019	Installation of water monitoring systems to control abnormal water consumption of the various water purifier systems.	continuous	Completed 2021.
EMAS GAAP-576	R.6	All buildings-JRC-Geel	2021	Analysis of the possibility to monitor water consumption of the various building air humidifiers on site.	Multi-stage	Works on going. To be completed end 2022.
EMAS GAAP-648	R.6	JRC-Geel Site	2022	To analyse and implement alarms on the water monitoring measurement instruments in all JRC Geel buildings.	Multi-stage	To start in 2022
EMAS GAAP-649	R.6	Building 190	2022	To analyse and install an automatic blowdown system for B190 cooling towers.	Multi-stage	To start in 2022

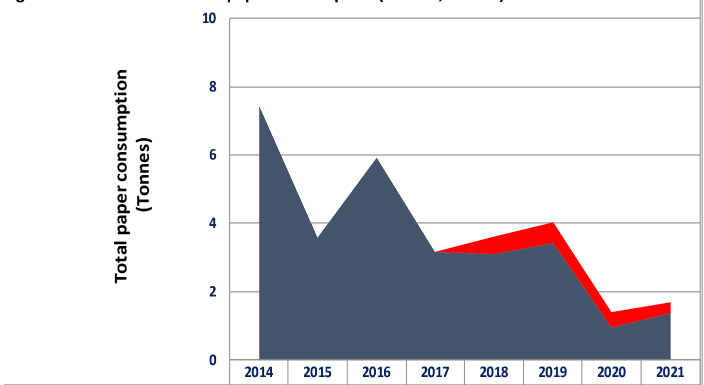
D3.3 Office and Print shop paper use in JRC-Geel buildings

The evolution of total and per capita office paper consumption is illustrated in **Figures D11 and D12**. These figures reflect the paper consumption in the JRC-Geel premises only and do not include domestic printing when teleworking during the COVID pandemic.

The paper consumption is always based on the paper purchasing data. The overall paper consumption in 2021 has increased by 21 % when compared to 2020, when a minimal number of staff was present on site but still is more than 58 % lower than the consumption of 2019. This augmentation in 2021 is linked to the higher consumption of office paper (+43.9 %), the print shop paper being even less used than in 2020 (- 28.3 %). The paper consumption in 2021 is however reduced compared to 2019 with a combined reduction of both office (- 60 %) and print shop paper (-49.7 %). This saving of paper is also likely due to the use of 75 g/m^2 paper as of 2020.

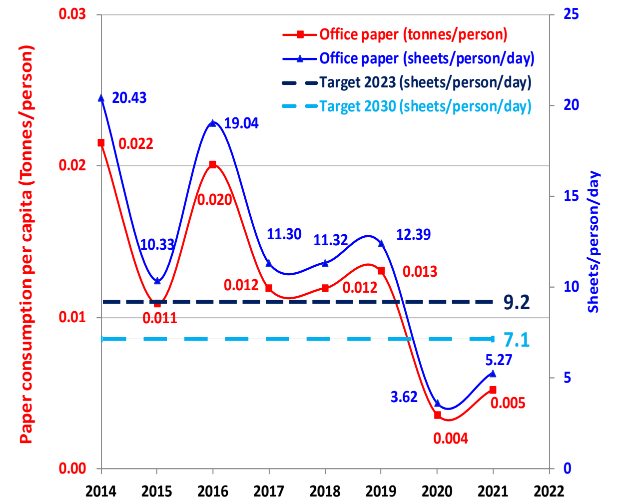
Figures D11 and D12: Evolution of paper consumption (total and per capita)

Figure D11: Evolution of total paper consumption (Tonnes, Sheets)



	2014	2015	2016	2017	2018	2019	2020	2021
Total paper consumption (tonnes)	7.441	3.568	5.934	3.152	3.62	4.045	1.391	1.683
Printshop paper (tonnes)	0.000	0.000	0.000	0.000	0.533	0.628	0.441	0.316
Office paper (tonnes)	7.441	3.568	5.934	3.152	3.087	3.417	0.950	1.367
Office (A4 sheet equivalent) x 1000 000	1.49	0.72	1.19	0.63	0.62	0.68	0.20	0.29

Figure D12: Office paper consumption per capita (Tonnes, Sheet per day)



The status of actions to reduce paper consumption is presented below (**Table D9**):

Table D9: Main actions for reducing paper consumption in buildings

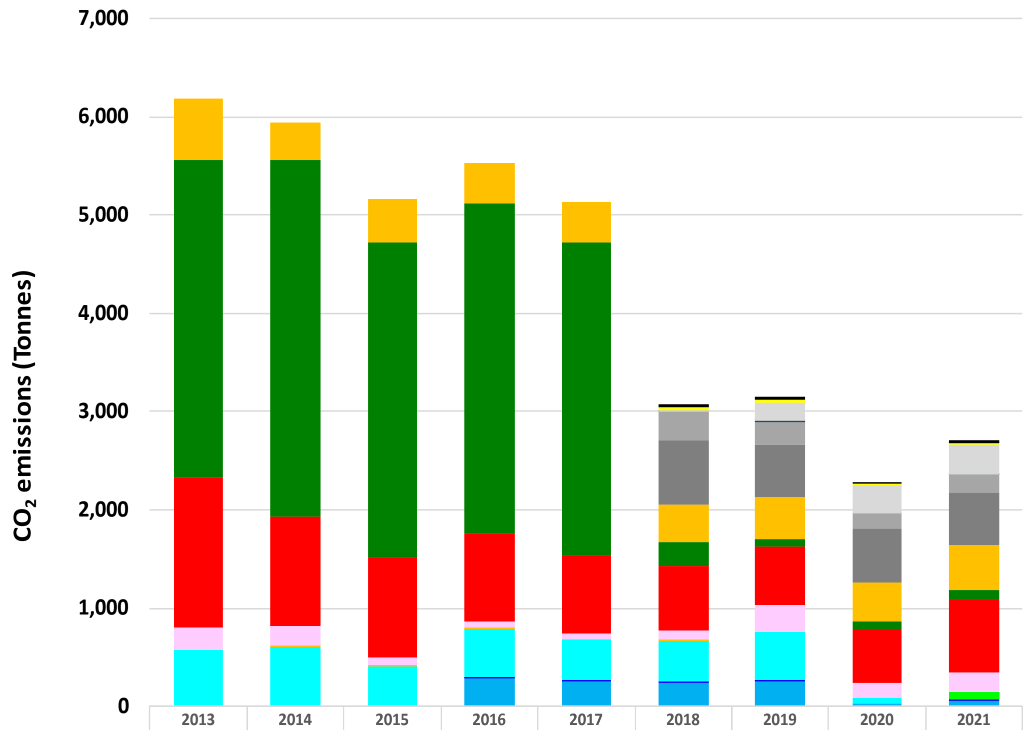
JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
No new action for 2022 and the two others actions are closed since 2019 & 2020.						

D4 Reducing carbon footprint and air emissions

D4.1 Overall Carbon footprint

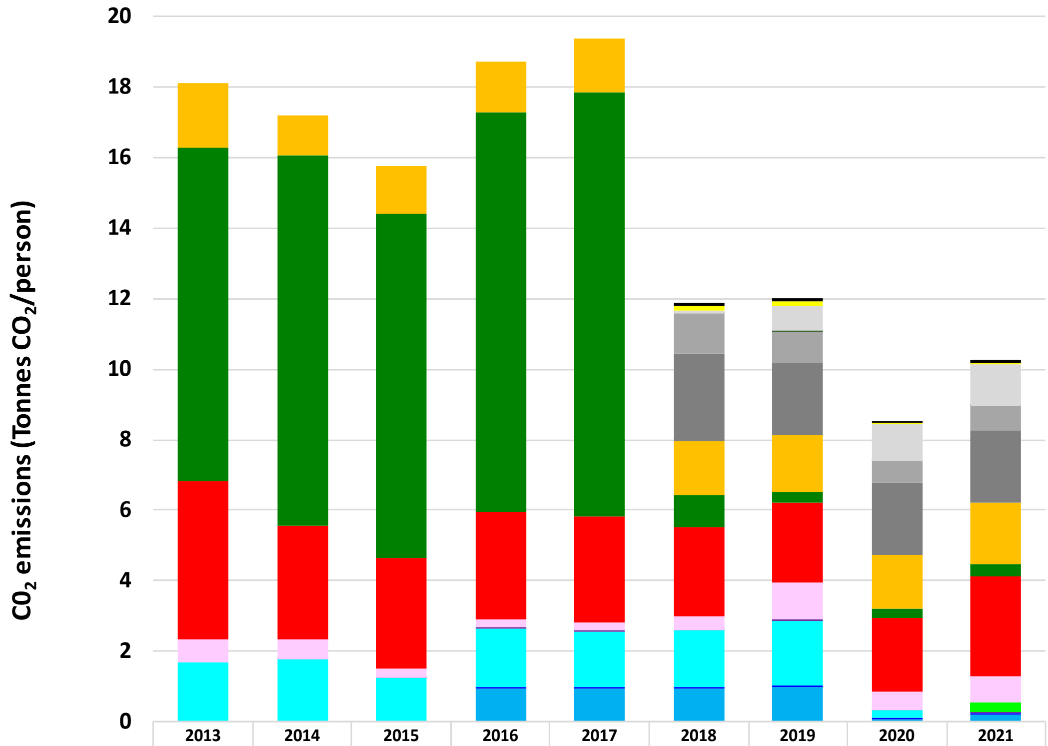
The carbon emissions due to different sources are detailed in **Figures D13** and **D14 and includes an estimation of the teleworking emissions.**

Figure D13: Carbon footprint (CO_2 or equivalent emissions) 2013-2021 (Tonnes)



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	6,179	5,946	5,164	5,533	5,131	3,079	3,148	2,270	2,701
Own waste	0	0	0	0	0	31	29	11	20
Catering	0	0	0	0	0	31	28	13	11
Service contracts	0	0	0	0	0	20	187	277	313
Paper supply	0	0	0	0	0	4	4	1	2
Fixed assets - Commission vehicles	0	0	0	0	0	0	1	0	0
Fixed assets - IT	0	0	0	0	0	291	236	162	177
Fixed assets -buildlings	0	0	0	0	0	647	538	540	540
Buildings - fuel for heating	626	394	441	418	405	390	420	408	458
Buildings - electricity	3,219	3,627	3,198	3,350	3,185	237	78	74	91
Buildings - district heating/cooling	1,534	1,109	1,024	908	797	653	591	550	746
Buildings coolant losses	226	196	85	60	59	98	278	143	195
Teleworking emissions						0	0	0	72
Vehicle fleet fuel consumption	0	8	8	8	8	7	6	5	4
Missions air (RFI=2)	571	602	395	496	412	413	487	53	5
Missions excluding air	3	9	14	12	12	11	10	5	8
Experts' travel	0	0	0	0	0	0	0	0	0
Staff commuting	0	0	0	281	251	246	256	26	58

Figure D14: Carbon footprint elements (Tonnes CO_2 / person)



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	18.1	17.2	15.7	18.7	19.4	11.9	12.0	8.5	10.3
Own waste	0.00	0.00	0.00	0.00	0.00	0.12	0.11	0.04	0.08
Catering	0.00	0.00	0.00	0.00	0.00	0.12	0.11	0.05	0.04
Service contracts	0.00	0.00	0.00	0.00	0.00	0.08	0.71	1.04	1.19
Paper supply	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.01
Fixed assets - Commission vehicles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed assets - IT	0.00	0.00	0.00	0.00	0.00	1.12	0.90	0.61	0.67
Fixed assets -buildlings	0.00	0.00	0.00	0.00	0.00	2.50	2.05	2.03	2.05
Buildings - fuel for heating	1.84	1.14	1.34	1.41	1.53	1.51	1.60	1.54	1.74
Buildings - electricity	9.44	10.48	9.75	11.32	12.02	0.92	0.30	0.28	0.35
Buildings - district heating/cooling	4.50	3.20	3.12	3.07	3.01	2.52	2.26	2.07	2.84
Buildings coolant losses	0.66	0.57	0.26	0.20	0.22	0.38	1.06	0.54	0.74
Teleworking emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
Vehicle fleet fuel consumption	0.00	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.01
Missions air (RFI=2)	1.67	1.74	1.20	1.68	1.56	1.60	1.86	0.20	0.02
Missions excluding air	0.01	0.03	0.04	0.04	0.05	0.04	0.04	0.02	0.03
Experts' travel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Staff commuting	0.00	0.00	0.00	0.95	0.95	0.95	0.98	0.10	0.22

The total CO_2 emissions measured in 2021 increases compared to 2020 (+ 18 %) due to the restart of staff commuting (+126 %) and missions (+ 49 % for mission excluding air) as well as the increase of the functioning of the site (+ 86 % for the waste; 36 % for the gas and heating). However, when comparing to 2019 (a full operational year), the levels of CO_2 emitted are 15 % lower than in 2021. The same observation goes for the data expressed per capita with 20 % higher quantities of CO_2 emitted, when compared to 2020 and 15 % reduction versus 2019.

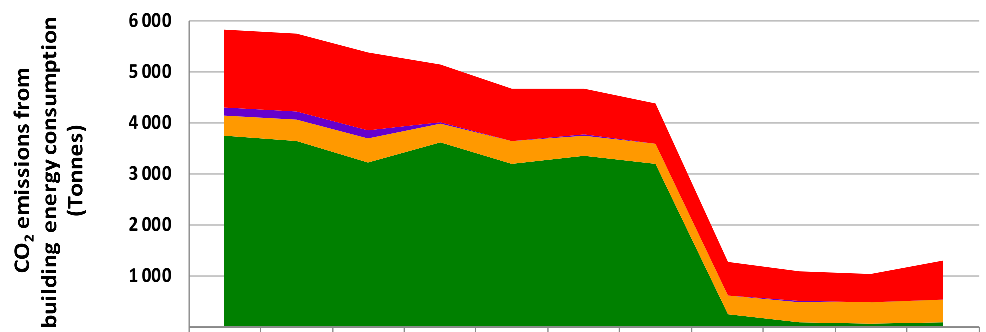
Table D10: Carbon footprint per capita CO_2 or equivalent (CO_2 e) emissions 2013-2021 by scope (Tonnes)

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Scope 1: Fuel consumption and fugitive emissions	**2,16**	**1,52**	**1,38**	**1,38**	**1,50**	**1,63**	**2,40**	**1,82**	**2,19**
Fuel for bldgs: mains gas	1,11	0,87	1,08	1,13	1,22	1,20	1,29	1,26	1,41
Fuel for bldgs: tanked gas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel	0,39	0,06	0,02	0,02	0,03	0,04	0,03	0,01	0,03
Biomass	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Commission vehicle fleet	0,00	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,01
Refrigerants	0,66	0,57	0,26	0,20	0,22	0,38	1,06	0,54	0,74
Scope 2: Purchased energy	**13,20**	**12,87**	**12,11**	**13,08**	**13,68**	**2,73**	**1,95**	**1,79**	**2,45**
External electricity supply (grey),	8,70	9,66	8,99	10,43	11,08	0,55	0,00	0,00	0,00
External electricity supply contract (renewables), combustion	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
District heating (combustion)	4,50	3,20	3,12	2,65	2,60	2,18	1,95	1,79	2,45
Scope 3: Other indirect sources	**2,75**	**2,80**	**2,26**	**4,23**	**4,19**	**7,53**	**7,67**	**4,93**	**5,62**
Fuel for bldgs: mains gas (upstream)	0,25	0,19	0,24	0,25	0,27	0,27	0,27	0,26	0,30
Fuel for bldgs: tanked gas (upstream)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel (upstream)	0,09	0,01	0,00	0,01	0,01	0,01	0,01	0,00	0,01
Commission vehicle fleet (upstream)	0,00	0,00	0,00	0,01	0,01	0,01	0,00	0,00	0,00
Site generated renewables (upstream)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
External grey electricity supply, line losses	0,74	0,82	0,76	0,89	0,94	0,05	0,00	0,00	0,00
External 'renewables' electricity contract (upstream with line loss)	0,00	0,00	0,00	0,00	0,00	0,32	0,30	0,28	0,34
District heating (upstream)	0,00	0,00	0,00	0,42	0,41	0,34	0,31	0,28	0,39
Business travel: air (combustion)	1,67	1,74	1,20	1,68	1,56	1,60	1,86	0,20	0,02
Business travel: rail (combustion)	0,00	0,01	0,00	0,01	0,01	0,00	0,00	0,00	0,01
Business travel: hire car (combustion)	0,00	0,00	0,02	0,01	0,02	0,02	0,02	0,00	0,00
Business travel: private car (combustion)	0,00	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
Experts' travel: air emissions	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Experts' travel: rail emissions	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Commuting (combustion)	0,00	0,00	0,00	0,95	0,95	0,95	0,98	0,10	0,22
Fixed assets - buildings	0,00	0,00	0,00	0,00	0,00	2,50	2,05	2,03	2,05
Fixed assets - IT	0,00	0,00	0,00	0,00	0,00	1,12	0,90	0,61	0,67
Fixed assests - Commission vehicles	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Paper supply	0,00	0,00	0,00	0,00	0,00	0,01	0,02	0,01	0,01
Service contracts	0,00	0,00	0,00	0,00	0,00	0,08	0,71	1,04	1,19
Catering	0,00	0,00	0,00	0,00	0,00	0,12	0,11	0,05	0,04
Own waste	0,00	0,00	0,00	0,00	0,00	0,12	0,11	0,04	0,08
Teleworking emissions (equipment electricity use)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,07
Teleworking emissions (fixed assets, equipment)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Teleworking emissions (space heating)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,21
Sum	**18,1**	**17,2**	**15,7**	**18,7**	**19,4**	**11,9**	**12,0**	**8,5**	**10,3**

D4.1.1 Buildings' emissions from energy consumption (1294 tCO2e in 2021, 47.9 % of the JRC-Geel overall carbon footprint)

The annual CO_2 emissions generated by energy consumption of buildings and the respective contributions of energy sources are presented in **Figure D15**.

Figure D15: CO_2 emissions generated by buildings energy consumption



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total (tonnes)	5 817	5 761	5 380	5 130	4 663	4 676	4 388	1 281	1 089	1 032	1 294
District heating/cooling	1 522	1 548	1 534	1 109	1 024	908	797	653	591	550	746
Diesel	148	162	162	26	8.4	8.9	10.5	11.8	10.8	2.8	9.0
Mains gas	387	419	464	368	432	410	394	378	409	406	449
Electricity	3 760	3 632	3 219	3 627	3 198	3 350	3 185	237	78	74	90

The CO_2 emissions generated by buildings energy consumption follow a constant negative trend from 2011 to 2020 (82.2 % decrease) with a reduction of about 80 % compared to 2014.

To be able to compare the data with the previous years, the introduction of a new factor in 2020, estimating the CO_2 emission generated by the renewable energy sources (i.e. total upstream for renewable electricity), has also been taking into account in the calculation of the CO_2 emissions for 2018 and 2019 to avoid an artificial increase of CO_2 emission in 2020.

The observed decrease in CO_2 emissions in 2019 is attributed mainly to the full supply of electricity from renewable sources and the lower CO_2 emission due to a reduction of the district heating. The combination of replacement of cooling installations/devices and optimisation of technical equipment operation using the BMS system contribute to the CO_2 emission reduction. These developments allowed JRC-Geel to meet the 2020 target for CO_2 emissions per square meter as well as per capita.

In 2021, the CO2 emissions from building energy consumption increased (+ 25.4 %) as a result of a combined augmentation of the emission from all energy sources: from district heating (+ 35.6 %), diesel (+ 213.8 %), main gas (+ 10.6 %) and electricity (+ 21.6 %).

The JRC-Geel needs to make additional efforts in reducing its CO_2 emissions to be able to reach the 2023 and 2030 set targets. The delay in the activation of the geothermal heating supply rescheduled for 2024 while initially planned in 2021 impacts the possibility of JRC-Geel to reduce its CO_2 emissions.

Several ongoing actions aiming at mitigating the JRC-Geel CO_2 emissions are listed in **table D11**. Many other actions to reduce energy consumption, and consequently the CO_2 emissions, are detailed in Section D4.1.

Figures D16 and D17 show emissions from building energy consumption per capita and per m².

Figures D16 and D17: CO_2 emissions derived from building energy consumption (per capita, per m²)

Figure D16: CO_2 emissions derived from building energy consumption (Tonnes CO_2/person)

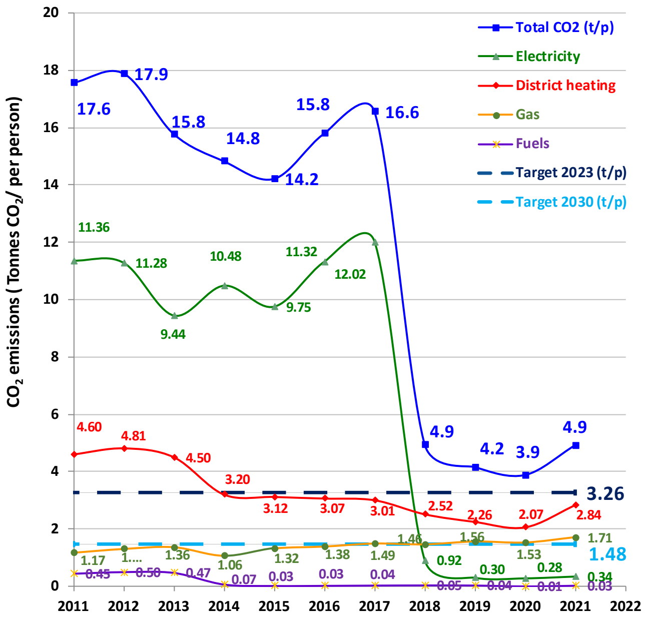


Figure D17: CO_2 emissions derived from building energy consumption (Kg CO_2 /m²)

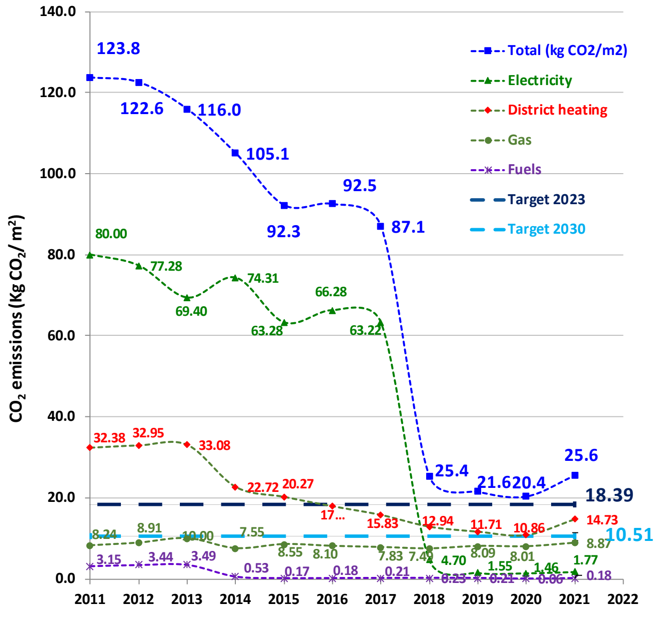


Table D11: Main actions planned to further reduce the CO_2 emissions

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-301	R.6	All buildings-JRC-Geel	2017	Heating from geothermal origin: new contract to be signed.	Single	Completed. Contract (C931626) signed in 2017. As of beginning 2024, hot water for heating should be from geothermal origin.
EMAS GAAP-553	R.6	JRC-Geel Site	2020	Retrofit/renewal of cooling installations.	Multi-stage	To be completed summer 2022.
EMAS GAAP-640	F.6	Building 200	2022	Set-up of a continuous leak detection system for the Epsilon 100D freeze dryer.	Multi-stage	To start in 2022
EMAS GAAP-641	F.6	Building 190	2022	Replacement of 20 ultra-low temperature freezers with freezers using no F gas and with increased efficiency.	Multi-stage	To start in 2022

D4.1.2 Emissions from household energy use (72.11 tCO_2e in 2021, 2.7 % of the overall JRC-Geel carbon footprint)

HR-D7 has made a first analysis to estimate the emissions from the teleworking energy use for the different sites in a draft note[9]
.

The rough estimation made for Geel is extracted from table E: *Sources of energy emissions per site* of this document shown underneath.

Source of emissions	GEEL
Homeworking heating limited working area emissions per site (TCO2e)	54,74
Electricity emissions for cooling limited working area per site (TCO2e)	0,04
Electricity emissions per site (TCO2e)	16,75
Emissions of VC caused by homework per site (TCO2e)	0,58
Fixed assets emissions due to homeworking (TCO2e)	0,00
Total energy emission (TCO2e)	**72,11**
Emission per teleworkers per site (kgCO2e)	**234,4**

Heating is the main contributor to the CO2 emissions during teleworking. The estimated total emission related to the teleworking constitutes, in 2021, approximately 2.7 % of the total percentage of the carbon footprint.

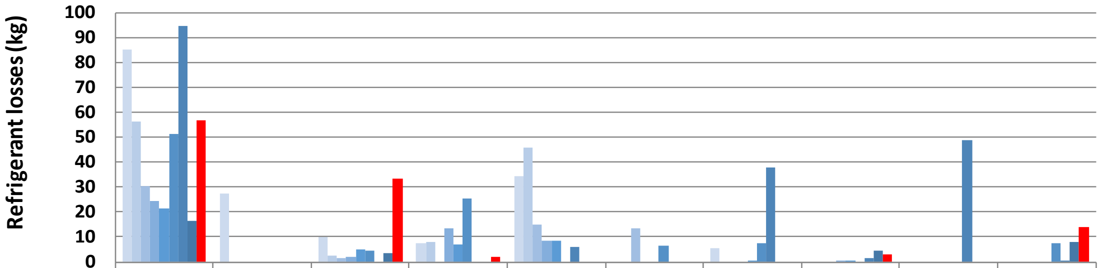
[9] Draft note: 2022_04_11_Note_for_the_file_on_Impact_of_Homeworking_on_EMAS-results_2021

D4.1.3 Buildings - other greenhouse gases (refrigerants) (195 tCO_2e in 2021, 7.2 % of overall JRC-Geel carbon footprint)

Since the legislative act adopted by the European Commission in 2006 (2006 F-gas Regulation) to control emissions from fluorinated greenhouse gases (F-gases), the JRC-Geel is required to declare the hydrofluorocarbons (HFCs). The EU Regulation No. 517/2014 on fluorinated greenhouses gases, which came into force in 2014, toughened the legal obligations to contain the polluting emissions of fluorinated gases (F-gases). The implementation of this EU Regulation No. 517/2014 was accompanied with the extension of the list of gases to monitor: such as insulating gas SF6 and the cooling gas (ISCEON89) used in various freeze dryers added in 2016 and 2018 respectively or earlier in 2013, with the inclusion of R22. On 1 January 2020, a replenishment ban for F-gases with a GWP (Global Warming Potential) ≥ 2500 entered into force. In this context, JRC-Geel is analysing the possibility to switch to alternative gases in existing installations or to replace old ones.

Figures D18 and **D19** depict the evolution in recorded gas losses from refrigerating Units.

Figure D18: Losses of refrigerants at JRC-Geel (kg) (indicator 2b)

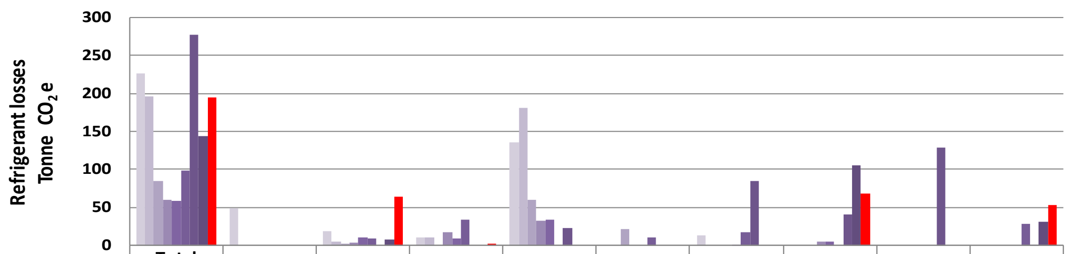


	Total losses (kg)	R22	R410A	R134A	R404A	R407C	R507A	SF6	R227A	ISCEON 89
2013	85	28	9.80	7.50	34.60	0.00	5.60	0.00	0.00	0.00
2014	56	0	2.60	8.00	45.80	0.00	0.00	0.00	0.00	0.00
2015	30	0	1.43	0.00	15.21	13.55	0.00	0.00	0.00	0.00
2016	24	0	2.02	13.66	8.31	0.00	0.00	0.23	0.00	0.00
2017	21	0	5.08	6.95	8.49	0.00	0.55	0.23	0.00	0.00
2018	52	0	4.45	25.66	0.00	6.42	7.52	0.00	0.00	7.54
2019	94	0	0.00	0.00	5.89	0.00	37.85	1.71	49.00	0.00
2020	16	0	3.74	0.00	0.00	0.00	0.00	4.50	0.00	8.00
2021	57	0	33.25	2.00	0.00	0.00	0.00	2.93	0.00	14.05

The evolution of the gas losses follows a negative trend over the years with peaks highlighting a change in the legislation becoming stricter with an extension of the list of gas to monitor (2018). Several actions (retrofit/replacement action plan) were implemented to mitigate the risk of leaks from gas with a high GWP.

Despite the significant decrease (- 82.6 %) during the 2020 lock down, high gas losses were observed with R410A, SF6 and ISCEON89. The situation in 2021 improved compared to 2019 (with almost 30 % reduction) and is comparable to the one of 2014. However, the reduction of CO_2eq due to SF6 losses in 2021 is not sufficient to counterbalance the increased levels of ISCEON89, R410A and R134A leaks when compared to 2020.

Figure D19: Losses of refrigerants at JRC-Geel (tonnes CO_2 e) (indicator 2b)



	Total losses (tCO2eq)	R22	R410A	R134A	R404A	R407C	R507A	SF6	R227A	ISCEON 89
2013	226	48	19	10	136	0	13	0	0	0
2014	196	0	5	10	180	0	0	0	0	0
2015	85	0	3	0	60	22	0	0	0	0
2016	60	0	4	18	33	0	0	5	0	0
2017	59	0	10	9	33	0	1	5	0	0
2018	98	0	9	33	0	10	17	0	0	29
2019	278	0	0	0	23	0	85	40	129	0
2020	143	0	7	0	0	0	0	106	0	30
2021	195	0	64	3	0	0	0	69	0	53

Refrigerant losses represent about 7.3 % of JRC-Geel's carbon footprint as reported in D5.1.

D4.1.4 CO_2 emissions from vehicles (14.51 tCO_2e in 2021, 0.54 % of the JRC-Geel overall carbon footprint)

D4.1.4.1 Commission vehicle fleet

Table D12: Fleet vehicle characteristics and tailpipe CO_2 emissions

	2014	2015	2016	2017	2018	2019	2020	2021
Total (MWh/yr)	**30.42**	**29.67**	**27.71**	**28.53**	**25.30**	**21.33**	**18.44**	**14.51**
MWh/person	**0.088**	**0.090**	**0.094**	**0.108**	**0.098**	**0.081**	**0.069**	**0.055**
CO_2 emissions (tonnes)								
From Diesel	2.69	2.26	2.72	3.28	2.52	2.47	2.91	1.85
From Petrol	5.71	5.93	4.87	4.66	4.51	3.26	2.11	1.99
From Propane	0.36	0.36	0.36	0.29	0.27	0.38	0.28	0.44
Tailpipe emissions (CO_2)	**8.76**	**8.55**	**7.95**	**8.23**	**7.30**	**6.11**	**5.31**	**4.27**
Tailpipe emissions (CO_2/person)	**0.025**	**0.026**	**0.027**	**0.031**	**0.028**	**0.023**	**0.020**	**0.016**

The emissions related to JRC-Geel fleet vehicles continuously decrease from 2017 to 2021. When compared to 2020, the emissions decline at total energy level (by 21 %) and per capita (by 20 %). The emissions currently represent less than 0.33 % of the emissions due to energy consumption. This improvement was mainly attributed to the reduction of tailpipe emissions.

D4.1.4.1 Local work based travel (excluding Commission vehicle fleet)

To minimise its CO_2 footprint and encourage its staff to sustainably commute between buildings, JRC-Geel provides, in its premises, 90 bicycles. For this purpose, staff is provided with around 29 white bicycles, while the remaining ones are allocated to specific groups (technical services, guards, fire brigade).

D4.1.5 Commuting (57.95 tCO_2e in 2021, 2.15 % of the JRC-Geel overall carbon footprint)

In 2021, JRC-Geel participated to the obligatory mobility survey launched by the Belgian Federal Government. The participatory to the survey reached 69.2 % (200 participants over 289 people: 229 internal and 60 external workers).

This survey highligted that more than 70 % of the staff members use the car for commuting to the JRC-Geel while around 20 % use the bike.

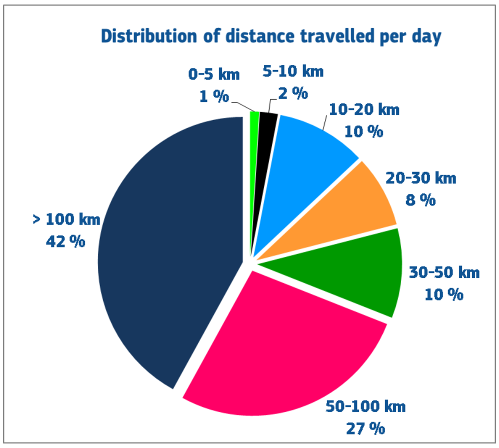
This survey comforts the results obtained during the last commuting survey organised by the JRC-Geel in 2016.

As expected, people living in the surroundings of JRC-Geel premises are more inclined to come by bike or walk to work. The main reasons for people not to commute by bike include the too long distance from their home place, the unsafe circulation and inadapted cycling infrastructures. People are more enclined to use the car due to the remotness of the site and by convenience since they can drop off and pick up their children of school age from their respective schools on their way to and from work.

The lack of public transport with efficient connections or adapted to the JRC-Geel working hours "discourage" people living in the neighbouring towns (Mol/Geel) from taking a bus operated by De Lijn, serving stops close to the site and the European School. People commute preferably by car to minimise the time spent in the public transport. This explained the fruitless pilot study conducted in 2015 to assess the feasibility of a shuttle service for people working on the site.

To estimate the CO_2 emissions from the commuting, the 2016 mobility survey was used. In this survey answered by 132 staff members, the average daily commuting distance travelled (excluding journeys by bicycle, on foot or as a car passenger (including car-pooling) was 4469 km/day i.e., 33.86 km/person/day. The distribution of journey length is presented in **Figure D20**.

Figure D20: Distribution of daily commuting distance



The lock down of the site during the COVID-19 pandemic in 2020 led to a drastic decrease in commuting. During the lock down, an estimate of 10 % of the staff (critical staff and authorised people to come on site to perform technical activities) was allowed to access the site, which corresponds to 27 staff members (over the 266 staff members reported in 2020). While far from being accurate, the rough estimation of the mobility was done as followed: by keeping 33.86 km/person/day estimated in the 2016 survey with an average emissions of 133 g CO_2/km[10], and the number of working days of 211, the annual CO_2 emissions due to commuting is 0.95 Tonnes CO_2/person.

Therefore for a number of staff members of 27 people, the annual CO_2 emissions reached 25.65 Tonnes in 2020. This corresponds approximatively to 1.05 % of the site's carbon footprint for 2020.

When applying the same reasoning for 2021 with a 23 % of presence on site (61 staff members), the commuting represents 57.95 Tonnes of CO_2.

[10] https://www.statista.com/statistics/260028/average-co2-car-emission-levels-in-eu-27/, or average over 10 years https://www.smmt.co.uk/reports/co2-report/

D4.2 Total air emissions of other air pollutants (SO_2, NO_2, PM)

Emissions from other air pollutants are rather limited and relatively stable. This is explained by the fact that most of the buildings are heated by natural gas and hot water supplied by VITO. The other sources of emissions (arising from diesel) arise mostly from testing or using the emergency generators which run less than 100 hours per year. In 2021, the higher emissions reported compared to 2020 is due to the Easter shutdown exercise performed which triggers the operation of the emergency generators. This exercise was not performed in 2020.

Table D13: Total air emissions of other air pollutants (SO_2, NO_x, PM_{10})

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total air emissions buildings (tonnes) as minimum (SO_2, NO_x, PM_{10})	0.791	0.436	0.470	0.447	0.434	0.420	0.444	0.425	0.482

D5 Improving waste management and sorting

D5.1 Non-hazardous waste

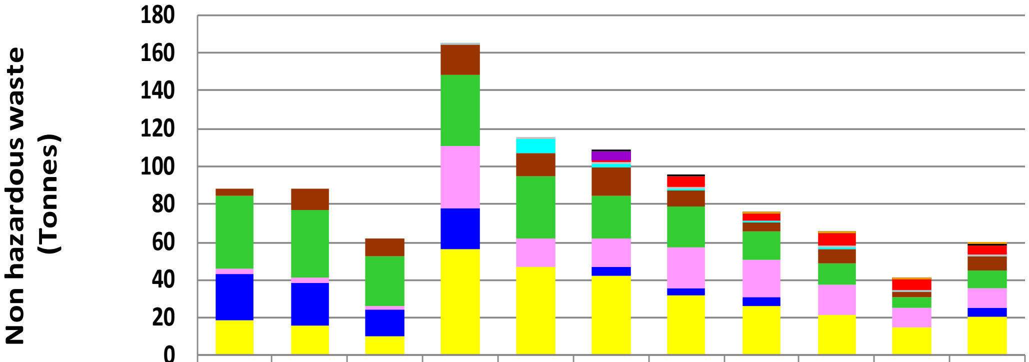
The evolution of non-hazardous waste disposed of from JRC-Geel is represented in **Figure D21**.

JRC strives to reduce its waste production by putting into place an efficient sorting and waste management process. Since 2014, the quantities of non-hazardous waste follow a negative trend going from 165.8 tonnes of waste to 40.28 tonnes in 2020 (i.e., a 75.7 % reduction).

In 2021, the quantities of non-hazardous waste increased by 47 % compared to 2020, with a general increase for all the waste categories in contrast to the swill (-4 %) which decreased.

When compared to 2019 a “normal” year, the production of waste decreased by 9 %. In this case the different waste streams are reduced compared to 2019 except for plastics (+83 %) and PMD (+35 %).

Figure D21: Evolution of non-hazardous waste disposed



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total non haz.waste (tonnes/person)	0.27	0.28	0.18	0.48	0.35	0.36	0.36	0.29	0.25	0.15	0.23
Total non hazardous waste (tonnes)	88.33	88.72	61.50	165.80	115.01	107.66	94.95	75.74	65.16	40.28	59.19
Non Dangerous frying oil cat 3. (200125)							0.00	0.36	0.34	0.34	0.17
Non Dangerous sox lamps (160216)							0.00	0.01	0.01	0.00	0.00
Plastics (200139)						0.05	0.06	0.00	0.23	0.04	0.42
Wine samples (020304)						4.45	0.00	0.00	0.00	0.00	0.00
Swill (200108)						0.76	5.49	3.57	6.40	5.00	4.80
Packaging waste: PMD (150106)	0.00	0.00	0.00	1.16	0.54	0.69	0.95	0.67	0.89	0.70	1.20
Glass (200102, 150107)	0.00	0.00	0.00	0.04	7.83	2.14	1.19	0.98	0.89	0.30	0.40
Wood (170201, 200138)	4.20	12.02	8.54	16.28	11.88	15.46	8.22	4.74	7.20	2.70	6.90
Metal (191202, 200140)	38.18	35.28	26.98	37.72	33.24	22.32	22.16	15.00	11.28	6.30	9.50
Paper and cardboard (200101)	2.72	2.62	1.62	32.65	14.64	14.84	20.87	19.50	16.41	9.50	10.50
Building, brick and stone (170102, 170301)	24.66	22.64	13.66	21.84	0.00	4.50	4.26	4.26	0.00	0.00	4.90
Residual; mixed (070299, 080318, 191210, 191212, 200301, 200307)	18.57	16.16	10.70	56.12	46.88	42.46	31.76	26.65	21.52	15.40	20.40

Note: Data before 2014 are only indicative. No comparability possible due to changes in waste management, legislation, EURAL codes.

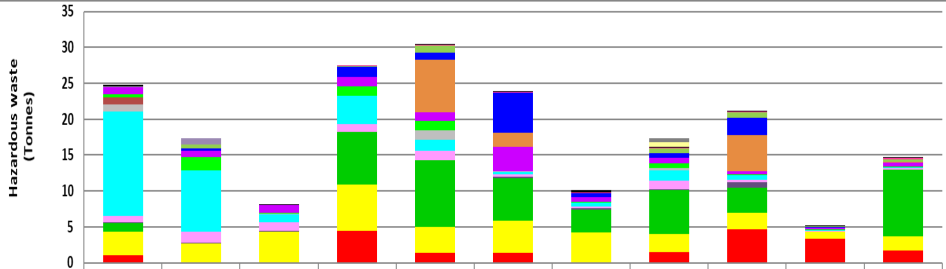
D5.2 Hazardous Waste

The evolution of hazardous waste disposed of from JRC-Geel is shown in **Figure D22**.

The hazardous waste quantities fluctuate per year depending on the scientific activities performed at JRC-Geel in support to the EU policy.

From 2017 to 2019, the quantity of hazardous waste increased. The main contribution seen in 2019 was related to nuclear waste, antifreeze, PCB product, pressurized gas and lab chemicals when compared to 2018. In 2020, a strong decrease (around 76 %) of hazardous waste was observed linked to the reduction of scientific ativities on site during the COVID-19 pandemic. In 2021, as the scientific activities restarted, an increase of this waste stream occurred when compared to 2020. Most of the waste categories contributed to this increase except for three types of waste showing lower levels: the radio-active waste, pressurised gas and lab chemicals (both reduced by 49 %) as well as Paint, ink, glue, resin (- 4 %). When compared to 2019, the waste quantities decrease by 31 % for most of the waste categories.

Figure D22: Evolution of hazardous waste disposed



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total hazardous waste, (tonnes/person)	0.075	0.054	0.024	0.079	0.093	0.0806	0.0381	0.0668	0.0810	0.0192	0.0559
Total hazardous waste (tonnes)	24.736	17.344	8.121	27.445	30.385	23.861	10.093	17.299	21.215	5.113	14.705
Hazardous medical waste (Eural code 170903)							0.000	0.460	0.000	0.000	0.000
Expired medicines, dangerous (Eural code 070513)							0.00	0.65	0.00	0.00	0.00
Fluorescent lamps and mercury containing objects (200121, 160307, 060404)	0.178	0.000	0.064	0.000	0.076	0.108	0.311	0.105	0.113	0.006	0.102
Waste from mechanical processes (191211)	0.070	0.866	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Waste from production of water for industrial use including resins (190905)	0.000	0.000	0.000	0.045	0.042	0.070	0.073	0.115	0.112	0.033	0.160
Batteries and accumulators (160601, 200133)	0.028	0.520	0.013	0.064	0.957	0.007	0.026	0.660	0.799	0.074	0.335
Pressurised gasses and lab chemicals (160504, 160506, 200119)	0.000	0.335	0.000	1.414	1.031	5.568	0.575	0.738	2.394	0.136	0.069
Antifreeze, PCB (160114, 160209)	0.000	0.000	0.000	0.000	7.360	1.926	0.000	0.000	5.028	0.000	0.130
Packaging waste, absorbents, cleaning cloth, filters (150110, 150202)	1.004	0.922	1.090	1.314	1.123	3.431	0.616	0.736	0.453	0.246	0.537
Cooling gasses (140601)	0.000	0.000	0.000	0.033	0.068	0.000	0.000	0.000	0.000	0.000	0.000
Waste oil (130205, 130301, 130802)	0.432	1.868	0.077	1.273	1.290	0.032	0.054	0.615	0.122	0.062	0.065
Waste from thermal processes (100804)	1.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Paint, ink, glue, resin containing hazardous substances (080111, 080317, 200127)	0.920	0.000	0.084	0.090	1.360	0.028	0.000	0.367	0.000	0.024	0.023
Waste from organic chemical processes (070101, 070103, 070104, 070701, 070704)	14.601	8.495	1.192	3.861	1.460	0.406	0.584	1.357	0.641	0.084	0.129
Waste from inorganic chemical processes (060106, 060205, 060399)	0.869	1.580	1.148	1.143	1.318	0.259	0.222	1.248	0.316	0.089	0.184
Asbestos (170605)	0.046	0.082	0.152	0.018	0.000	0.251	0.240	0.077	0.730	0.025	0.033
Electric & electronic, AEEA (160213,160214, 200136)	1.230	0.000	0.000	7.342	9.340	5.924	3.120	6.200	3.540	0.000	9.240
Biological waste (180103)	3.293	2.676	4.301	6.360	3.596	4.456	4.272	2.481	2.317	0.979	1.979
Radioactive waste	1.039	0.000	0.000	4.488	1.363	1.395	0.000	1.488	4.650	3.355	1.719

Note: Data before 2014 are only indicative. No comparability possible due to changes in waste management, legislation, EURAL codes.

D5.3 Waste sorting

Table D14: Percentage of waste sorted at JRC-Geel

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Percentage of waste sorted (%)	**83.6**	**84.8**	**84.6**	**71.0**	**67.8**	**67.7**	**69.8**	**71.4**	**75.1**	**66.1**	**72.4**
Percentage of unsorted waste (%)	**16.4**	**15.2**	**15.4**	**29.0**	**32.2**	**32.3**	**30.2**	**28.6**	**24.9**	**33.9**	**27.6**
Unsorted waste (Tonnes/p)	**0.056**	**0.050**	**0.031**	**0.162**	**0.143**	**0.143**	**0.120**	**0.103**	**0.082**	**0.058**	**0.078**

In 2021, the percentage of waste sorted increased compared to 2020.

Table D15 provides an overview of the actions to improve waste sorting.

Table D15: Actions relevant to waste

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-461	R.6	All buildings	2019	Improvement of waste segregation with the set-up of "Waste Segregation Islands" in various JRC-Geel buildings and to remove the individual trash bins.	Multi stage	2022 – fine tuning of the implementation / process organisation and communication 2021 – Analysis of various solutions (leasing, buying) done.
EMAS GAAP-462	R.6	2 buildings	2019	Study the feasibility of installing water meters on the 2 main industrial waste water tanks. (B170 and B200).	Single	Completed 2021.
EMAS GAAP-554	R.6	JRC-Geel site	2020	Eco-workshops.	Multi stage	2020/2021 - On hold due to the COVID-19 Pandemic.
EMAS GAAP-582	R.6	1 building JRC-Geel	2021	Procurement and installation of a new dedicated chemical and biohazardous waste storage walk-in container for temporary hazardous waste storage	Single	Container delivered in 2021. Commissioning to be performed spring 2022
EMAS GAAP-582	F.001	JRC-Geel site	2022	Recruitment of a new nuclear waste manager	Single	To start in 2022

D5.4 Industrial wastewater disposal

At JRC-Geel the industrial water is disposed through waste water tanks connected to the sewerage network

To record the industrial waste water quantities, the two main waste water tanks (B200 and B171) have been equipped with meters connected to the building management system (BMS). Twice a year the industrial waste water is analysed by an accredited laboratory.

More improvement on the industrial wastewater network (more smart water meters…) will be studied in 2022.

D6 Protecting biodiversity

The total sealed area (corresponding to the built surface on ground) at JRC-Geel, as defined in the Annex IV of the EMAS Regulation for the biodiversity indicators, increased from 2017 till 2021. The consecutive increases observed in **Table D16** correspond to the gradual construction of new high voltage cabins in the different buildings, building of a new pumping station and the demolition of the old one and the update of the road network and extension of parking areas.

The building area represents almost 19 % of the total surface. In 2021, the built surface per person increased by 3.4 %.

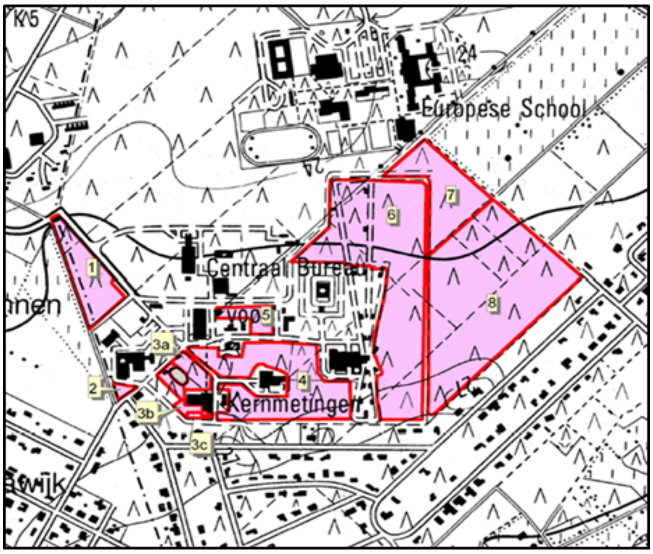
Table D16: Biodiversity oriented surface area

	2014	2015	2016	2017	2018	2019	2020	2021
Total use of land* (m^2)	380 316	380 316	380 316	380 316	380 316	380 316	380 316	380 316
Total sealed area** (m^2)	70 623	71 286	71 286	70 203	70 309	70 336	70 512	72 109
Built surface area (%) as part of the site	18.57	18.74	18.74	18.46	18.49	18.49	18.54	18.96
Total nature-oriented area on site (m^2)* **	**309 693**	**309 030**	**309 030**	**310 113**	**310 007**	**309 980**	**309 804**	**308 206**
Sealed area / person (m^2/person)	204.1	217.3	240.8	264.9	271.5	268.5	265.1	274.2
Total nature-oriented area on site/person (m^2/person)	**895.1**	**942.2**	**1044**	**1170.2**	**1196.9**	**1183.1**	**1164.7**	**1171.9**
* Total surface area of the site (m^2) until 2018 ** Built surface area (m^2) on ground (including roads, parking, pathways) *** Difference between Total use of land and Total sealed area								

JRC-Geel follows the different actions, to be performed to preserve the forest, as described in its JRC-Geel Forest Management Plan approved by the “Natuur en Bos” authorities in 2009. (**Figure D23**). This 2010-2029 plan includes the gradual replacement of exotic tree species (e.g., pine trees) present on the forest parcel by native species as well as the eradication and the prevention of the regrowth of other foreign tree species or vegetation such as “Amerikaanse vogelkers” (American black cherry) to plant new native trees (e.g., oaks) or plants to restore the gradually the original forest.

The forest management plan was appraised by an external company contracted to also develop a biodiversity plan in 2020. The analysis of the forest management plan has highlighted that JRC-Geel manages appropriately its plan with the respect of the actions set up, such as the elimination of exotic trees for endogenous species.

Figure D23: Location of the forest lots (forest management plan)



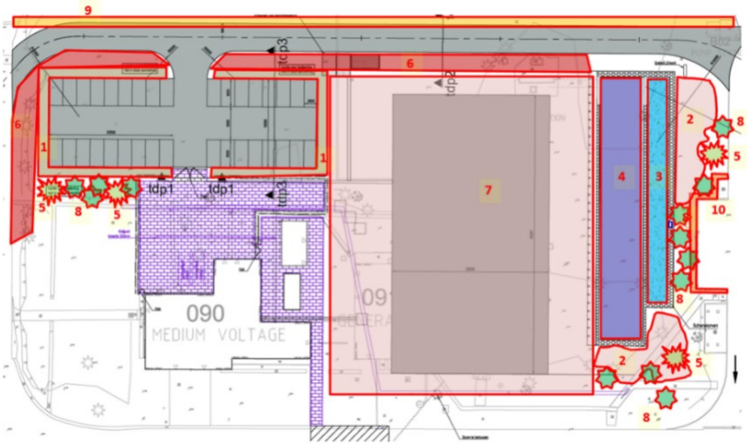
The large forest and green areas at the JRC-Geel offers possibilities to implement actions to maintain and develop its biodiversity. Several actions are yearly performed to preserve biodiversity.

JRC-Geel ensures that toads migrate safely during their pairing season every year, by placing screens to prevent them from crossing the streets and transferring them into buckets from one side of the street to the other, to reach the pond.

To further enhance its biodiversity on its premises, JRC-Geel has hired an external company specialised in biodiversity to develop a biodiversity plan. This study, completed in 2020, assessed the existing status of the biodiversity and proposed complementary actions to increase it further. A prioritisation of the actions was made in 2021. As a result, two main actions were carried out to improve both the fauna and flora:

- The first action has been the purchase of various bird nests of different types (owl, as well as bats) and, insect hotels to improve the fauna habitats.
- The second action set up was taken to increase the flora in the green areas of the JRC-Geel. **Figure D24** shows the map of the green areas of the JRC site where the action has taken place. Each area has been attributed a number to which the specific flora planted is listed in the joint table.

Figure D24: Biodiversity actions: planting plan to improve the flora and the species.



Area	**Planted species**
1 parking area	Symphoricarpos doorenbosii ('mother of pearl') (360 pieces)
2 buffer area	Myrica gale (800 pieces)
3 swamp	Caltha palustris (96 pieces); Carex riparia (120 pieces); Iris pseudacorus (120 pieces); Mentha aquatic (96 pieces); Menyanthes trifoliate (120 pieces); Sparganium erectum (120 pieces); Typha angustifolia (120 pieces)
4 buffer basin	Nymphaea alba (5 pieces)
5 parking and buffer area	Amelancier laevis ('ballerina') (4 pieces)
6 roadside	(650 m^2) with haver, roodzwenkgras, rietzwenkgras, kropaar, rode klaver, korenbloem, knoopkruid, groot kaasjeskruid, timothee, veldbeemdgras, struisgras, luzerne, wilde cichorei, gewone margriet, smalle weegbree
7 Building 230 area	(2750 m^2) with korenbloem, muurbloem, hemelroosje, strandviolier, siberische muurbloem, margriet, nigelle, goudsbloem, zeepkruid, duizendblad, vaste meisjesogen, ijslandse papaver, duizendschoon
8 site: near Building 225; around site Building 230; crossing middle of the site	Ulex europaeus (Gaspeldoorn) (total 167 pieces)
9 between new road and fence	(450 m^2) with Grass
10 around parking and containers	(15 m^2) with Fagus sylvatica

An additional action was initiated under the bumble bee nest project managed by unit R.6. Old wooden pallets were collected and sawed for the construction of bumble bee nests.

Table D17 describes the main ongoing or foreseen actions for the biodiversity expansion.

Table D17: Actions relevant to biodiversity

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-555	DIR	All site – JRC-Geel	2020	Biodiversity assessment and action plan for the forested areas of JRC-Geel.	Multi-stage	Completed 2021
EMAS GAAP-577	DIR	All site – JRC-Geel	2021	To set-up priorities and start implementing actions based on the 2020 biodiversity study performed at JRC-Geel.	Multi stage	On-going. Priorities set, implementation started.
EMAS GAAP-643	F.001	All site – JRC-Geel	2022	To analyse / implement tools for biodiversity mapping / quantification.	Multi stage	To start in 2022
EMAS GAAP-650	R.6	All site – JRC-Geel	2022	To build and install bumble bee houses using recycled materials.	Multi stage	To start in 2022

D7 Green Public Procurement (GPP)

D7.1 Incorporating GPP into procurement contracts

The JRC procurement tool includes an automatic control step embedded in the PPMT (Public Procurement Management Tool), based on the CPV codes[11] (Common Procurement Vocabulary), flagging the request as soon as GPP criteria are involved. When flagged, the procurement dossier has to be assess by the JRC-GEEL EMAS site Co-ordinator regarding the environmental aspect.

In 2021, 9 out of 58 high value contracts (15.5 %) were flagged as falling under GPP. Of the 9 contracts signed in 2021 with GPP criteria, 4 were classified as light green and 5 as green[11].

[11] CPV codes are internationally recognised. They establish a single classification system for public procurement aimed at standardising the references used by contracting authorities and entities to describe procurement contracts.

[11] "according to scale adopted by European Court of Auditors Special Report 14 (2014)".

Table D18: GPP categories and contracts

Category (environmental clauses in GPP)	**Compliance criteria** Core (a)/ Comprehensive (b)	**Award criteria** (environmental specifications)	**2018**	**2019**	**2020**	**2021**
Not green (No)	-	-	22	24	44	49
Light green (+)	partly (a)	< 10 %	4	3	3	4
Green (++)	Fully (a)/ Partly (b)	≥ 10 %	4	3	3	5
Very green (+++)	Fully (b); Best practices	≥ 25 %	3	3	0	0
Green by nature (++++)	Primary function	“100 %”	1	1	1	0
Total signed			**34**	**34**	**51**	**58**

- (a) Core / (b) comprehensive criteria: criteria suitable for use: (a) by any contracting authority and address the key environmental impacts / (b) for those who wish to purchase the best environmental products available on the market.
- The percentage is expressed as the weighting of environmental criteria as a share of the total weighting (for price and quality).

Primary function: goods, services and works to be procured is green (e.g: green roof; consultancy services to improve environmental performance).

Table D19 gives an overview of the main actions related to the green public procurement.

Table D19: Actions relevant to procurement

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-651	R.6	One building	2022	"Levels" analysis for the refurbishment of B100.	Multi-stage	To start in 2022

D8 Demonstrating legal compliance and emergency preparedness

D8.1 Managing the legal register

The legal compliance of JRC-Geel's activities is divided into nuclear and non-nuclear areas and was followed up by different external entities accordingly:

- The nuclear environmental protection issues are regulated by the Federal Authorities and monitored by the Federal Agency for Nuclear Control (FANC) and its technical subsidiary BelV. The last update of the nuclear operational license was approved in the Royal Decree on the 08 February 2010. The SAR (safety analysis report) reflecting the license basis of the plant has been revised in June 2020.
- The non-nuclear environmental protection is regulated by the Flanders Region. The main agencies involved are Departement Omgeving, OVAM (Openbare Afvalstoffen Maatschappij) and VMM (Vlaamse Milieu Maatschappij). The JRC-Geel environmental legal license (13 July 2012) was updated on the 8 February 2018 and 16 July 2020 respectively. The follow-up of the appropriate legislation is performed by an environmental coordinator. At JRC-Geel this task is outsourced with a contract initiated in 2019 company.

The legal compliance in 2021 was managed at JRC-Geel by:

- Health Physics Service (HPS) from the unit F.001 director's office which followed the Nuclear legislation;
- The JRC-Geel EMAS Site Coordinator from unit F.001 in close collaboration with Unit R.6 for the follow up of the Non-Nuclear Environmental Legislation with the environmental legal register set up for JRC-Geel in 2018 as well as with the strong support of the external environmental coordinator, conducting regular inspections during site visits and audits.
- The Biosafety Coordinator, belonging to Unit F.6, who intervened in the framework of contained use of GMOs and pathogens in biosafety laboratories.

Since 2020, JRC-Geel has a procedure describing the management of its environmental legal compliance which has been reviewed in 2021 (Ares(2021)6766371). Environmental control measures are implemented to assess and ensure that JRC-Geel complies with the legislation (inspections, audits: internal and external…).

Table D20 lists the main on-going actions set up for the legal compliance of JRC-Geel.

Table D20: Major actions relevant to legal compliance

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-553	R.6	JRC-Geel Site	2020	Retrofit/renewal of cooling installations following ban of gas with GWP > 2500.	Multi-stage	To be completed summer 2022.
EMAS GAAP-578	Dir	JRC-Geel Site	2021	To set-up a full process, including procedures, as well as communication for the regular update of the dangerous products inventory. Study of the possible implementation of an electronic inventory tool.	Multi-stage	Process set-up on going. Electronic inventory tool to be tested mid-2022.
EMAS GAAP-579	R.6	4 buildings- JRC Geel	2021	Replacement of the main electric boards in buildings 010, 050, 060 and replacement study in B040.	Multi-stage	Works on going. Buildings 010 & 060 completed in 2021. B040 planned for 2022.
EMAS GAAP-580	R.6	1 building- JRC Geel	2021	Study of renewal high voltage distribution in B090.	Multi-stage	Study completed in 2021.
EMAS GAAP-644	F.001	JRC-Geel Site	2022	To fine tune the JRC Geel environmental legal register to improve legal compliance verifications.	Multi-stage	To start in 2022
EMAS GAAP-645	F.001	JRC-Geel Site	2022	To update JRC Geel environmental permit.	Multi-stage	To start in 2022
EMAS GAAP-652	R.6	JRC-Geel Site	2022	Procurement and installation of the new JRC Geel high voltage distribution.	Multi-stage	To start in 2022
EMAS GAAP-653	R.6	2 buildings- JRC Geel	2022	To connect the cooling towers (effluent side) to the JRC Geel's industrial waste water network.	Multi stage	To start in 2022

D8.2 Prevention and risk management

Prevention and risks management at JRC-Geel is under the management of the Health Physics Service (HPS).

JRC-Geel is currently implementing an Occupational Health & Safety (OH&S) Management System (MS), in the context of the JRC Integrated Management System (IMS). The system is certified according to the latest international standard, ISO 45001: Occupational health and safety management systems– Requirements with guidance for use. The standard provides a framework to increase safety, reduce workplace risks and enhance health and well-being at work, enabling the organisation to proactively improve its OH&S performance.

Implementation of the OH&S MS is coordinated by HPS and regularly monitored by the Geel Site Safety & Security Committee and Geel Site Management Group.

The general principles, responsibilities and details are described in the JRC-Geel Site ISO 45001 Manual IMS-GEE-S6.5-MAN-0004.

D8.3 Emergency preparedness

Emergency preparedness and response at JRC-Geel is managed by HPS according to the registered manual (IMS-GEE-S6.5-MAN-0002 - JRC-Geel Site Internal Emergency Plan) and JRC-Geel incident response plan (IMS-GEE-S6.5-FRM-0014 - JRC Geel Incident Response Plan).

D9 Communication and training

D9.1 Internal and external communication

D9.1.1 Internal communication

Table D20a: Major actions relevant to internal communication

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-646	F.001	JRC-Geel Site	2022	Communication on activities performed to reduce the JRC-GEEL environmental impact.	Multi stage	To start in 2022
EMAS GAAP-647	F.001	JRC-Geel Site	2022	Communication of JRC-Geel environmental performance (through EMAS) to staff through Director's address, Connected, campaigns.	Multi stage	To start in 2022

JRC-Geel uses two main means of communication, namely the flat screens installed in the different buildings and the JRC intranet (Connected) to inform the staff and promote the different EMAS actions. In 2021, the EMAS team advertised the campaigns only via Connected due still to too few staff on site due to the COVID-19 pandemic. Seventy campaigns were broadcasted on Connected with complementary links and documents.

The different promoted campaigns were either a communication from JRC-Geel's own initiative or in support of and with the material of DG HR.

An example of EMAS communication made at JRC-Geel via Connected for the Federal mobility survey is illustrated in **Figure 25.**

Figure D25: Federal mobility survey

Federal Government Survey-Commuting 2021

Posted by Guy VAN DEN EEDE in My Site - JRC Geel on 07-Sep-2021 17:30:04

Dear colleagues

I would like your co-operation for the completion of the **mandatory survey of the Federal Government on "Commuting 2021"**.

This is a legal obligation for all public companies and services in Belgium employing more than 100 people and required by the FOD Mobility and Transport (under programmawet 08/04/2003).
The objectives of this survey are to collect data on home-work trips and business mobility policies in Belgium (data are used by mobility actors) and to launch a discussion to encourage companies to take action for more sustainable and efficient mobility.

At corporate level the data obtained from this survey will be used to initiate actions to improve the accessibility to the sites and encourage more sustainable mobility. At global level the data will be used to develop the most comprehensive diagnosis of workers' mobility in Belgium and create a tool for societal actors of mobility (such as policy makers, unions, experts, etc.).

To start the survey, click on the following link: https://es.mobilit.fgov.be/woon-werkverkeer-public/#/interrogation/91ae8e3b-8179-4c09-a102-809aa94741c6/general

This survey will take only ten minutes of your time. The FOD Mobility and Transport processes this data anonymously.

Deadline for completion: 30 November 2021.

N.B. when completing the survey please approach this from a normal working situation point of view i.e. pre-Covid restrictions

Thank you for your co-operation.
Guy

71 Views Tags: mobility, emas, jrc_geel_director, commuting, jrc_geel_env_news Categories: Messages from the Director

The 2021 Federal mobility survey organised by the FOD was promoted by the JRC-Geel site Director on Connected, as well as through email to staff, to sensitise them to participate to the survey. As a result of this mobilisation, almost 70 % participation was reached.

Important Connected blog communications organised by JRC-Geel to strengthen the commitment of the staff and its awareness on the waste sorting since new legal requirements were implemented in 2021. These communications are illustrated in **Figure D26**.

Figure D26: Communications on waste sorting at JRC-Geel

Less Waste, More Action Together - Three reasons to sort PMD correctly at work

Posted by Rosemary MCLAUGHLIN in Environmental Management Geel on 22-Nov-2021 10:25:54

Three reasons to sort PMD correctly at work - Less Waste, More Action Together

1. A sustainable choice

Sorting PMD at work promotes sustainability, because the more we sort, the more we can recycle. This way we make sure that packaging is no longer in the residual waste but is given a new life as valuable raw material. What's more, thanks to the extension of the PMD sorting rules, sorting is now easier than before.

2. A logical choice

Sorting PMD at work is only logical. Because we all do it at home. Staff, visitors and customers increasingly expect to be able to sort at our site just as they do at home. Because admit it, you can no longer afford to just throw PMD into the residual waste, can you?

3. Sorting is mandatory

Sorting PMD at work is required by law in Belgium for all companies and organisations.

So what is the JRC-Geel EMAS Team doing to facilitate correct sorting of PMD?

There are currently two waste separate bins for the collection of PMD and plastic foil. The new PMD rules allow us to reduce this to one bin. This means that the small 60 litre yellow bins in your coffee and open spaces (used for foil similar to household packaging) will be removed in the coming days.

N.B. Foils around pallets and commercial packaging are treated as industrial waste and will continue to be disposed of in the large foil containers on site.

Ever wondered what happens to PMD waste? Have a look at these three short videos

- How does a bottle become a bottle again ?
- What happens with your PMD in the sorting centre ?
- How does your PMD get recycled ?

111 Views Tags: waste, emas, geel, jrc_geel_newsroom, pmd, jrc_geel_env_news Categories: EMAS Campaigns/Communications

BIN IT RIGHT! BE A GOOD SORT!

Posted by Rosemary MCLAUGHLIN in Environmental Management Geel on 23-Nov-2021 09:27:32

The legislation laid down in Vlarema (https://www.ovam.be/vlarema-wijziging-8) was recently revised and became effective on 1 September 2021.
What does this mean for us?

- The collector (Renewi) will carry out visual checks of our residual waste containers, checking for sorting errors. They will be looking at the residual waste to make sure that is does not contain plastics, metal, glass etc. They may also check the PMD.
- If they find that the residual waste has not been correctly sorted, they are legally obliged to register this as a nonconformity in the central register of OVAM (Openbare Vlaamse Afvalstoffenmaatschappij, Public Waste Agency of Flanders).
- Local and regional enforcers can carry out more targeted inspections based on this register.

We must therefore be more vigilant in our sorting habits.

What is the JRC-Geel EMAS Team doing to facilitate correct sorting of waste?

1. There will be a gradual phasing out of personal bins from offices and laboratories (first quarter of 2022). The number of sorting stations on site will be increased in order to compensate for this.
2. The JRC-Geel EMAS Team are currently looking in to the best way to organise the collection of biodegradable waste from coffee rooms and kitchen areas/open spaces which is currently deposited in the residual waste bins. The aim is to have this waste stream covered during the course of 2022.

60 Views Tags: jrc_geel_newsroom, jrc_geel_env_news Categories: EMAS Campaigns/Communications

Other activities were promoted such as the Velowalk, EMAS spring events, etc.

D9.1.2 External communication and stakeholder management

The mandatory annual reports to Departement Omgeving and VMM (Vlaamse Milieu Maatschappij) were prepared and submitted on the e-platform of the authorities on schedule (March 2021).

JRC-Geel is continuously in communication with its sub-contractors (i.e. maintenance, cleaning, building management system, etc.) either via reports or meetings to efficiently manage its environmental aspects.

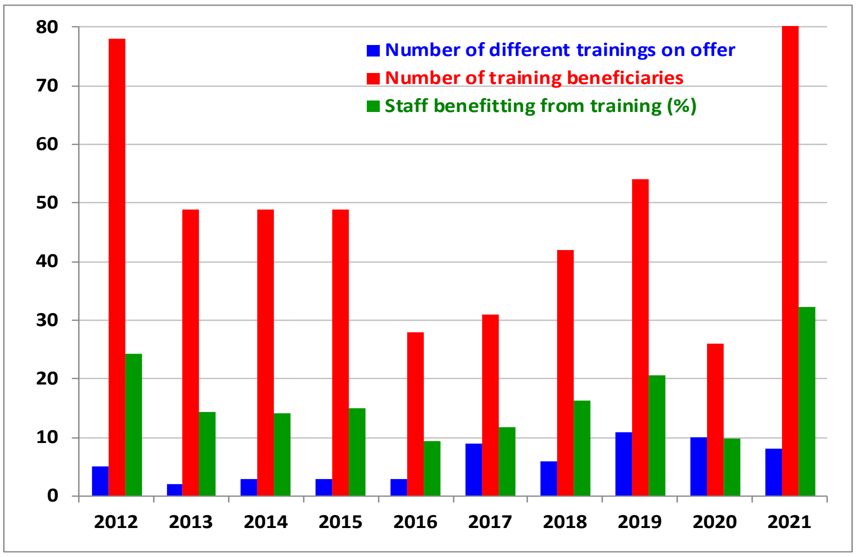
The lock down early in 2021, the yearly meeting with the local community could not take place to update the “neighbours” on the different actions JRC-Geel implemented or performed to fulfil its obligation with respect to the environmental, safety of the facility and its surrounding to limit the risks and disturbances.

The nuclear legal obligations require even more regular communication with FANC (Federaal Agentschap voor Nucleaire Controle) and BelV (subsidiary of the FANC taking care of the regulatory controls in nuclear installations).

D9.2 Internal and external trainings

Figure D27 gives the evolution of training given to JRC-Geel staff:

Figure D27: Evolution training



Within 2012-2016, the gradual reduction of staff and limited number of newcomers was accompanied with a decrease, over the years, in training beneficiaries. The trend reverses from 2016 till 2019 with increasing percentages of staff benefiting from trainings. The release of the new ISO 14001 (2015) standard and the revision to the EMAS regulation (2017) explained the increase observed in 2017 and 2018 of JRC-Geel staff trained for an efficient implementation. The higher number of people trained in 2019 is likely due to a slight increase in the number of new staff; and an increase in the number of training courses offered to the staff. In 2020, the number of trainings offered and the trained people declined significantly since the lock down prevented the majority of the trainings to take place as they required the physical presence of staff. Great efforts have been made to build up a training programme in virtual mode allowing the great increase in staff trained. The JRC-GEEL EMAS site Co-ordinator promoted strongly the HR EMAS basic sessions to the newcomers to raise their awareness with respect to EMAS and stimulate their commitment.

The trainings (internal and external) provided to JRC-Geel staff are listed in the below sections.

D9.2.1 Internal trainings

In 2021, the following training sessions related to environmental protection took place, mainly via video conferencing:

- Induction course for newcomers-HPS (including environment);
- Biosafety;
- HR EMAS basic sessions
- JRC GEEL Laboratory and chemical safety training
- EMAS specific trainings:
    - EMAS process – Environmental Review;
    - EMAS - Action management;
    - EMAS - Verification of the meters;
    - EMAS - Data processing

The induction course was specifically prepared for Commission Staff. The Biosafety course is delivered to both Commission staff and staff members from external companies. However, the statistics displayed in **figure D27**only consider Commission staff members.

Any nuclear training courses directly linked to Health and Safety, such as for radiation protection, are excluded from the statistics discussed in this report.

D9.2.2 External trainings

In 2021, no specific external training relevant to environmental protection was followed by any JRC-Geel staff member.

D9.3 EMAS Costs and savings

Table D21: EMAS administration and energy costs for buildings in the EMAS area

	Costs											Change in
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	last year
Total Direct EMAS Cost (EUR)	0	0	66,000	66,000	67,000	67,000	69,000	74,000	75,000	76,000	78,500	2,500
Total Direct Cost per employee	0	0	194	191	204	226	260	286	286	286	298	13
Total buildings energy cost (EUR)	1,714,963	1,687,504	1,362,337	1,337,755	1,200,048	1,192,636	1,085,126	1,043,440	1,260,420	1,017,619	1,161,745	144,126
Total buildings energy cost (EUR/person)	5,181	5,241	3,995	3,866	3,659	4,029	4,095	4,029	4,811	3,826	4,417	592
Total water costs (EUR)	27,807	25,607	19,005	13,491	11,706	9,905	12,399	22,614	23,527	19,187	17,594	-1,594
Water (EUR/person)	84	80	56	39	36	33	47	87	90	72	67	-5
Total paper cost (EUR)	0	0	0	7,419	3,793	6,462	3,518	3,896	4,295	1,227	1,763	536
Total paper cost (EUR/person)	0	0	0	21	12	22	13	15	16	5	7	2
Waste disposal (general) - unit cost/tonn	0	0	0	0	210	290	340	533	585	780	605	-174
Waste disposal (general) - EUR/person	0	0	0	0	73	105	122	156	145	118	136	18

NA Not applicable

In 2021, most of the costs generated by the resources consumption increased as well as per capita especially the building energy cost. On the contrary, the water costs decreased.

D9.4 Conversion factors used for JRC-Geel

Table D22: Conversion factors

Parameter and units	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
kWh of energy provided by one litre diesel (1)	11	10.89	10.89	10.89	10.89	10.89	10.89	10.89	10.89	10.62	10.58	10.58
kWh of energy provided by one litre petrol (1)	9	9.42	9.42	9.42	9.42	9.42	9.42	9.42	9.42	9.42	9.46	9.46
kWh of energy provided by one kg propane (2)		12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78	12.78
Paper Density (g/m^2)		80	80	80	80	80	80	80	80	80	75	75
Kgs CO2 from 1 kWh of electricity (3)		0.285	0.285	0.285	0.285	0.285	0.285	0.285	0.285	0	0	0
Kgs CO2 from 1 kWh natural gas (4)		0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.21
Kgs CO2 from 1 kWh diesel (4)		0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.266	0.266	0.266
GWP of R22	1 760	1 760	1 760	1 760	1 760	1 760	1 760	1 760	1 760	1 760	1 760	1 760
GWP of R410A (5)	1 920	1 920	1 920	1 920	1 920	1 920	1 920	1 920	1 920	1 920	1 920	1 920
GWP of R134A (5)	1 300	1 300	1 300	1 300	1 300	1 300	1 300	1 300	1 300	1 300	1 300	1 300
GWP of R404A (5)	3 940	3 940	3 940	3 940	3 940	3 940	3 940	3 940	3 940	3 940	3 940	3 940
GWP of R407C (5)	1 620	1 620	1 620	1 620	1 620	1 620	1 620	1 620	1 620	1 620	1 620	1 620
GWP of R5O7A (5)			2 240	2 240	2 240	2 240	2 240	2 240	2 240	2 240	2 240	2 240
GWP of R23 (5)						12 400	12 400	12 400	12 400	12 400	12 400	12 400
GWP of R508B (8)						13 396	13 396	13 396	13 396	13 396	13 396	13 396
GWP of R227A (5)							2 640	2 640	2 640	2 640	2 640	2 640
GWP of SF6 (5)						23 500	23 500	23 500	23 500	23 500	23 500	23 500
GWP of ISCEON89							3 805	3 805	3 805	3 805	3 805	3 805
GWP of R407D (5)							1 627	1 627	1 627	1 627	1 627	1 627
GWP of R32										675	677	677
Kgs CO2 from one litre of diesel (7)	0	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16
Kgs CO2 from one litre of petrol (7)	0	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.808	2.808
Annual cost of one FTE (6)				132 000	132 000	134 000	134 000	138 000	148 000	150 000	152 000	157 000

Notes:

(1) www.carbontrust.com, (Conversion factors 2013)

(2) From site use, (PCI value)

(3) Value based on EU Covenant of Mayors

(4) Base Carbone 2017, ADEME (PCI for natural gas; Europe averages considering upstream and combustion emissions)

(5) IPCC 5th Assessment report 2014, referenced by Base Carbone 2017, ADEME

(6) Data from DG BUDG financial units network (RUF) for average cost of Administrator staff at beginning of year of reporting

(7) Base Carbone 2017, ADEME (vehicle fleet (France), including upstream and combustion emissions)

(8) http://climalife.dehon.fr/uploads/media/3/276/276_1496_r508b-fd-fr-13.pdf and http://www.linde-gas.com/en/products_and_supply/refrigerants/hfc_refrigerants/r508a/index.html (and as calculated by Ispra) (ARCADIS report May 2018

D10 Site breakdown: buildings' characteristics and performance (selected parameters, indicative data)

Table D23: Site breakdown

Building	Address	Occupant	Useful surface area (m^2)	Staff	Office	Café	Self service restaurant	Creche/ child care	Printing and mail sorting	Medical service	Depot, large storage	Workshop	Sports/ recreation centre	IT Server centre	Power generation	Water treatment plant	Lab/experimental (non nuclear)	Nuclear lab/experimental	Electricity	Mains gas	Other gas	Diesel	District heating	District cooling	Site renewable solar	Site heating from heat pumps	Site renewable biomass	**Total energy**	Water (m3)	Non hazardous waste (tonnes)	Hazardous waste (tonnes)	Wastewater discharge (industrial)
1) Building essential details					**2) Building use 2021**														**3) Energy sources and amount (MWh for 2021)**										**4) Water and waste consumption**			
10	Main building	F.4, G.2	8 327		X												X	X	656				396					**1 052**	144			
20	Monnet building	G.2	3 364		X													X	751				178					**929**	43			
40	Mass spectrometry building	G.2	6 818		X												X	X	1382				878					**2 260**	2251			
50 (and FP51)	Linac building	G.2	8 303		X							X		X				X	1770	539								**2 308**	817			
60	Technical Services	R.6	2 776		X				X		X	X							96				80					**176**	108			
70-71-72&171	Dangerous products, chemical products and chemical waste storage building & pumping station		166								X																					
81	Cafetaria		665			X	X												56				137					**193**	251			
90	Generators building		756												X				56			26.47						**83**		59	15	
100	Conference building		793																39				70					**109**	13			
110	Chemistry building	F.5	2 030		X												X		528	980								**1 507**	115			
120	Garages	R.6			X						X								20				58					**78**	59			
130	BCR building	E.5; F.4, F.5	2 599		X												X		730			1.27	509					**1 240**	366			
190	Reference Materials Storage building	F.6	3 276		X						X								659									**659**	615			
200	Reference Material Processing building	F.6	5 880		X									X			X		969	489								**1 458**	369			
210	Administration building	F.001 &2, R.6	3 074		X														95				11			86		**192**	82			
222	Entrance building	F.001	1 723		X					X				X					176				96					**272**	193			
225	Incoming goods building	Guards	100								X								6									**6**				
JRC-GEEL Total			**50 650**																**7 988**	**2 007**		**27.7**	**2 414**					**12 523**	**5 427**	**59**	**15**	

Notes Surface B060 includes B120

B110 includes B114 (as annex since 2018)

JRC Geel water/building: numbers given take into account rain water consumed in B200, 210 and 222

District heating measured in each building using heat meters

B120 water and electricity included in B060 for year 2016; 2017 only water in common for B060&120

The difference observed between the sum of the electricity invoices and the electricity consumption of every single power meter of the JRC-Geel building (< 0.22 %) is mainly due to the power meters measurement uncertainty (at least +/- 0.5 % according to the manufacturer's specifications) as well as to the losses on the high voltage lines and in the various transformers

EUROPEAN COMMISSION

Environmental Management System

VERIFIED ENVIRONMENTAL MANAGEMENT
BE-BXL-000003

Environmental Statement 2022
2021 Results
Annex E: JRC-Seville

For further information on environmental performance in Seville please contact:

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Or visit EMAS page on My Intracomm EMAS system (europa.eu)

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ANNEX E: JRC-Seville – Administrative activities

The history of the European Commission's Joint Research Centre (JRC) is intertwined with the history of European integration: starting from the signing of the Treaties of Rome, the JRC has evolved over time to address the changing needs and priorities of what would eventually become the European Union. As the science and knowledge service of the European Commission, its mission is to support EU policies with independent evidence throughout the whole policy cycle. The JRC is established in six European locations. The site of Seville, Spain, was created in 1994 under the name *Institute for Prospective and Technological studies*, and after the re-organisation of the JRC in 2016 it became JRC-Seville Site.

The activity of the services present at JRC-Seville touches upon all the main pillars of the work program of the JRC, with particular emphasis on the socio-economic and scientific and technological dimensions of the European priorities, such as the green and digital transitions. Unlike other JRC sites, JRC-Seville does not operate large laboratories nor facilities, but counts with an efficient high performance computing infrastructure that allows researchers to develop and run complex computer models and analyses with minimal impact on the environment.

In 2021 the Commission adopted a Communication on Greening the Commission describing how it will become carbon neutral by 2030 and promote circular economy and biodiversity. Measures will be progressively implemented that will contribute towards a Commission wide reduction of 60% emissions with remaining emissions to be subject to carbon removal credits.

E1 Overview of core indicators at Seville since 2010

Since 2011, JRC-Seville has been collecting data on the activity of the site, out of which core indicators have been identified and used. The data values compiled in 2011 and from 2014 to 2021 are shown in **Table E1**, along with performance trends and targets for 2021, 2023 and 2030.

Reporting and the COVID-19 pandemic

For continuity reasons and to enable comparative analysis of data, reporting for 2021 retains the same approach as in previous years, mostly based on site activity and total staff numbers. The data will therefore reflect the significant reduction of staff presence on-site during the pandemic period.

The EMAS Corporate Coordination Team has estimated the **Environmental Impact of teleworking** focussing particularly on energy consumption and CO2 emissions **(**with high level assumptions for paper, water consumption and waste disposal).

These impacts are referenced separately, to regularly report data for the building in the following sections of this report.

General overview

The table E1 shows a decreasing trend for most indicators for the period 2010 – 2021. This trend is very positive, particularly taking into account the significant increase of staff (increase by 84 %) and occupied surface area (by 44 %), as illustrated in Table 2.
Based on a history of effective collaboration, JRC-Seville and the property owner, EPGASA, continue to work towards reducing the environmental impact in all activities related to the building, under responsibility of EPGASA. In 2022 EPGASA is installing HEPA filters and UVC disinfection (c.a. **400K€)** to recirculate air safely in the Expo building

Concerning other indicators with very positive outcome, the decreasing trend since 2014 by 81% (Tons/p) in office paper and 36% in water consumption (l/m^2) would suggest higher degree of awareness by staff and by the facility management services, who have deployed new policies in those areas in the last years.

As far as the energy (+10 % Kwh/m^2) consumption, this parameter continues influenced by the COVID-19 pandemic effect. These data are analysed in the chapter E4.

Finally, the economic indicators show also a descending trend since 2014. In 2021, Seville carried out different waste removals in close collaboration with the cleaning company which lead to a saving of 9.8 €/person in the Waste disposal indicator regarding 2019

Table E1: Historical data, performance and targets for core indicators proposed for Commission level reporting

Physical indicators:	**Historic data values**						**Performance since:**		**Future targets**		**Future targets**	
(Number, description and unit)	2010 (1)	**2014**	2018	2019	2020	2021	2010 Δ %	2014 Δ %	2014-23 Δ % (2)	2014-30 Δ % (2)	2023 value(2)	2030 value (2)
1a) Energy bldgs (MWh/p)	9.13	**9.13**	6.87	6.29	5.91	6.55	**-28.2**	**-28.3**	-35.0	-40.0	5.94	5.48
1a) Energy bldgs (KWh/m^2)	393	**376**	310	301	291	318	**-19.1**	**-15.5**	-35.0	-40.0	244	226
1c) Non ren. energy use (bldgs) %	100.00	**77.4**	79.3	86.5	20.4	17.6	**-82.4**	**-77.3**	-8.0	-10.0	71.2	69.6
1d) Water (m^3/p)	42.81	**21.73**	14.66	13.18	13.04	11.80	**-72.4**	**-45.7**	-45.0	-50.0	12.0	10.9
1d) Water (L/m^2)	1 627	**895**	661	630	642	573	**-64.8**	**-36.0**	-45.0	-50.0	492	448
1e) Office paper (Tonnes/p)	0.03	**0.012**	0.013	0.010	0.003	0.002	**-92.7**	**-81.0**	-22.0	-24.0	0.010	0.009
1e) Office paper (Sheets/p/day)	31	**12.6**	12.8	9.7	3.2	2.4	**-92.2**	**-81.0**	-22.0	-24.0	9.8	9.5
2a) CO_2 buildings (Tonnes/p)	4.54	**3.09**	2.31	1.79	1.30	1.43	**-68.4**	**-53.5**	-39.0	-70.0	1.88	0.93
2a) CO_2 buildings (kg/m^2)	172	**127**	104	86	64	70	**-59.7**	**-45.3**	-45.0	-50.0	69.9	63.5
2c) CO_2 vehicles (g/km, manu.)	136	**136**	136	136	136	136	0.0	0.0	0.0	0.0	136	136.0
2c) CO_2 vehicles (g/km, actual)	0	**260**	210	149	237	0(3)	0.0	0.0				
3a) Non haz. waste (Tonnes/p)	0.000	**0.022**	0.031	0.044	0.014	0.010		**-56.8**	-20.0	-25.0	0.0	0.0
3b) Hazardous waste (Tonnes/p)	0.0003	**0.012**	0.004	0.007	0.003	0.006		**-48.9**				
3c) Unseparated waste (%)	0.0	**23**	41	36	23	29		**29.9**	-25.0	-50.0	16.9	11.3
3c) Unseparated waste (T/p)	0.000	**0.008**	0.014	0.018	0.004	0.005		**-40.4**	-25.0	-50.0	0.006	0.004
Economic indicators (Eur/p)												
Energy consumption (bldgs)	0	**1 142**	779	769	677	652		-42.9				
Water consumption	0.0	**38.3**	29.9	27.3	22.6	21.0		-45.1				
Non haz. waste disposal	0.0	0.0	12.0	11.2	1.4	1.0						

Note: (1) Earliest reported data, for a reduced scope of buildings (and not directly comparable with current scope)
(2) Draft figures from the Global Annual Action Plan 2022
(3) No service car in 2021.

The evolution of the EMAS system in JRC-Seville since 2010 is as shown below:

Table E2. JRC-Seville EMAS Basic Parameters evolution from 2010 to 2021

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Useful surface area in EMAS perimeter, (m^2)	5,577	5,577	5,899	6,497	7,017	7,165	7,165	7,580	7,580	7,698	7,756	8,039
Population: Staff evolution in EMAS perimeter (p)	212	240	244	282	289	283	300	322	342	368	382	390

Notes : Staff no. centrally collected figures from DG HR;

The staff in JRC-Seville steadily and significantly increases over the years, from 212 in 2010 to 390 registered in 2021, representing an overall increase of 84% for that period. The work program 2021 foresees that this figure peaks at 425 persons, with an estimated yearly average of 410 staffs.

The increasing EMAS perimeter of useful surface area in the JRC-Seville Site logically follows the demographic pressure. The space rented to the property owner has reached 8039 m^2 in 2021, representing an increase rate of 44% as of 2010, which, compared to the evolution of the staff count, indicates an efficient use of the space and the creation of new infrastructures for staff such as a Conference Room and offices spaces.

E2 Seville activities[1], context and key stakeholders, environmental aspects.

E2.1 Activities

JRC-Seville is located in the building known as the "Expo building" since 1994, which is located in the Science and Technology Park (*Isla de la Cartuja*) to the west of the Seville city centre. EPGASA, a public company owned by the regional government of Andalusia, manages the building, along with other facilities originating from the Expo 1992.

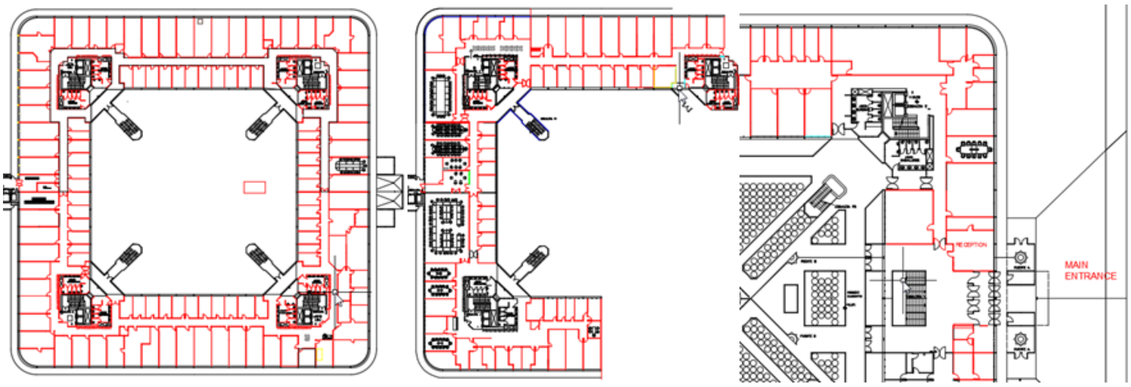
Figure E1 Site location

The Expo Building is a three-storey multi-tenant offices building with a total office space of 12 584 m^2, of which JRC-Seville occupies 8036 m^2, equivalent to 69 % of the total and distributed across the ground, first and second floors. The building has

[1] NACE codes associated with Seville activities are: 99 – Activities of extraterritorial organisations and bodies; 72.1 Research and experimental development in natural sciences and engineering

two basements used as parking, including bicycles, and hosting core infrastructures. The total site area is 11 669 m^2. The building itself occupies 8168 m^2 at ground level.

Figure E2 Site layout



SECOND FLOOR FIRST FLOOR GROUND FLOOR

The Seville site accommodates several services of the JRC, mostly from its directorate Growth and Innovation, but also from Energy, Transport and Climate, Sustainable Resources and Centres of Competence. Additionally, the local Services Support Unit, Human Resources and the Medical Service provide horizontal support for the functioning of the site. The Director General of the JRC, based in Brussels, delegates his responsibility on environment conservation, security and health and safety on the Director of Growth and Innovation, the so called "Site Manager", based in Seville.

The so-called Scientific Units execute the policy and research work undertaken by the JRC in its yearly and multi-annual work programs. The Units structure their work in projects, under specific work-packages. The Programme Officers of the different directorates coordinate their respective scientific production. For Seville, the Programme Officer of Growth and Innovation manages internal communications, publications services, audits and quality management.

The table E3 in section E12, shows the main core business activities carried out at JRC-Seville.

E2.2 Context-risks and opportunities

As mentioned before, the environmental responsibility is shared with the public company EPGASA, owner of the Expo Building. EPGASA is responsible for the general building management, maintenance and several accessory services. JRC-Seville's infrastructure-related processes seek to guarantee that staff enjoy a properly functioning and cleaning working environment while taking into account environmental issues and ensuring the premises' safety, security and business continuity.

The government of Andalusia and the city council of Seville are the competent bodies regulating the applicable local environmental legislative framework at regional and local level.

E2.2.1 External issues affecting JRC-Seville's environmental performance

The analysis follows the PESTLE[2] methodology looking at the main external issues affecting JRC-Sevillel's environmental performance, considering both risks and opportunities, was updated in 2022, and we could highlight the following isues:

1. **Political and Economic** – Budget variations influence possible investments to reduce resource consumption. Lack of direct control on the management of the buiding. Finantial constraints faced by the property owner. Uncertainly about the future seat of JRC- Seville The steady growth of JRC´s activity in the site has an impact on energy consumption and cost of support resources

[2] PESTLE criteria– Political, Economic, Social, Technological, Legal, Environmental

2. **Social-** General evolution of environmental consciousness among staff and interested parties. Incorporation of massive teleworking to "new normal" working conditions

3. **Environmental** - Variation of seasonal temperatures from one year to another have an important impact on energy consumption and generate variable building performance.

4. **Legal** – There is an increasing complexity of environmental regulations.

The complete analysis results are shown in the table E4 in section E12.

E2.2.2 Internal issues affecting JRC-Seville's environmental performance

These have been analysed using ASCPF[3] criteria. With regards to risks and opportunities, the two most important are as follows:

1. **Strategic direction** –. JRC Complex structure increases travelling needs. Target that the Commisision has to be become climate neutral by 2030.

2. **Culture & employees** – Multi-culturalism at JRC Seville has to be also considered from the point of view of impact on the environmental behavior. The reduction and aging of staff are critical for the JRC-Seville performance since it implies potential risks in terms of business continuity and a potential lack of knowledge transfer as well as inability to ensure full compliance due to the lack of resources.

The complete analysis results are shown in the table E5 in section E12

E2.3Stakeholders (interested parties), compliance obligations.

In terms of a management system, JRC-Seville's main 'customers' are the policy Directorate-Generals (DG) of the EC, although in practice the JRC and other DGs work as partners, to ensure the formulation of policies based on research–based evidence. The JRC-Seville occasionally provides services for other European institutions, notably the European Parliament.

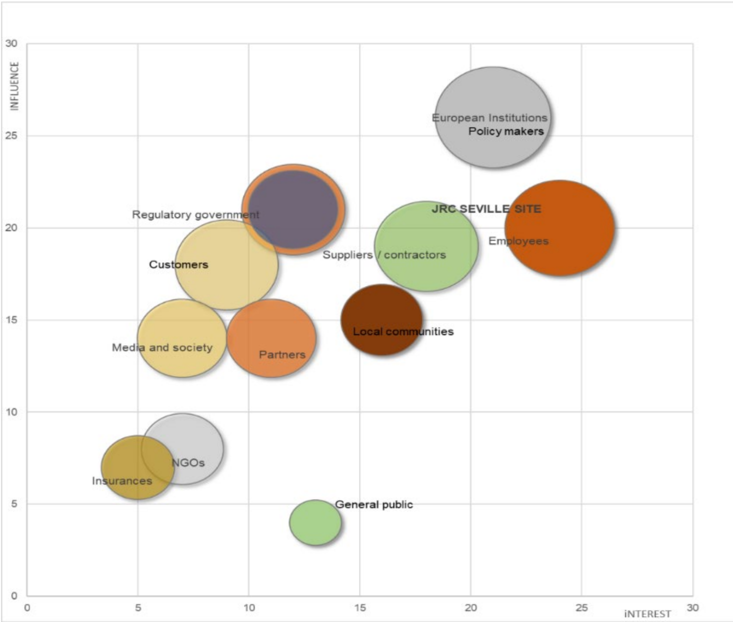
JRC-Seville, according to the EMAS EC Environmental Policy, commits to minimise the environmental impact of its everyday work and continuously improve its environmental performance by:

- Complying with the EMAS Regulation;
- Fulfilling the applicable legal and other requirements related to the environmental aspects;
- Taking measures to prevent pollution and to achieve more efficient use of natural resources (mainly energy, water and paper);
- Taking measures to reduce overall CO_2 emissions;
- Encouraging waste prevention, maximising waste recycling and reuse, and optimising waste disposal;
- Integrating environmental criteria into public procurement procedures and into the rules regarding the organisation of events; and
- Stimulating the sustainable behaviour of all staff and subcontractors through training, information and awareness-raising actions.

In 2022(retrospectively for 2021), JRC-Seville reviewed the stakeholder and context analysis clearly defining the various stakeholder groups, their main representatives as well as their interests or expectations. The results are shown in the table in E6 in section E.12. The various groups are distributed according to their level of interest/influence and involvement on environmental matters using a semi-quantitative approach.

[3] ASCPF criteria – Activities, Strategic direction, Culture and employees, Processes and systems, Financial

Figure E3.Stakeholders Analysis



The following environmental compliance obligations apply to JRC-Seville:

- Having an Environmental Management System (EMS) in line with the EMAS Regulation (Commission Decision C(2013) 7708 of 18/11/2013);
- Contributing to the objectives adopted by the EMAS Steering Committee, in particular the ones adopted for the period 2014-2020 (Note DG-HR/D.2/RV/CSM/MR of 24/01/2018); and the Green Deal.
- Using the core criteria of Green Public Procurement whenever applicable; and
- Ban the use of single use plastic.

E2.4 Environmental aspects

JRC-Seville undertook a full update of the environmental aspects in 2021[4] in accordance with the corporate methodology included in the procedure EMS-PRO-001. The Aspects Register is reviewed annually and updated when necessary. Significant impacts associated with three main aspect groups were identified, as described in Table E7 in section E12.

The analysis of environmental aspects continues strongly influenced by the COVID-19 pandemic situation. For example, to keep up with safety standards, the ventilation system has required a greater level of energy consumption, independently of the office activity. For this reason, the environmental impact associated to the electricty and gas consumption in the building has resulted significant. The other aspects described in the Environmental Aspects Register can be considered of minor significance.

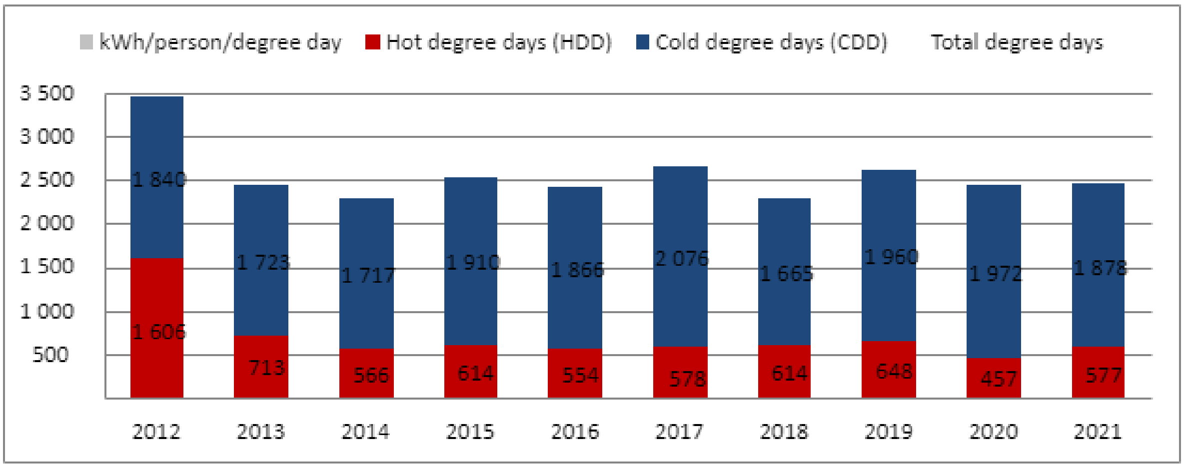
[4] Environmental Aspects Register (IMS-SVQ-S.6.6-REG-0001v3 Environmental Aspects JRC-Seville).

E3 More efficient use of natural resources

E3.1 Energy consumption of JRC-Seville building and vehicles

The building's energy consumption is influenced by the climatic conditions. Official meteorological data[5] suggest that the climatic conditions have been quite stable since 2013 with remarkably hot summers and mild winters (see Figure E5). In 2021, the number of Hot Degree Days (necessitating heating) increased by 26%, whereas the number of Cold Degree Days (requiring cooling) were lower by 4.8% compared to 2020.

Figure E5: Total annual degree-days at JRC-Seville, 2012-2021

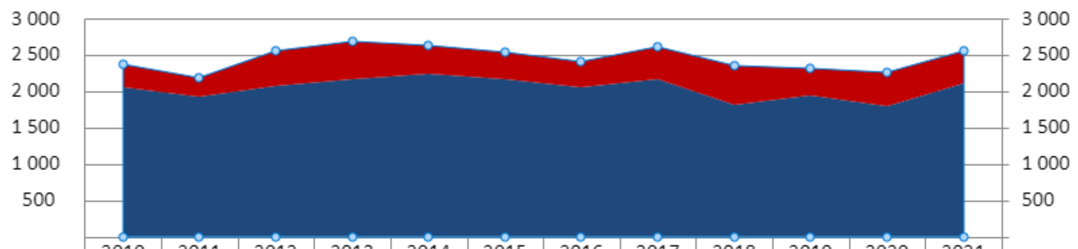


The figures presented in this section are for Expo building only and do not include domestic energy consumption due to homeworking under the COVID pandemic, and which is estimated in the corporate summary.

E3.1.1 Energy consumption of Buildings

The evolution of total annual energy consumption is presented in the Figure E6, while data per capita and per square metre are presented in Figures E7 and E8. In view that JRC-Seville's energy consumption is not measured individually, but there is one single meter for the whole building, the values are based on the prorata building occupation (2020: 61,65% share ot the total building consumption). In 2021, there was not any refill of diesel reported by the property owner.

Figure E6: Annual buildings energy consumption (MWh)perimeter (indicator 1a)

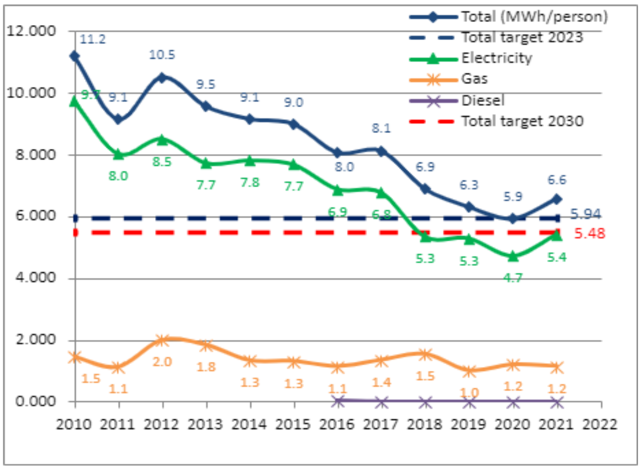


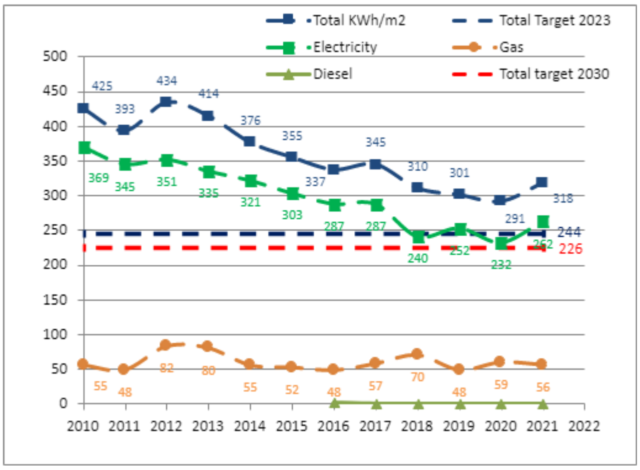
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
diesel				0	0	0	11	0	0	0	0	0
mains supplied gas	309	269	486	519	387	373	344	435	529	372	461	449
electricity	2 060	1 922	2 073	2 173	2 252	2 169	2 059	2 177	1 822	1 943	1 798	2 106
Total energy consumption	2 369	2 191	2 559	2 692	2 639	2 542	2 414	2 612	2 351	2 315	2 259	2 555

electricity mains supplied gas diesel Total energy consumption

[5] Station LEZL, base 15,5 C, monthly degreedays.net. Note that temperature is just one factor influencing heating and cooling requirements

Figures E7 and E8: Evolution of total annual energy consumption for JRC-Seville EMAS building in MWh/person and in kW/m²





Figures E7 and E8 show that between 2010 and 2020 there was a continuous reduction in energy consumption. This reduction was the result of the replacement of two chillers and two boilers (one boiler started operation in 2019) and through better performing equipment including refurbished restrooms, with energy and water saving features. In 2020, the property owner launched the project of replacing the fluorescents lamps in corridors by LED lightings.

However, in 2021, total energy consumption shows an increase of 13 % MWh in relation to 2020. This increase has been significant in the electricity consumption (15.6% regarding 2020) and it is due to COVID 19 pandemic, the ventilation system has been taking the outside air at all times, which for the city of Seville implies extreme conditions.

It should be noted that the regional Government signed a framework contract with their electricity supplier to acquire "green energy" with guarantee of renewable origin, to all public buildings included in the "REDEJA Net[6]". This contract is valid until 2023 and the EXPO Building belongs to this net.

In 2022, the property owner has started the installation of HEPA filters, which would allow safe recirculation of the air and therefore a noticeable reduction of energy consumption. As can be seen JRC-Seville achieved many of the 2020 targets and strives to continue to improve and collaborate with the property owner in their periodically coordination meeting and ever, because JRC-Seville does not posses direct control over the environmental aspects relating to the building's infrastructure, the actions included in this report depends on the property owner's management plan.

Table E8 Further actions to reduce buildings energy consumption

Action plan no	Year planned	Description	Progress	Status / Date
630	2022	Comfort and lighting hour's optimization.	Period of time in collaboration with the landlord has been established for the reduction of the comfort hours during summer, winter and non-working hours.	On going

E3.1.2 Energy consumption of fleet vehicles

JRC Seville's service car fleet is composed of one diesel car only, which has been halted in 2021 due to COVID 19 pandemic situation and the chauffeur's retirement at the end of 2020.

The future of the service implies tendering a transport service, which will take into consideration environmental clauses.

[6] Red de Energía de la Administración de la Junta de Andalucía (REDEJA)

E3.1.3 Renewable energy use in buildings and vehicles

The Expo building does not have installations producing renewable energy. However, as mentioned before, in 2021, all the electricity consumption at Expo Building, was consumed from renewable sources thanks to a contract between the electricity supplier and the Andalusia authority, owner the Expo Building.

The Order ITC/1522/2007 regulates the certificate of origin of the energy but does not foresee how the breakdown of the energy is communicated. Therefore, JRC Seville can verify that the electricity provided is "green", but cannot identify its sources.

Table E8 shows the increasing proportion of renewable energy used in the building, culminating in 2020 with the new contract.

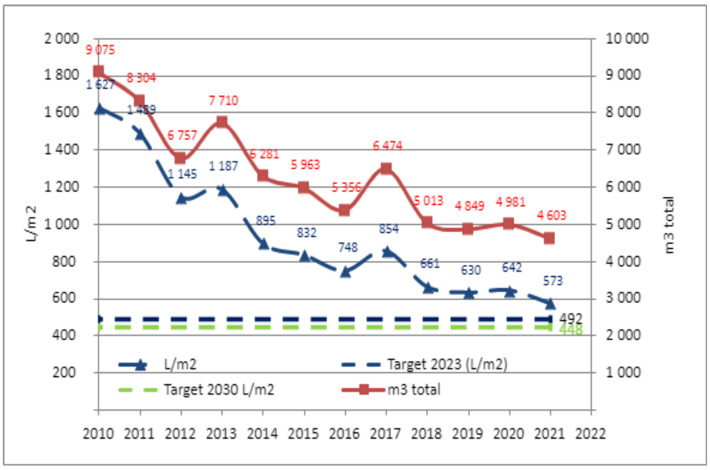
Table E9: Non-renewable energy use in the buildings

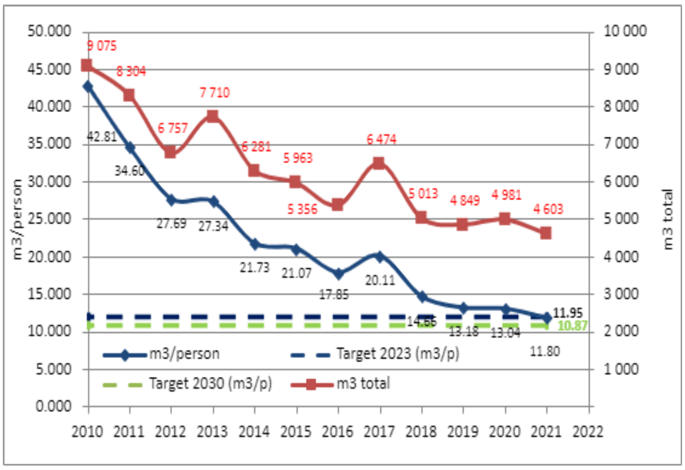
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Electricty from renewables (MWh)	0	267.1	296.4	328.1	596.8	427.2	380.9	428.8	486.4	312.8	1798	2106
(Electricity from renewables (%))	0	13.9	14.3	15.1	26.5	19.7	18.5	19.69	26.7	16.1	100	100
Electricty from non-renewables (MWh)	2059.	1654.8	1776.5	1845.2	1655.5	1741.7	1678.3	1748.1	1335.3	1630.1	0	0
(Electricity from non-renewables (%))	100	86.1	85.7	84.9	73.5	80.3	81.5	80.3	73.3	83.9	0	0
mains supplied gas (MWh non-renewable)	309	269	486	519	386.9	372.6	344	434.79	529.4	372	460.7	449
(Mains supplied gas (from non-renewables (%))	100	100	100	100	100	100	100	100	100	100	100	100
Total renewables (MWh)	**0.0**	**267.2**	**296.4**	**328.2**	**596.9**	**427.3**	**381.0**	**428.8**	**486.4**	**312.8**	**1798.**	**2106.**
Total renewables (%)	**0.0**	**12.2**	**11.6**	**12.2**	**22.6**	**16.8**	**15.8**	**16.4**	**20.7**	**13.5**	**79.6**	**82.4**
Total non-renewables (MWhr/yr)	2368.	1923.8	2262.5	2364.2	2042.4	2114.3	2033.0	2182.8	1864.7	2002.1	460.7	449
Total non-renewables (%)	100.0 0	87.81	88.42	87.81	77.39	83.19	84.22	83.58	79.31	86.49	20.39	17.57

In 2022, the property owner has foreseen to tender the services of an external consultant to performance an energy efficiency audit with the aim to improve the EXPO building's energy efficiency, identifying feasible energy saving measures.

E3.2 Water consumption

Figure E9 & E10: Evolution of total annual water consumption for Seville EMAS building





Figures E9 and E10 show the total water consumption relative to staff count and surface. The figures confirm a global descending trend since 2010, with a reduction of 7.6 % in 2021 regarding 2020. The pandemic has contributed in these years to reduce direct water consumption by staff, however, the intensive use of air conditioning required to counter the extreme summer temperatures without recirculation of the air accounts for values detected.

Saving measures have been undertaken since 2014. The target for 2022 is to reach the objective set for 2023 and to continue reducing at least 7 % of water use at the building regarding to 2021. To achieve this objective, we will continue cooperating with the property owner to better monitor aspects under their control.

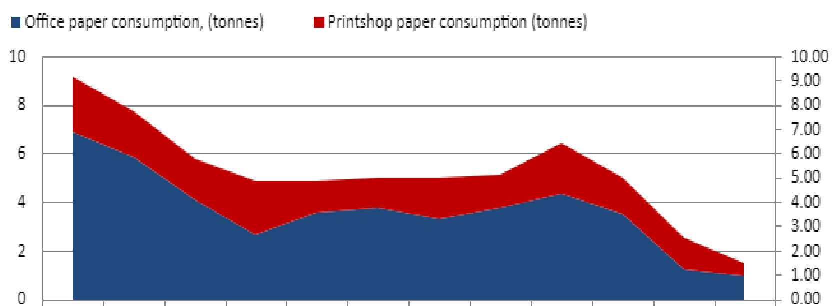
Furthermore, JRC.R.1 has set up a coordination procedure with the cleaning contractor, OHL, for communication of, infrastructure incidents (water leaks, taps broken,etc.) detected by them in the workplace during their activity.

Additionally, we will focus awareness camapaingns on fostering employee involvement using own and corporate resources.

E3.3 Office and printshop paper

The evolution of office and printshop or offset paper at JRC-Seville and per capita breakdown presented below:

Figure E11: Evolution of paper consumption at JRC-Seville (totals)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Printshop paper consumption (tonnes)	2.28	1.91	1.69	2.16	1.24	1.24	1.67	1.40	2.10	1.45	1.30	0.53
Office paper consumption, (tonnes)	6.84	5.80	4.10	2.66	3.58	3.76	3.29	3.73	4.31	3.51	1.21	0.92
Total paper consumption (tonnes)	9.12	7.71	5.79	4.82	4.82	5.00	4.96	5.13	6.41	4.96	2.51	1.45

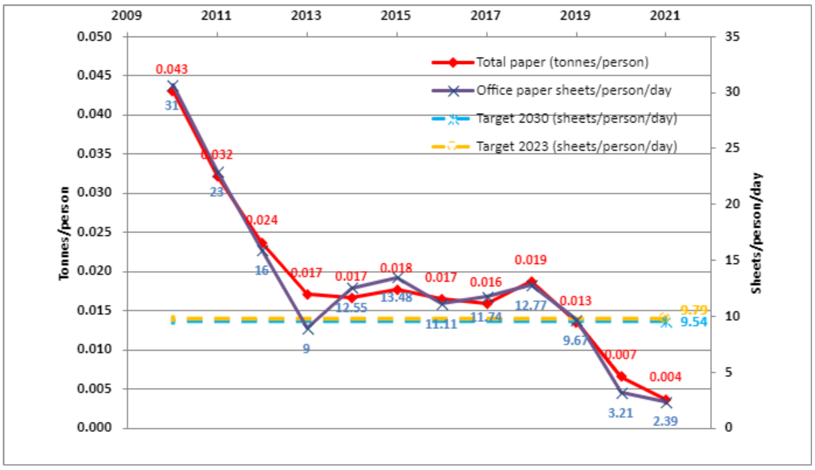
Paper consumption is under direct control by JRC-Seville. Figure E11 shows a significant reduction of both office and offset paper consumption over the years. Due to the pandemic, most of the staff was working from home since March 2020. As a consequence, paper consumption saw a drastic reduction on that year. Nevertheless, a new policy for distribution of paper[7], changed in September 2019, demonstrated to be very effective until the outbreak of the pandemic, with a notable 24% average reduction between the first three quarters of 2019 and the period October 2019 – March 2020.

Additionally, the introduction of the teleworking mode brought along the full implementation of electronic procurement prodecures at JRC Level, contributing to the consumption decrease by 25 % (t/p) in 2021 with respect to the previous year. Thus, paper consumption remains considerably lower than in 2010 and below the target values for 2020.

Regarding offset paper consumption, and considering that the pandemic did not affect this activity, a positive trend may be observed due to the policies implemented by JRC Seville's Program Office. In 2021, offset paper consumption decreased by 67% (t/p), referred to 2020.

[7] The logistics team refills printer based on automatic alerts sent by the printer servers to them by email, so they do not distribute paper to staff members anymore. Formerly, the logistics team would distribute paper packs in reprography areas for free use by staff members.

Figure E12: Evolution of paper consumption[8] at JRC-Seville (totals, and per person)



The target in 2020 and 2021 was to continue monitoring the results of the new paper distribution policy and to try to address the heaviest consumers by location through targeted awareness campaigns. Naturally, this action had to be extended to 2022 or beyond, until resumption of the onsite working mode. Therefore, the objective for 2022 will be to launch targeted campaigns to raise staff awareness on the need to continue reducing paper consumption.

The following actions have contribute to reduce paper consumption:

- close monitoring of paper consumption;
- improving electronic processes;
- fostering the use of electronic signature and distribution of documents.

E4 Reducing carbon footprint and air emissions

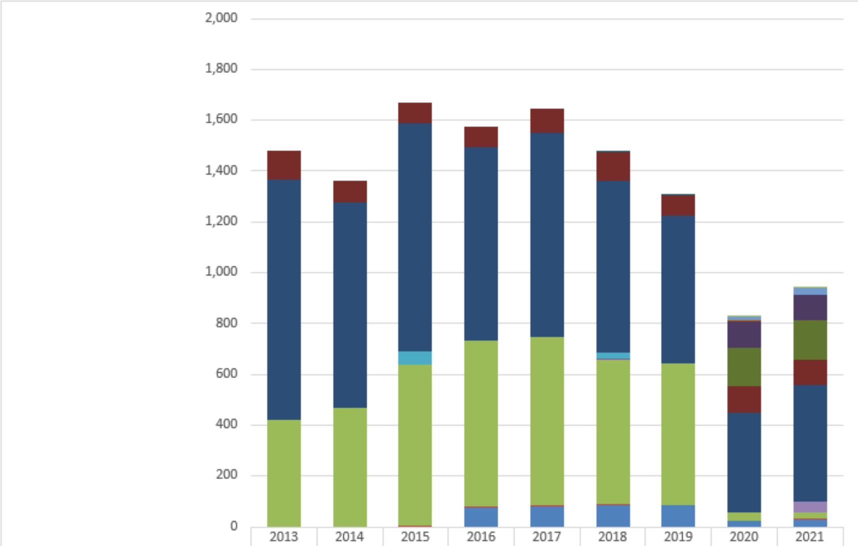
E4.1Overall Carbon footprint

The carbon emissions due to different sources are shown in Figure E13[9]. **This figures include an estimation of the teleworking emissions.**

Figure E13. JRC-Seville, carbon footprint (tonnes CO_2 equivalent emissions 2014-2021)

[8] The counted method for this indicator included the comparison of printed copy total provided by JRC Helpdesk and the total paper boxes bought in the year.

[9] Carbon emission figures obtained using the conversions factors. See the detailed values in the corporate chapter Appendix 2 Carbon footprint: factors and technical elements



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	1,479	1,361	1,669	1,573	1,646	1,477	1,307	828	945
Own waste	0	0	0	0	0	0	0	1	1
Catering	0	0	0	0	0	0	0	0	0
Service contracts	0	0	0	0	0	0	0	13	28
Paper supply	0	0	0	0	0	0	0	2	2
Fixed assets - Commission vehicles	0	0	0	0	0	0	0	0	0
Fixed assets - IT	0	0	0	0	0	0	0	106	100
Fixed assets -buildlings	0	0	0	0	0	0	0	152	153
Buildings - fuel for heating	114	85	82	79	96	117	83	103	101
Buildings - electricity	943	806	894	760	803	672	577	392	460
Buildings - district heating/cooling	0	0	0	0	0	0	0	0	0
Buildings coolant losses	0	0	51	0	0	27	0	0	0
Teleworking emissions						0	0	0	42
Vehicle fleet fuel consumption	1	1	1	1	1	1	1	0	0
Missions air (RFI=2)	418	465	636	654	662	570	558	33	25
Missions excluding air	2	2	4	3	3	2	2	1	3
Experts' travel	0	0	0	0	0	0	0	0	0
Staff commuting	0	0	0	76	82	89	85	24	30

Due to the pandemic, in 2020 the total emissions decreased by 32% compared to 2019. However, in 2021 there was a progressive returning to work from Seville's staff and this fact has contributed to raise the total emissions by 14%. Main contributors to the carbon footprint in 2020 are linked to electricity and gas supply and the own waste.

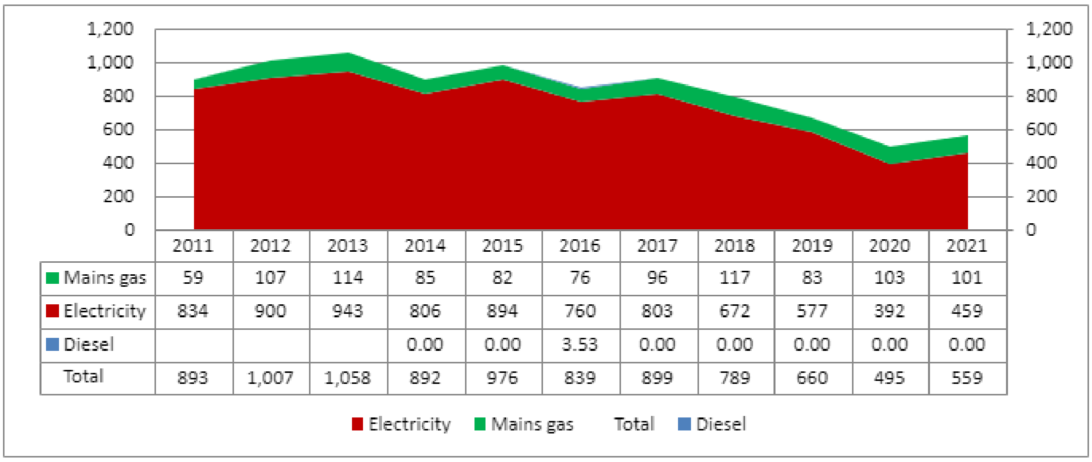
The same observation goes for the data expressed per capita with 9.1 % higher quantities of CO_2 emitted when compared to 2020 and 33 % reduction versus 2019. See the Table in E9 in section E12.

E4.1.1 Buildings' emissions from energy consumption[10] (559 tCO2 in 2021, 59.3% of carbon footprint)

The annual CO_2 emissions generated by energy consumption and the respective contributions of energy source are presented in Figure E14

[10] No diesel consumption reported by the property owner in 2021

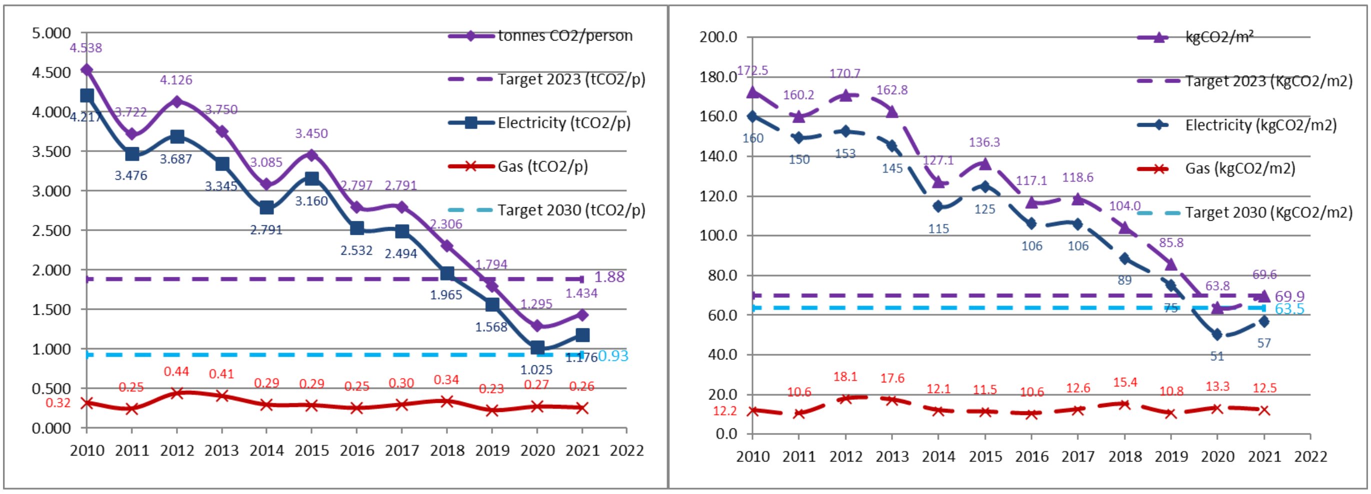
Figure E14: CO_2 emissions from buildings heating in the EMAS perimeter, tonnes



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Mains gas	59	107	114	85	82	76	96	117	83	103	101
Electricity	834	900	943	806	894	760	803	672	577	392	459
Diesel				0.00	0.00	3.53	0.00	0.00	0.00	0.00	0.00
Total	893	1,007	1,058	892	976	839	899	789	660	495	559

The main sources of CO_2 emissions considered under EMAS are from energy used for the buildings, (including equivalent emissions from release of refrigerants). JRC-Seville has evaluated the annual CO_2 emissions for buildings in 2021 at 1.4 tonnes/person.

Figures E15 & E16: CO_2 emissions from buildings heating (tonnes/person & kg/m²) in the EMAS perimeter



Figures E14, E15 and E16 show an overall CO_2 emissions increase in 2021 of 13 % relative to 2020, with a slightly reduction by 2 % in the emissions linked to gas consumption. These emissions from combustion of gas to which contribute the operating of the boilers, increased by 24% due to the pandemic in 2020, as mentioned before (need to constantly heat up external air).

Because the vast majority of CO_2 emissions are due to energy consumption and that JRC Seville does not manage these facilities, no additional specific CO_2 emissions actions have been planned. The 2022 target is the careful monitoring of related indicators, besides supporting actions by the property owner such as installation of HEPA filters, which would allow safe recirculation of the air and therefore a noticeable reduction of energy consumption and it is currently being carried out.

E4.1.2 Emissions from household energy use (42.58 tCO_2e in 2021, 4.4% of carbon footprint)

Homeworking emissions have been estimated for the first time in 2021 in response to the change in behaviour under the COVID pandemic and comprise emissions from i) work and domestic appliances used while teleworking ii) energy consumption from space heating and cooling, and iii) from the embodied energy of IT fixed assets that the Commission financed.

The result of this analysis made to estimate the emissions from the teleworking energy use for the different sites, has been included in a draft note (2022_04_11_Note_for_the_file_on_Impact_of_Homeworking_on_EMAS-results_2021).

The rough estimation made for Seville is extracted from table E: *Sources of energy emissions per site* of this document shown underneath.

SOURCE OF EMISSIONS	JRC SEVILLE
Homeworking heating limited working area emissions per site (TCO2e)	14,07
Electricity emissions for cooling limited working area per site (TCO2e)	0,29
Electricity emissions per site (TCO2e)	27,35
Emissions of VC caused by homework per site (TCO2e)	0,87
Fixed assets emissions due to homeworking (TCO2e)	0,00
Total energy emission (TCO2e)	**42,58**
Emission per teleworkers per site (kgCO2e)	**93,3**

E4.1.3 Buildings -other greenhouse gases (refrigerants)

The property owner manages maintenance of the cooling system and is therefore responsible for the refrigerant life cycle in the building. However, JRC Seville owns individual equipments, for which a comprehensive, detailed register was elaborated and its maintenance contracted with the landlord. The register thoroughly describes the preventive maintenance actions required by type of device, and their periodicity. This preventive program is run by the building owner every month, trimester, semester and year.

In 2021, no leakage or refill of any refrigerant was reported by the property owner. The target in 2022 is to continue monitoring the preventive and corrective maintenance activities carried out by the property owner.

E4.1.4 Staff travel from missions

JRC-Seville did not have any specific target associated with missions' emissions. However, JRC-Seville continues promoting the use of available videoconferencing and IT infrastructure as an alternative for missions. With this aim, a new conference center-Infrastructure, furniture and equipment is being completed. In this room, a high efficiency filtering of air installed to allow safe recirculation and consequently, energy savings and reduced environmental impact.

Videoconference equipment and dedicated videoconference rooms are key assets for JRC Seville and therefore they follow a continuous maintenance and upgrade cycle over the years.

Due to COVID-19 pandemic situation, the business travels were cancelled to almost 100% in 2021.

As the table E10 shows, there was a steady increase in the use of videoconferencing over the years, per staff member until the beginning of the pandemic.

In 2021, only 177 videoconferences took place at JRC-Seville premises. As we mentioned before, most of the staff was teleworking and the meetings were organised using corporate videoconferencing from home and this figure is not included in the table below.

Table E10: Evolution of videoconferences[11] organised in JRC-Seville, relative to staff count

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total of videoconferences	**681**	**802**	**914**	**1051**	**1179**	**1628**	**1628**	**2146**	**753**	**177**

[11] Figure only shows videoconference/organised at JRC-Seville facilities.

Number of staff	244	282	289	283	300	322	342	373	382	390
Videoconference/p	2.79	2.84	3.16	3.71	3.93	5.06	4.76	5.75	1.97	0.45

E4.1.5 CO2 emissions from vehicles.

JRC-Seville only operated one vehicle, mostly used to bring mission holders to Seville's airport. Due to pandemic, after March 2020, this service was interrupted. Car use has been constantly diminishing since 2012, but due to organisational decisions this service probably will be externalised.

The target for 2022 is to contract an external service considering environmental clauses and promoting efficient means of transport.

E4.1.6 Commuting

The CO_2 footprint of staff commuting was first-estimated in May 2019. JRC-Seville launched a survey to determine the transport modes used for commuting between home and the workplace. The CO_2 footprint resulted in approximately 84.7 t CO_2/day or (0.23 t CO_2/p). Unfortunately, as in 2020, the follow up survey planned for 2021 as part of the Sustainable Mobility Campaign could not be performed due to the lack of staff's presence on site. As most of the staff was teleworking, the CO_2 footprint of staff commuting has been approximated considering the result of 2019 and the percentage of staff with presence at the site. The CO_2 footprint resulted in 30 tCO_2/day.

The 2022 target is to continue to the Greening Commuting and minimizing the related CO2 emissions by

- Monitoring commuting Carbon footprint of staff with the participation in the corporate Mobility Survey
- Promoting staff awareness campaigns to use more sustainable means of transport.
- Testing different incentives for staff to shift towards sustainable mobility.

The status of actions related to reducing CO_2 emissions is presented below.

Table E11 Further actions to reduce commuting carbon footprint (indicator 1e)

Action plan no	Planned	Description	Progress	Status / Date
425	2018	Greening daily Commuting of JRC-Seville staff, thus minimizing the related CO2 emissions.	JRC-Seville launched the Sustainable Mobilty transport organised by Ciclogreen.	On going May 2022
588	2021	To install vehicle charging poles in parking areas	Communication with the property owner for the installation of vehicle charging poles in parking areas. Prperty owner has already launched the installation of two charging points	In progress Dec 2022
626	2022	Mobility actions like to evaluate and implement efficient recommendations to improve the mobility, such as the support to use rented bikes or free tickets for public transport	Anlaysis	In progress Dec 2022

E4.2Total air emissions of other air pollutants (SO_2, NO_2, PM)

JRC-Seville's non-CO_2 air emissions are mainly result from the building's energy consumption due to the gas feeding the boilers. The property owner does not report on these parameters and we did not have the values required to measure concentrations of air pollutants in the boilers emissions.

However, in 2019 and 2018 the property owner installed two condensing gas boilers whose NO_2 emissions are shown in Table E13. Calculation takes as maximum concentration of NO_2 emissions, the value indicated in the manual of the manufacturer (Class 6 NOx <56 mg/Kwh.)

There are no data for the parameters on SO2 and particle emission to the atmosphere.
No relevant specific targets for 2020 and 2021.

Table E12 NO_2 emissions 2019 to 2021 by scope (tonnes)

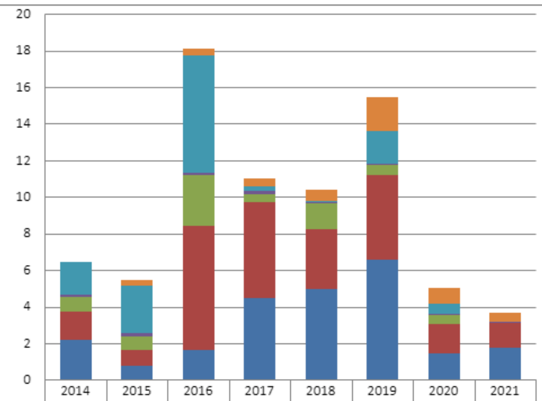
	2014	2015	2016	2017	2018	2019	2020	2021
Total NOx emission (tonnes)	NR	NR	NR	NR	NR	0.021	0.025	0.0251
Change %	NR	NR	NR	NR	NR	NR	19	0.4

(1) NR-No reported

E5 Improving waste management and sorting

E5.1Non-hazardous waste

Figure E17: Evolution of total non-hazardous waste in JRC-Seville (tonnes)



	2014	2015	2016	2017	2018	2019	2020	2021
Total non haz.waste (tonnes/person)	0.022	0.019	0.060	0.035	0.031	0.044	0.014	0.010
Total non hazardous waste, (tonnes)	6.4	5.5	18.1	11.3	10.7	16.1	5.2	3.7
20 01 39 Plastic		0.346	0.370	0.480	0.617	1.883	0.860	0.520
20 01 40 Metal (scrap) - (tonnes)	1.730	2.600	6.420	0.220	0.092	1.800	0.600	0.000
20 01 02 Glass (tonnes)	0.130	0.136	0.080	0.163	0.048	0.050	0.010	0.030
20 01 38 Wood (tonnes)	0.810	0.760	2.780	0.440	1.427	0.540	0.500	0.000
20 01 01 Paper and cardboard (tonnes)	1.540	0.892	6.812	5.234	3.272	4.610	1.610	1.340
20 01 08 Household waste (tonnes)	2.200	0.744	1.610	4.490	4.956	6.590	1.460	1.770

Non-hazardous waste values in 2021 continue being exceptionally low as side effect of the pandemic and the very limited presence of staff on site, particularly during the lunch break. In this scenario, JRC-Seville disposed a total of 3.7t of non-hazardous waste, including household waste, paper and cardboard, wood, glass and metal. It is important to highlight that in 2021, there was no disposal of furniture.

This total amount of waste includes coffee capsules (80 kg).

The cleaning contractor reports most of the waste generated on site. Paper and cardboard waste disposal is managed periodically by an accredited contractor who provides the corresponding certificates indicating the type of treatment given to and the quantities of waste according to the national waste legislation.

In 2021, Seville continued developing improvement actions to manage urban waste that started at the end of 2019:

- Waste collection and disposal by authorised waste managers, thus improving monitoring of legal compliance;
- Co-operation and coordination with the cleaning company and the authorised waste managers;
- Improved measuring of waste.

Impacted by the pandemic, the building's canteen[12] closed in the course of 2020, reducing the production of waste. The target will be to sign an environmental agreement with the future catering provider, in collaboration with the property owner.

The status of actions related to optimising and reducing waste is presented below:

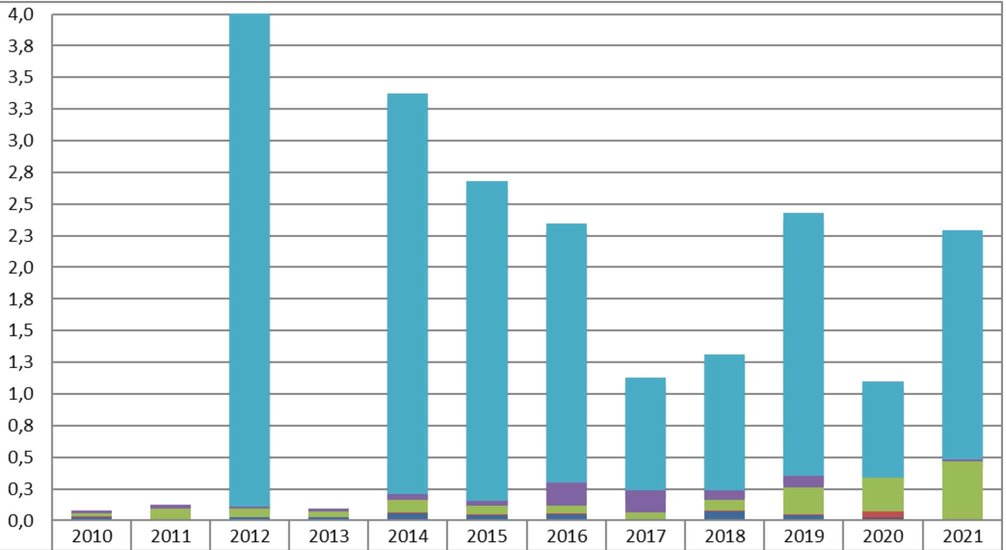
Table E13 Further actions to improve the waste management and to reduce non-hazardous waste

Action plan no	Planned	Description	Progress	Status
550	2020	Progressively reduce plastics for single use items dispose in the vending machines and replacing them by others environmentally friendly options	Proposal of actions to the vending machine distributor. Due to COVID-19 crisis, this action was delayed. Vending machines placed in lunch room will be replaced by a new refrigerators increasing the c	On going
587	2021	Eliminate single use plastics for events organised by JRC-Seville.	Eliminate single use plastics for the events organised by JRC-Seville in collaboration with the new catering contractor replacing them by environmentally friendly options (porcelain cups, glasses and plates)	To start with the new contractor
590	2021	New environmental commitment letter with the future contractor of the catering services of the Expo Building	Sign an Environmental Commitment Letter with the contractor of the catering services of the Expo Building containing the guidelines of sustainable events guide (specially checklist) We are trying to extend this commitment to other catering services with which JRC Seville has agreements.	On going
631	2022	New waste sorting point in the new Conference Centre at the ground floor.	Purchase of the containers.	On going

E5.2 Controlled Waste

Figure E18: Evolution of total controlled waste in Seville (tonnes)

[12] EPGASA's contractor.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total hazardous waste (tonnes)	0,059	0,097	4,091	0,071	3,326	2,638	2,412	1,130	1,312	2,432	1,099	2,292
Total hazardous waste, (tonnes/person)	0,000	0,000	0,017	0,000	0,012	0,009	0,008	0,004	0,004	0,007	0,003	0,006
20 01 35 Electrical equipment (WEEE) (tonnes)	0	0	4	0	3,16	2,52	2,05	0,89	1,07	2,08	0,76	1,81
08 03 18 Inks and toner	0,024	0,025	0,018	0,024	0,044	0,039	0,180	0,174	0,078	0,087	0,000	0,015
20 01 21 Flourescent lamps (tonnes)	0,026	0,092	0,063	0,043	0,105	0,070	0,064	0,064	0,082	0,220	0,270	0,458
18 01 03 Medical waste (tonnes)	0,008	0,005	0,003	0,003	0,003	0,003	0,003	0,002	0,006	0,006	0,039	0,003
16 06 02 Batteries (tonnes)	0,025	0,000	0,025	0,025	0,058	0,045	0,050	0,000	0,072	0,039	0,013	0,000
18 01 09 Medicaments											0,02	0,004

Figure E18 illustrates that the hazardous waste at JRC-Seville has fluctuated over the last few years depending of WEEE removals. WEEE has been largest component of waste since 2012, having achieved a 43 % reduction in 2021 compared to 2014. Once more, the pandemic has contributed to drastically drop the consumption of inks and toners.

The remainder of controlled waste generated by JRC-Seville comprises batteries, medical waste, and fluorescents lamps. For all of them JRC-Seville has a specific contract with an authorised waste manager.

The procedures established in previous year are working properly and awareness campaigns will continue. Therefore, there are no specific management approved actions for continual improvement, except the action described in E.5.1 that also applies to controlled waste. Hazardous waste can be considered as a non-significant environmental aspect according to the environmental aspects' analysis and in relation to the activities of the site.

E5.3 Waste sorting

Table E14: Percentage of waste sorted at the JRC-Seville

	2014	2015	2016	2017	2018	2019	2020	2021
Percentage of unsorted waste (%)	22.6	9.2	7.8	36.2	41.4	35.6	23.1	29.3
Percentage of waste sorted (%)	77.4	90.8	92.2	63.8	58.6	64.4	76.9	70.7

JRC-Seville is separating waste since 2014. Bins for each type of waste are distributed throughout the premises to facilitate separation. The cleaning contractor collects waste daily, providing the monthly measurement of quantities disposed.

While waste is separated as much as possible, the common household waste cannot be separated further in our premises. This is due to the municipal waste collection company's separation policy of non-recovery of organic matter comprising cellulose type waste from toilet paper, wipes, napkins, compresses. Nevertheless, for safety reasons, additional containers have been distributed in key locations for disposal of used facemasks and other potentially contaminated COVID-19 waste.

Probably related to the fewer total amounts generated, the percentage of unsorted waste raises in 2021 by 27%.

Since 2021, a specialised contractor manages paper waste, replacing the cleaning contractor.

E5.4Industrial wastewater disposal

There is no disposal of industrial wastewater at JRC-Seville.

E6 Protecting biodiversity

The total area of the site occupied by the Expo building, including the surrounding garden strips and the pavement, is 12094 m^2, equivalent to 31, 0 m^2 per capita.

The total sealed area is 23487 m^2 equivalent to 60,25 m^2 per person.

A courtyard at the centre of the site has various tree species that provide a cooling effect by shading. It occupies 2 227 m2, representing 19% of the total site area. This area is included in the total nature-oriented area on site. The values are included in the Table E15 in section E12.

In 2020, JRC-Seville started to work with a local consultant to improve the habitat and biodiversity of the EXPO Building and of its surroundings. In 2021, the recommendations of the consultant were exposed to the property owner and to the Site Manager seeking the improvement of biodiversity in the site.

As a result, in 2022 JRC.R.1 will organise specific actions such as installation of nest boxes for insectivorous birds in trees nearby our premises. To promote awareness and engagement of our staff this activity will be done in close collaboration with JRC Seville's staff voluntaries.Table E16 Action relevant to biodiversity

Action plan no	Planned	Description	Progress	Status / Date
557	2020	Identification of a biodiversity action for JRC-Seville	The biodiversity study is done. Proposal actions will be presented to the Senior Management and one action plan 2021-2024 will be defined.	Completed in 2021
632	2022	To install bird nests to help the settling of different bird species based on prior study	Purchase of the birds boxes	In progress
633	2021	To develop interpretative signage	We are going to install information signs regarding each of the tree species in the internal courtyard	In progress

E7 Green Public Procurement (GPP)

E7.1 Incorporating GPP into procurement contracts

JRC-Seville aims to incorporate GPP into its contracts where appropriate, irrespective of their value.

Regretfully, we observe that only the contracts and purchases committed by the Administration considered GPP criteria and most of scientific studies do not consider these principles. For this reason, in 2021 we started a campaign to help research staff including GPP criteria in their contracts.

The following actions are being carried out:

- Cooperation with the corporate Environmental Procurement Team (JRC-Ispra) to look for solutions to improve GPP.
- Sharing this issue with the network of corporate Operational Staff, in charge of procurement.
- Creation of a local environmental group in charge of validating the GPP criteria.
- Promotion of the inter-institutional GPP helpdesk to ensure support to those contracts that must have Green Criteria.
- Meetings with the Secretariats to inform about the status of GPP in the Scientific units.

In 2021, relevant examples of JRC-Seville's Green Public Procurement are the contracts signed with the cleaning service company, the maintenance of the security systems, external prevention service and design of the new building contest besides small purchases and acquisition of office stationary from Commission's framework contracts (see next section).

In 2021, 7 contracts above 60000€ included GPP Criteria.

The status of GPP related actions included in the EMAS annual plan is presented below.

Table E17: Further actions to enhance GPP culture (indicators 5a & 5b)

Action	Year started	Description	Progress	Status/date
423	2018	Ensuring accurate and traceable GPP reporting data.	In Public Procurement Management Tool (PPMT), when it is necessary, in the workflow for approving a purchase in the system, the EMAS Coordinator is included to ensure that the purchase is compliant with the Green Public Procurement. We have included a group of environmental actors for the quick validation of these green criteria.	Done Dec 2021

E7.2 Office supply contracts

Most office supplies are provided through framework contracts arising from the Commission's call for tenders managed by the Office for Infrastructure (Brussels). The Commission applies "green" criteria to select suitable contractors and products. Examples of the Commission's current framework contracts used by JRC-Seville are those for office supplies and furniture or the supply of PCs and peripherals and for printing devices (through DG-DIGIT's contracts). There is no planned action to support further improvement.

E8 Demonstrating legal compliance and emergency preparedness

E8.1 Managing the legal register

JRC-Seville site is compliant with all relevant legislation. JRC-Seville conducts a periodical assessment of its legal compliance by monitoring applicable Spanish legal requirements regarding safety and environment for technical installations. The applicable regulations are listed and assessed in the legal register[13] , which was fully reviewed and updated in 2021.

In 2021, Seville did not identify any non-compliances thanks to systematic execution of compliance assessments.

Furthermore, the JRC Seville environmental coordinator carried out a full legal compliance assessment regarding the building parts under control of Epgasa performed in May and Nov 2021 where all regulatory documentation was checked, such as permits, certificates, contractors' authorisations, and laboratory tests that are shared with JRC Seville through a file exchange platform.

Additionally, for this evaluation, JRC-Seville holds periodic meetings with the property owner to verify legal compliance in situ.

E8.2 Prevention and risk management

In 2021, JRC-Seville did not record any incidents on health, safety and environment. Every year, emergency preparedness and response procedures are tested and updated if necessary in collaboration with the property owner. Particular attention is paid to identify potential accidents and reacting quickly to emergencies to minimise their negative impact. In addition, in 2021 the external prevention service elaborated a specific Emergency Plan for the Seville Site, which has included environmental emergencies identified in the Environmental Aspect register. However, this document does not replace, but rather complements EPGASA's self-protection plan, currently under revision

Furthermore, the Joint Research Centre annually conducts a risk assessment exercise at corporate level, covering those risks associated with its Environmental Management and Occupational and Health & Safety process.

E8.3 Emergency preparedness

JRC-Seville has a dedicated Emergency procedure describing the methodology used at local level to identify and react to potential accidents and emergencies that may affect staff, facilities as well as the environment. Most of the environmental emergencies has to be managed by the property owner in accordance with their Emergency preparedness and response procedure. JRC-Seville has in place a dedicated emergency Initial Response and Evacuation Team and conducts a fire drill annually in dovetails collaboration with the property owner, responsible for the procedure.

Emergency drill carried out in November 2021.The exercise ran smoothly and effectively, according to Epgasa's report. This exercise was influenced by the lack of presence on site due to the pandemic.

The safety and security equipment and installations are regularly verified and maintained in accordance with the applicable legislation.

[13] IMS-SVQ-S.6.6-REG-0002-Legal Requirements JRC-Seville

Due to the pandemic, most of the actions carried out in 2021 continued being related to the prevention measures against COVID-19 risks. Some practical examples carried out for a safety reincorporation at the workplace:

- Elaborating of a Contingency Plan against COVID 19 and protocols for returning to work.
- Establishing measures and protocols to prevent the risk of COVID-19 spreading
- New site occupational risks assessment exercise due to the COVID 19 risks
- Updating legal requirements register
- Ensure effective cooperation with the property owner
- Certification of the COVID 19 Contingency Plan by an external certified organisation

E9 Communication

E9.1 Internal communication

Internal communication may typically involve Commission staff and contractors. To optimise resources, internal communication on site level were focused in non-intrusive though personalised strategies, as for example the use of **signatures in Outlook** by R.1 **to echo campaigns** or to fix the attention of the recipient on particular messages. This action was appraised by EC´s EMAS COORDINATOR.

Additionally, internal stakeholders were informed via dedicated Connected web site. Nineteenth campaigns were broadcasted with complementary links and documents

Mainly, JRC-Seville carried out the communications action defined in the Action Plan 2021 at corporate level. A summary of some of them is included in the Table E18 in section E12.

E9.2 External communication and stakeholder management

JRC-Seville constantly seeks to influence its external suppliers, particularly through the signature of environmental commitments, and encourages them to contribute to sustainable development. For example, new environmental commitment letters were signed with waste managers in 2021.

In 2021, due to the pandemic, collaboration with the property owner has increased on the basis of common interest and a more effective use of the possibilities of the rental contract. For example, a **senior management meeting between JRC-Epgasa** took placed on 09/02/2021, where topic related to environmental and safety issues were treated.

In 2022, JRC-Seville will start contacts with the new contractor of the catering services in the Expo building to discuss best practices for a sound waste management and pursuing the use of environmentally friendlier single-use items, particularly those made of plastic, in events organised by JRC-Seville.

Additionally, contacts with the city council were established at top level with the objective to improve the collaboration between both organisations.

In 2022, JRC Seville will continue participating in the project eCitySevilla. This project is a public-private collaboration initiative led by the regional and local authorities (*Junta de Andalucía, Ayuntamiento de Sevilla*), and the private companies *Parque Científico y Tecnológico la Cartuja* (PCT Cartuja) and Endesa.

eCitySevilla proposes the development of a new urban model, transforming *Isla de la Cartuja* in an open, digital, decarbonized and sustainable ecosystem by 2025. Given the political relevance of the potential new building for the JRC Seville in Isla de la Cartuja, the impact of a strategic action in this sense may be considerable and long lasting.

E10 Training

E10.1 Internal training

In 2021, the training sessions related to environmental protection took place as it is indicated in the table E 19 in section E12.

Due to COVID-19 situation, the training was on-line.

Until last year, Seville's environmental training focused on new staff. However, from 2020 and in collaboration with DG HR's Corporate EMAS team, the JRC-Seville Site is promoting the EMAS Basic info sessions for all staff, in order to raise awareness on EMAS and how staff may contribute to minimise the environmental impact of their daily activity.

The target for 2022 will be to continue requesting the participation of Seville's staff in the corporate training, with at least 80% of staff participation in this training.

The status of environmental related training actions included in the EMAS annual plan is indicated in the Table E19.

Table E20: Further actions related to environmental training in 2020

Action	Year started	Description	Progress	Status/date
422	2018	Keep promoting EMAS training for newcomers. More accurate feedback from attendees to be collected.	All the newcomers at JRC-Seville receive fortnightly a basic introductory session about the EMS. New evaluation process for this awareness session	On going Dec-2021

E10.2 External training

In 2021, JRC-Seville did not offer any external environmental training.

E11 EMAS Costs and savings, conversion factors

E11.1 Costs and savings

Total direct per capita costs of implementing EMAS increased in 2021 by 3.3 % in relation to 2020, from 398€ in 2019 to 403€ in 2021. However, savings have been achieved in relation to per capita costs in the majority of the indicators.

Because the property owner manages the building, JRC-Seville has direct control over relatively few parameters, but these include paper consumption, waste disposal and fuel costs (vehicles). Anyhow, since 2014 JRC-Seville has encouraged the property owner to behave in a more environmentally responsible manner, which have also been successful in reducing operational costs.

Total paper costs include both office paper and printshop paper (publications). In 2021, as happened in 2020 and due to COVID-19 situation and the end of the publication framework contract, the paper cost was reduced by 36 €/person. On the same way, the inclusion of the waste management into the cleaning services contract allowed a general waste disposal reduction of 10€ per person over the year 2019.

The figures are presented in table E21 in section E12.

E11.2 Conversion factors

Conversion factors (most of which apply to all the sites) are shown in an Appendix X of the Corporate Summary.

E12 Tables

E12.1 Description of main activities in JRC-Seville.

Table E3

DIR or UNIT	Activities
JRC B - Growth & Innovation	JRC Directorate B - Growth & Innovation conducts research that provides science-based, customer-driven socio-economic and techno-economic support for the conception, development, implementation and monitoring of EU policies.
JRC B1 Finance and Economy	To provide scientific support to improve European economic and financial governance and to contribute to the reform of the European financial system.
JRC B2 Fiscal Policy Analysis	To model and analyse tax policies, and to support the action plan for a fair and efficient corporate taxation in the EU.
JRC B.3 for Territorial Development	To perform research and analysis and to provide policy support at the crossroads of EU regional, cohesion, R&I and industrial policies, including the assessment of economic and territorial impacts, in order to enhance the formulation and implementation of policy and more effective and efficient use of EU funds.
JRC B.4 Human Capital & Employment	To provide scientific support related to Human Capital and Employment, to contribute to Innovation, Growth and Social Cohesion in the EU.
JRC B5 Circular Economy & Industrial Leadership	To provide the techno-economic support in the fields of industrial emissions, product policy, waste and environmental management.
JRC B6 Digital Economy	To study the current and emerging facets of digital transformation, and its impacts on the European economy, society and environment.

DIR or UNIT	Activities
JRC B7 Knowledge for Finance, Innovation & Growth	To support EU policies by focusing on topics that cut across several Dir B and other JRC Units, integrating scattered knowledge within JRC and outside, and doing essential complementary research to fill the gaps.
JRC C6, Economics of Climate Change, Energy & Transport	To Support the European Commission by performing economics based research in support of energy, transport and climate-related policies.
JRC D4 Economics of agriculture	To provide scientific support to the EU policy-makers in assessing through macro and micro socio-economic analyses the development of the Agro Food sector and related sectors including rural development, food security, trade and technological innovation in the EU and globally but also with special emphasis on Africa.
JRC R.1	To support and coordinate the implementation of resource management functions on the JRC Seville Site in a client responsive manner and in compliance with all applicable rules and regulations, acting as focus of resource management support to the Directorate JRC Seville. To provide technical support for the scientific programmes of the site and to develop and maintain the infrastructure of JRC Seville.
HR.AMC.8	To provide support to human resources dossiers.
I.5	To provide informatics support to the JRC-Seville site

E12.2 External issues affecting JRC-Seville's environmental performance

Table E4

Criterium	External issues[14]	Risks	Opportunities	Actions taken	Efficient and compliant Yes/No	Actions to take/ Action plan
Political	Energy transition and COP (Conference of Parties) 2030 energy targets	Lack of direct control on the management of the building. Financial constraints faced by the property owner Time planning regulation constraints Uncertainty about the future seat of JRC Seville	Potential to use renewable energy sources	Participation in regular meetings with the property owner	Yes/No	Work out with the property owner potential proposals for energy saving measures to reach COP 2030 targets.
	European Green Deal	Difficulty of implementation. Need to allocate more resources and budget. Lack of direct control over the management of the building	Climate-neutrality by 2050 (net zero greenhouse gas emissions by 2050)	Participation in regular meetings with the property owner	No	Assess requirements, risks and opportunities at local level to consider in the new building project

[14] Circumstances that influence JRC- Seville's environmental targets

Criterium	External issues[14]	Risks	Opportunities	Actions taken	Efficient and compliant Yes/No	Actions to take/ Action plan
	Changing policies would imply a revision of the work program (e.g. Brexit, pandemics, Green Deal)	Yet unforeseeable impact on financial and human resources required to sustain the activity of the JRC, with impact on horizontal services and environmental activity	The Green Deal may open a door to increased awareness and environmental efficiency actions.	No specific action. Liaise with Program Manager to anticipate potential actions if necessary.	Yes	
	Requirements of national environmental and energy legislation as well as health and safety legislation	Risk of missing requirements and implications	Improve legal compliance monitoring. Improve environmental performance (better impact monitoring)	Maintain support by an external service for identification and updating of the legal requirements	Yes	
	Policy on banning of single-use plastics	Lack of control on the restaurant-cafeteria contractor, including catering service. Financial and other constraints faced by the cafeteria contractor.	Room for improvement to promote environmental actions with the new catering-restaurant services.	Develop and implement a strategy to influence contractors´ policies and actions to reduce waste and use of plastics. Better environmental actions.(Environmental Action Plan 2021)	No	New catering. New environmental commitment letter with other restaurants GAAP 2022
Economic	Pressure on administrative budget	Potential for budgetary constraints to invest in resources for the EMAS management system.	Loss of opportunities to take environmental actions	Prioritise lower cost options	Yes	

Criterium	External issues[14]	Risks	Opportunities	Actions taken	Efficient and compliant Yes/No	Actions to take/ Action plan
	The steady growth of JRC´s activity in the site has an impact on energy consumption and cost of support resources	Higher share by JRC of total building energy consumption and costs	Justification for new investment in energy reduction (refurbishment, insulation, new buildings)	Participation in regular meetings with the property owner	Yes/No	We will continue exploring jointly with the property owner potential actions to improve the energy efficiency of the current site, commensurate with JRC´s work program.
	Captive market in relation with certain building maintenance tasks and services	Lack of market competition	There are external catering, parking and other offers available.	Explore jointly with JRC.R.1´s Procurement Sector potential actions leading to open the market that could have a positive impact on JRC´s environmental performance.	Yes	
	COVID19 crisis	Revision of budget priorities might affect safety and environment project Shirking offer by providers due to closure of businesses	Reduction of mobility causing better environmental performance of the site	Prioritise most relevant actions within the environmental and safety work plans	Yes	
Social	General evolution of environmental consciousness among staff and interested parties	Difficulties to face all demands of communication with limited resources.	Sharing of experiences and joining forces with other JRC/EC sites	Need to prioritise most relevant actions	Yes	

Criterium	External issues[14]	Risks	Opportunities	Actions taken	Efficient and compliant Yes/No	Actions to take/ Action plan
	Energy transition and COP (Conference of Parties) 2030 energy targets	Lack of direct control on the management of the building. Financial constraints faced by the property owner Time planning regulation constraints Uncertainty about the future seat of JRC Seville	Potential to use renewable energy sources	The property owner has signed a new green contract with Endesa Energia until 2022.	Yes	
	Incorporation of massive teleworking to "new normal" working conditions	Reputational risk, questioning of current staff regulations	Reduction of transport emissions, less waste generation. Better environmental indicators.	Support the Site Manager to set JRC Seville´s position with regard to telework, providing accurate estimates and data as required to define a balanced approach to it.	No	Pending of the EC Corporate Survey regarding teleworking
Technological	Increasing digitalization of processes, computer based management systems, videoconference systems	Budgetary constraints Uncertainty about the future seat of JRC Seville	Potential to digitalise facility management	Follow up digitalization through Green Public Procurement Ensure support to procurement of video-conferencing systems Follow up introduction of e-procurement.	Yes	
Legal	Increasing complexity of environmental regulations	Risk of missing requirements or insufficient monitoring Lack of sufficient control for implementation of some legal requirements Lack of adequate resources Budgetary constraints to carry out legally binding actions	Improve legal compliance monitoring. Improve environmental performance (better impact monitoring)	Maintain External Database service on key subject matters External Legal Compliance.	Yes	

Criterium	External issues[14]	Risks	Opportunities	Actions taken	Efficient and compliant Yes/No	Actions to take/ Action plan
Environmental	Climate change effects: changing seasons, peak and average temperatures. The Expo Building is Energy Class D certified.	Risk for higher heating and cooling costs, given obsolete base design of the Expo building, in spite of recent investments. Lack of direct control over the management of the building. Financial and other constraints faced by the property owner. Time planning regulation constraints Uncertainty about the future seat of JRC Seville	Potential to use renewable energy sources and technologies.	Proposed potential energy saving measures that could be agreed with the property owner. Participation in regular meetings with the property owner	Yes	

E12.3 Internal issues affecting JRC-Seville's environmental performance

Table E5

Criterion	Internal issues[15]	Risks	Opportutanities	Actions taken	Efficient and compliant Yes/No
Activities	Seville's core activity involves carrying out studies; therefore, it is of an administrative nature. The only specialist facilities required are well-equipped computers and data processing capabilities.	Degradation or interruption of power supply or connectivity.		Operational control procedures, regular meetings with the property owner	Yes
Strategic direction	JRC positioning as reference centre increases travelling needs. JRC complex structure. Target that the Commission has to be become climate neutral by 2030	Higher travel emissions (CO2) Complex reporting lines and decision making Need to align the EMAS with political instructions(technical/ staff limitations)	Streamlining of environmental activities in agreement with site manager. Need to prioritise	Promote video conferencing, ensure available, sustainable and reliable technical infrastructure. Agree on simplified working method with line management and site manager.	No
	Biodiversity	Lack of awareness by staff of potential for enrichment of the biodiversity in the site.	Potential to improve the biodiversity in a site with sufficient green areas.	To explore initiatives and collaboration with the property owner on this respect	Yes
Culture & employees	Multi-culturalism at JRC Seville has to be also considered from the point of view of impact on the environmental behavior.	"Negative" behavior can have negative influence on the environmental performance. Lack of interest	"Positive" behavior can have positive influences on the environmental performance as well as positively impact the general behavior	Regular communication campaigns on environmental issues valuing positive behaviour (Connected, info screens), awareness campaigns, and trainings provided to all staff.	Yes
	Staff issues (seniority, temporary contracts, retirement)	Lack of interest by certain staff	Experienced staff may be attracted to give their experience back to staff, to promote positive behaviour. Temporary or junior staff may be attracted by facilitating them to expose and promote their ideas.	Improve the participation in EC EMAS basic trainings.	Yes
Processes & systems	Increased demand for remote/flexible working	Organisational issues and priorities	Reduction of commuting emissions and consumption	Promotion of telework as environmentally friendly work mode where feasible	Yes/No
	Complex internal rules, i.e. tenders, budget authorisations, administrative tasks, etc.	Risk of low efficiency of the environmental management system. Risk of delays in set deadlines.	To a establish a good planning	Establish some corporate guidance and support. No more actions.	Yes
Financial	Pressure on administrative budget	Scarcity of resources for the EMAS management system	Incentive to promote savings related to environmental actions.	To explore initiatives into the normal JRC processes	Yes

E12.4 Stakeholder's analysis

Table E6

Stakeholder group	Main representatives	Interest, needs and expectations	Communication	Priority
European Institutions (Budget €)	– DG JRC, – EC – Council & parliament – Member states – Commission panels – EC citizens	– Timely response to DG's demands – Cost effective Environmental Management – Policy making – Effective implementation of policies at national level – Multi-annual investment plans: investments : refurbishment, upgrading buildings, new construction – Building site management	On regular basis	Manage closely
Policy makers	– -European Commission – -Spanish Government – Andalucía authority – Local authorities	– Contribution to environmental policy and COP 2030 targets on energy – COVID-19 pandemic crisis recuperation	On regular basis	Keep satisfied
Suppliers / contractors	– Property owner including building management and maintenance – Services: cleaning company, catering company, authorised waste managers, architects and consultants, contractors, – stationary supplies, printing services, training	– Business continuity – Timely delivery of services, supplies – Timely response in case of incidents – Adequate resources – Competence – Efficient procurement and financial management – Sound contract performance-Legal compliance – COVID 19 framework collaboration	On regular basis	Manage closely
Employees	– Staff representatives – Employees	– Safe and sound working environment – Transparency – Trust and respect – Be informed on environmental policy, targets and performance – Perceive the commitment from top management towards a sound environmental management.	On regular basis	Manage closely
Customers	– -Research centre/companies and EC DGs	– -Timely delivery of reference materials and policy support	On regular basis	Keep satisfied
Local communities	– Municipality – Tenants of the Expo building – Local Authorities	– Transparency – Legal compliance – Sound Environmental Management	On regular basis	Keep informed
Regulatory government	– Regulatory bodies Environmental inspection authorities	– Legal Compliance	On regular basis	Keep satisfied
Media and society	– Press/TV/radio – Society in general / public opinion	– News value indirect influence on impact through image effects. – Environmental awareness-Sound environmental Policy	On regular basis	Minimum effort
Partners	– policy advisors – other JRC sites – OECD	– Knowing our competences (to partner or compete) – Knowledge sharing, co-operation	On regular basis	Minimum effort
NGOs	– NGO	– Nature protection	On regular basis	Minimum effort

[15] Circumstances that influence JRC- Seville's environmental targets

Stakeholder group	Main representatives	Interest, needs and expectations	Communication	Priority
Insurances	– Fire insurances	– Minimize risk on incidents or calamities	On regular basis	Minimum effort
General Public	– Citizens	– Transparency -Sound environmental Policy	On regular basis	Minimum effort

E12.5 Summary of significant environmental aspects for JRC Seville

Table E7

Aspect Group	Type Aspect	Environmental Aspect	Environmental Impact	Activity product or service	Action plan
Use of natural resources, including energy	Indirect	Electricity consumption	Resources depletion, air emissions, global warming	Heating system	Andalusian public administrations have a specific green contract with the electricity supplier company until 2023. JRC Seville is following this contract. In 2022: Property owner is installing new HEPA filters so the air can be recirculate March 2022: They are evaluating to carry out an efficiency energy audit
Use of natural resources, including energy	Indirect	Gas consumption	Resources depletion, air emissions, global warming	Heating system	In 2022: Property owner is installing new HEPA filters so the air can be recirculate
Air emissions	Indirect	Electricity and heating emissions	Global warming	Ventilation system, Lights, Heating system	
Office work	Direct	Urban Waste Generation	Water pollution, damage to the ecosystem, contamination of land, depletion of resources	Office Activities	In 2022 GAAP: Progressively reduce plastics for single use items dispose in the vending machines and replacing them by others environmentally friendly options. New waste sorting station

E12.6 Carbon footprint per capita CO_2 or equivalent (CO_2 e) emissions.

Table E9

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Scope 1: Fuel consumption and fugitive emissions									
Fuel for bldgs: mains gas	**0.33**	**0.24**	**0.24**	**0.21**	**0.24**	**0.28**	**0.18**	**0.22**	**0.21**
Fuel for bldgs: tanked gas (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel for bldgs: diesel	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Biomass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commission vehicle fleet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refrigerants	0.00	0.00	0.18	0.00	0.00	0.08	0.00	0.00	0.00
Scope 2: Purchased energy									
External electricity supply (grey),	**3.08**	**2.57**	**2.91**	**2.33**	**2.30**	**1.81**	**1.43**	**0.94**	**1.08**
External electricity supply contract (renewables), combustion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
District heating (combustion) (2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scope 3: Other indirect sources									
Fuel for bldgs: mains gas (upstream)	**0.07**	**0.05**	**0.05**	**0.05**	**0.05**	**0.06**	**0.04**	**0.05**	**0.04**
Fuel for bldgs: tanked gas (upstream) (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel for bldgs: diesel (upstream)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commission vehicle fleet (upstream)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Site generated renewables (upstream) (3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
External grey electricity supply, line losses	**0.26**	**0.22**	**0.25**	**0.20**	**0.20**	**0.15**	**0.14**	**0.08**	**0.10**
External 'renewables' electricity contract (upstream with line loss)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
District heating (upstream) (2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Business travel: air (combustion)	**1.48**	**1.61**	**2.25**	**2.18**	**2.05**	**1.67**	**1.52**	**0.09**	**0.07**
Business travel: rail (combustion)	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Business travel: hire car (combustion)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Business travel: private car (combustion)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Experts' travel: air emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Experts' travel: rail emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commuting (combustion) (4)	**0.00**	**0.00**	**0.00**	**0.25**	**0.25**	**0.26**	**0.23**	**0.06**	**0.08**
Fixed assets - buildings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.40**	**0.39**
Fixed assets - IT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.28**	**0.26**
Fixed assests - Commission vehicles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paper supply	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Service contracts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.03**	**0.07**
Catering	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Own waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Teleworking emissions (equipment electricity use)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
Teleworking emissions (fixed assets, equipment)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Teleworking emissions (space heating)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Sum	**5.2**	**4.7**	**5.9**	**5.2**	**5.1**	**4.3**	**3.6**	**2.2**	**2.4**

E12.7 Biodiversity oriented surface area

Table E15

	2019	2020	2021
Total use of land* (m^2)	12094	12094	12094
Total use of land / person	32.9	31.7	31
Total sealed area (m^2)	23487	23487	23487

Total sealed area / person (m^2/person)	63.8	61.5	60.2
Total nature-oriented area on site (m^2)	4994	4994	4994
Total nature-oriented area on site/person (m^2/person)	6.1	5.8	5.7

E12.8 Internal communication actions promoted at JRC-Seville in 2021

Table E18

Action description	Organisation	Dates in 2019	Replication at JRC-Seville site level
Data shows Europe's getting better at recycling, so are we?	Centrally organised (Commission wide)	January 2021	Published on Connected
Reducing paper consumption at JRC Seville (III)	EMAS Site Coordinator	January 2021	Published on Connected
International Woman's Day and Climate Change	Centrally organised (Commission wide)	March 2021	Published on Connected
The carbon footprint of the internet	Centrally organised (Commission wide)	March 2021	Published on Connected
Greening the Commission: Let's walk the talk together!	Centrally organised (Commission wide)	March 2021	Published on Connected
23/03: How to organise "greener events" as part of the new normal?	Centrally organised (Commission wide)	March 2021	Published on Connected
Competition on Sustainable Conferences and Events	Centrally organised (Commission wide)	March 2021	Published via outlook
New "EMAS basics for all" online training available - May and June 2021	EMAS Site Coordinator	April 2021	Published on Connected
EMAS and lessons learnt during the pandemic	EMAS Site Coordinator	May 2021	Published on Connected
EMS Updated, Management review reports and audits reports	EMAS Site Coordinator	June 2021	Published on Connected
Online talk: sustainable fashion - no longer just another option	Centrally organised (Commission wide	July 2021	Published on Connected
Plastic Free July Blog by EMAS	Centrally organised (Commission wide	July 2021	Published on Connected
Report on impact of teleworking on climate change	Centrally organised (Commission wide	July 2021	Published on Connected
MOBILITY WEEK: LET'S PARTICIPATE USING SUSTAINABLE TRANSPORT IN SEVILLE	EMAS Site Coordinator	September 2021	Published on Connected
EU Mobility week 2021 at JRC Seville	Centrally organised (Commission wide	September 2021	Published on Connected
RETURN TO WORK? USE SUSTAINABLE MEANS OF TRANSPORT AND WIN PRIZES!	EMAS Site Coordinator	October 2021	Published on Connected

Action description	Organisation	Dates in 2019	Replication at JRC-Seville site level
European week for waste reduction, 20-28 Nov 2021	Centrally organised (Commission wide	Nov 2021	Published on Connected
Climathon Seville 19-21 Nov 2021	EMAS Site Coordinator	Nov 2021	Published on Connected
On-line "EMAS basics" training for all staff!	EMAS Site Coordinator	Nov 2021	Published on Connected

E12.9 Internal training provided at JRC-Seville in 2021

Table 19

Description	Organisation	Dates in 2021	Participation at JRC-Seville site level	Participants (estimated)
First things you need to know about Security, Environment, Health and Safety and use of the infrastructure	JRC-Seville	Fortnightly	75 min/session for newcomers	62
EMAS basics for all	HR EMAS Coordination Team	November and December 2020	All staff	22

E12.10 EMAS administration and energy costs (Euros) for buildings in the EMAS area

Table 22

Parameter	2014	2015	2016	2017	2018	2019	2020	2021	Change in last year
Total Direct EMAS Cost (EUR)	132,000	134,000	134,000	138,000	148,000	150,000	152,000	157,000	5000
Total Direct Cost per employee	457	473	447	429	433	408	398	403	5
Total buildings energy cost (Eur)	329,966	300,602	304,217	307,918	266,329	282,984	258,525	254,166	-4360
Total buildings energy cost (Eur/person)	1,142	1,062	1,014	956	779	769	677	652	-25
Total fuel costs (vehicles) (Eur)	502	412	260	385	310	462	143	0	-143
Total energy costs (Eur/person)	2	1	1	1	1	1	0.4	0.0	-0.4
Total water costs (Eur)	11,068	11,091	11,623	13,208	10,227	10,038	8,631	8,193	-437
Water (Eur/person)	38	39	39	41	30	27	23	21	-2
Total paper cost (Eur)	4 338	3 337	33 220	24 297	35 251	29 548	25 425	12 194	-13232
Total paper cost (Eur/person)	15	12	111	75	103	80	67	31	-35
Waste disposal (general) - unit cost/tonne	0	0	226	365	385	256	100	100	0
Waste disposal (general) - Eur/person	0	0	14	13	12	11	1.4	1.0	-0.4

EUROPEAN COMMISSION

Environmental Management System

EMAS
VERIFIED
ENVIRONMENTAL
MANAGEMENT

Environmental Statement 2022
2021 Results*
Annex F: JRC-Karlsruhe

***This annex was not subject to external verification audit**

Table of Contents

ANNEX F: JRC-Karlsruhe

JRC-Karlsruhe (hereafter referred to as Karlsruhe) is one of the six sites of the European Commission's Joint Research Centre and is a part of the JRC Directorate G for Nuclear Safety and Security. The mission of Directorate G is the implementation of the JRC Euratom Research and Training Programme, the maintenance and dissemination of nuclear competences in Europe to serve both ''nuclear'' and ''non-nuclear'' Member States. A strong cooperation and complementarity with their national organisations are of key relevance.

JRC Directorate G supports the relevant policy DGs with independent, technical and scientific evidence in the areas of nuclear safety, security and safeguards.

Directorate G is also an active key partner in international networks and collaborates with international organisations and prominent Academia and Research Institutes.

F1 Overview

F1.1 Reporting and the COVID pandemic

The year 2021 presented a similar situation to 2020 due to the COVID pandemic, although the level of operations was significantly higher in 2021 than in 2020 while still considerably limited (e.g., only max. 30 - 50% of staff were allowed on site). The reporting for 2021 retains the same approach for continuity, as previous years, and is therefore based on site activity and total staff numbers. The data will therefore reflect the impact of a significant staff absence on facilities operation to a certain extent. Nevertheless, as JRC Karlsruhe is a nuclear site which cannot be completely shut down, the reduction or the cancellation of scientific work as well as the absence of staff has some, but no significant, influence on several parameters because the installations necessary for the safe operations of the site (e.g., the ventilation system) were running under normal conditions most of the time.

The EMAS corporate coordination team has made estimates of home consumption, due to telework under COVID, as described separately in the Corporate summary. The impact of teleworking will be discussed in the various chapters where appropriate. As the resulting figures are based only on estimations, these data will not be included in the official reporting but only mentioned for informational purpose.

F1.2 Core indicators since 2008

Karlsruhe has been collecting data on some core indicators since 2002 although not systematically. More recent data (from 2008) are presented in this report. Table F1a shows data and performance trends since 2014, and targets, where applicable, for 2023.

Table F1a: Historical data, performance and targets for core indicators proposed for Commission level reporting

Physical indicators:	Historic data values						Performance since:		Future targets		Future targets	
(Number, desciption and unit)	2008 (1)	**2014**	2018	2019	2020	2021	2008	2014	2014-23	2014-30	2023	2030
							Δ %	Δ %	Δ % (2)	Δ % (2)	value(2)	value (2)
1a) Energy bldgs (MWh/p)(3)	78.64	**64.03**	73.06	76.90	66.30	75.34	-4.2	**17.7**	n.a.	n.a.	n.a.	n.a.
1a) Energy bldgs (KWh/m²)	610	**490.93**	536.45	561.10	474.56	532.26	**-12.7**	**8.4**	0.0	0.0	491	491
1c) Non ren. energy use (bldgs) %		**82.0**	75.8	74.1	72.2	82.8		0.9	-7.0	-10.0	76.3	73.8
1d) Water (m³/p)	16.51	**21.03**	19.11	15.22	12.29	16.78	1.6	**-20.2**	-29.0	-32.0	14.93	14.30
1d) Water (L/m²)	128	**161**	140	111	88	119	**-7.4**	**-26.5**	-32.0	-34.0	110	106
1e) Office paper (Tonnes/p)		**0.019**	0.011	0.007	0.000	0.003		**-82**	-22.0	-24.0	0.015	0.014
1e) Office paper (Sheets/p/day)		**17.8**	10.8	7.2	0.0	3.7		**-79**	-22.0	-24.0	13.9	13.5
2a) CO_2 buildings (Tonnes/p)(3)	19.37	**18.34**	21.21	20.20	15.79	16.88	**-12.9**	**-8.0**	n.a.	n.a.	n.a.	n.a.
2a) CO_2 buildings (kg/m²)	150.2	**140.6**	155.8	147.4	113.0	119.2	**-20.6**	**-15.2**	0.0	0.0	141	141
2c) CO_2 vehicles (g/km, manu.)		**202**	157	146	146	146		**-27.7**	-17.0	-19.0	168	164
2c) CO_2 vehicles (g/km, actual)(4)		**277.7**	389.8	280.6	135.4	192.8		-30.6				
3a) Non haz. waste (Tonnes/p)		**0.33**	0.27	0.25	0.19	0.19		**-43.8**	-22.0	-24.0	0.3	0.3
3b) Hazardous waste (Tonnes/p)		**0.033**	0.019	0.008	0.023	0.019		-42.6				
3c) Unseparated waste (%)(5)		**30.8**	28.7	39.2	32.5	29.3		**-5.1**	n.a.	n.a.	n.a.	n.a.
3c) Unseparated waste (T/p)(5)		0.113	0.083	0.100	0.071	0.060		**-46.5**	n.a.	n.a.	n.a.	n.a.
Economic indicators (Eur/p)												
Energy consumption (bldgs)		**5 210**	5 885	6 161	5 328	6 016		15.5				
Water consumption		**46.27**	42.04	33.49	27.03	36.92		-20.2				
Non haz. waste disposal		**NA**	NA	NA	NA	NA						

Notes: (1) Earliest reported data
(2) Compared to 2014
(3) Following mid-term review, JRC-Karlsruhe does not consider them useful in its particular context, because due to the site characteristics and the highly regulated nuclear activity the operation of the installations does not depend on the numbers of persons working.
(4) Following mid-term review JRC-Karlsruhe no longer applies the target for actual vehicle emissions owing to unreliability of manufacturer data.
(5) The new revision of the German Gewerbeabfallverordnung (German ordinance on industrial waste; taking effect from August 2017) defines different criteria regarding the waste separation than those used by the Commission for this Environmental Statement and consequently leads to different values. As there is a minimum value of 90%, separation required according to this Ordinance it is not possible for JRC Karlsruhe Site to use other criteria because these would lead to values far below the legally required percentage.
NA: Prices for various waste fractions differ too much for a useful calculation.

As a nuclear facility subject to German nuclear legislation, Karlsruhe must comply with extensive technical and legal requirements which limit the scope for some environmental improvements (cf. F3, F4.1.1 and F9.1). More specifically, Karlsruhe must at all times respect strict legal requirements governing site safety and security, which gives little flexibility regarding choices in consumption. Extensive active ventilation systems, for example, must run virtually continuously. Additionally, as a research institution, Karlsruhe's consumption of energy, water and other resources may vary significantly from year to year depending on its programme of activities and experiments as well as infrastructure measures.

Table F1a shows positive performance trends in all core parameters except energy consumption. The values of CO2 emissions per m² is influenced by an increase of the surface of approximately 22% since 2012. The increase in CO_2 emissions in 2017 is due to a change of electricity supplier, a decision outside Karlsruhe's control. Water use has reduced in recent years. Waste generation remains fairly steady since 2012 and is rather unpredictable as it depends to a large extent on the research as well as renovation and construction activities. Nevertheless, without construction waste, there is a significant decrease since 2014.

The evolution of the EMAS system in Karlsruhe is as shown below.

Table F1b: EMAS baseline parameters[1]

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Population: staff in EMAS perimeter	273	294	305	299	305	320	322	324	322	317	315	309	305
No. buildings for EMAS registration	0	0	0	0	2	2	2	4	4	4	4	4	4
Total no. operational buildings	2	2	2	3	2	2	4	4	4	4	4	4	4
Useful surface area in EMAS perimeter, (m²)	35 592	35 592	35 592	35 592	41 735	41 735	41 735	43 170	43 170	43 170	43 170	43 170	43 170
Useful surface area for all buildings, (m²)	35 592	35 592	35 592	35 592	41 735	41 735	41 735	43 170	43 170	43 170	43 170	43 170	43 170

1 Staff no. centrally collected figures from DG HR; surface area collected by Karlsruhe's technical services (adding up the surface areas of all rooms)

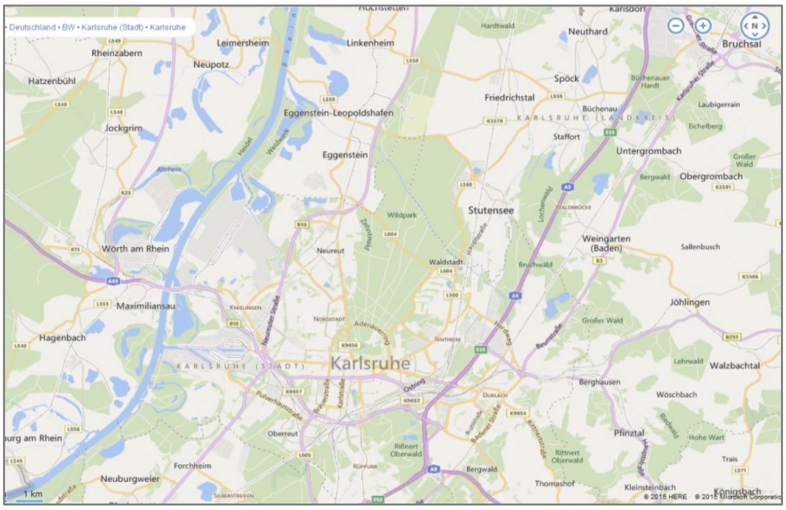
Karlsruhe did not set quantitative EMAS targets in 2020 for 2021 as it focussed on achieving the qualitative objectives and actions identified in its Environmental Program. A target was set for most parameters not to exceed the 2014 values. Moreover, since 2014 an environmental plan has been prepared yearly to better manage environmental aspects. In addition, Karlsruhe subscribes to the Commission's EMAS objectives for the period 2014-2023.

F2 Description of JRC-Karlsruhe:

F2.1 Site activities[2]

As shown in Figure F1a, the site is located in the north of Karlsruhe (Eggenstein-Leopoldshafen), Germany at the Karlsruhe Institute of Technology (KIT) Nord Campus. Karlsruhe has averaged about 300 staff over the last few years with a further 150 permanent contract workers on site.

Figure F1a: Site location



In contrast to most other Commission premises which are dedicated mainly to administration, Karlsruhe is a nuclear facility conducting scientific and technical research. It requires large laboratories and other technical and experimental facilities resulting in a wide range of activities with varying environmental impacts. Also, most of the installations have to run continuously for safety and security reasons and cannot even be shut down when there are no activities at all.

Including all new buildings having become operational in the last years the total floor space now covers 43,170 m². The total site area is about 234,000 m² of which about 72,000 m² are sealed surfaces (paved or built-up). The site consists of the used area as shown in figure F1b and of, approximately, an additional 120,000 m² of unused forested area east of the built-up part (cf. figure F16).

As shown below in Figure F1b, other than the guards' house and the goods' transfer building, the site is dominated by one building with nine interconnected wings. The building part in the north-east corner of the plan in figure 1b is the construction site of the new wing M, which is at the moment at the status building shell completed. This wing will operate largely independent but is also connected to the other parts of the building and will, of course, create more energy consumption as well as related emissions.

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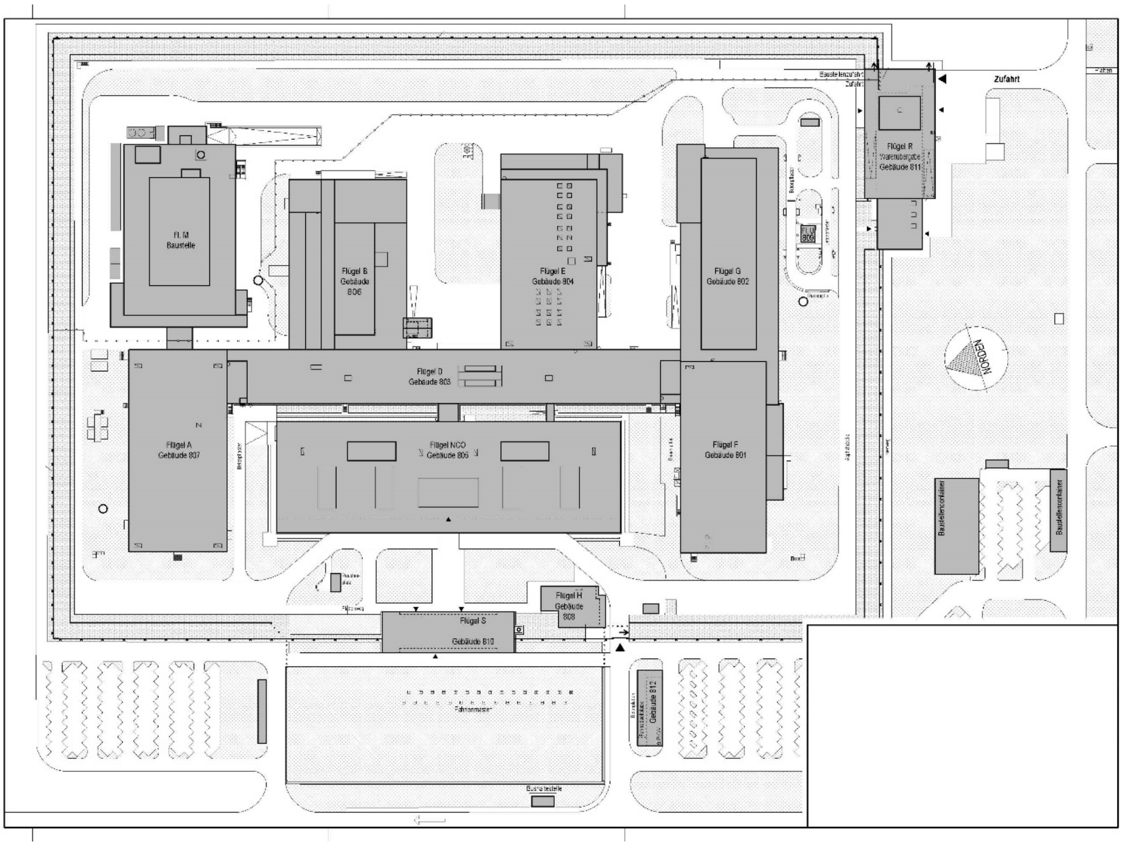
[2] NACE codes associated with Karlsruhe activities are: 99 – Activities of extraterratorial organisations and bodies; 71.2 Testing and technical anaysis, and 72.1 Research and experimental development on social science and humanities

Figure F1b: Site layout



Karlsruhe's scientific activities are conducted in the nuclear area, within the frame of the EURATOM Treaty, and are summarised in Table F2: Due to the significant cuts in the EURATOM budget since 2020 it is unclear if all of these can be continued

Table F2: Description of main activities in JRC-Karlsruhe's nuclear area

Activity	**Description**
Fundamental properties & applications	• Basic understanding of actinides, nuclear materials and fuel processes • Medical applications of alpha-emitter therapy of cancer and infectious diseases
Safety of nuclear fuels and fuel cycle	• Nuclear fuel behaviour in normal, transient and accidental conditions, codes and modelling • Safety assessment of conventional and advanced nuclear fuel cycle and advanced technologies
Nuclear waste management & decommissioning	• Assessment and modelling of key alteration processes, long-term behaviour of spent fuels under disposal and storage conditions • Development of innovative technologies and techniques for radiation surveillance, mapping and reconstruction technologies
Monitoring of radioactivity in the environment	• Procedures for data collection, evaluation and harmonisation, dispersion models • Radioactivity environmental monitoring with management of information systems
Nuclear safeguards	• Nuclear material measurements, containment & surveillance, process monitoring, analytical methodologies and measurements • Support to EURATOM safeguards regime and IAEA, operation of DG ENER onsite laboratory in La Hague
Nuclear non-proliferation	• Techniques and methodologies for the verification of absence of undeclared activities, trace and particle analysis, reference materials • Export control, trade analysis, non-proliferation studies
Nuclear security	• Prevention, detection, response, national response plan, CBRN • Combating illicit trafficking & nuclear forensics
Training and education	• European Nuclear Safety and Security School (EN3S), user facilities, higher education • Vocational training, European Nuclear Security Training Centre (EUSECTRA) • Knowledge management and dissemination

Since 2008 Karlsruhe has operated an Integrated Management System (IMS) and is certified according to ISO 9001 and 14001 as well as ISO 45001 (since 2018, previously BS OHSAS 18 001). Since 2015 the local IMS has been partially replaced by a JRC wide system (mostly concerning the Quality Management aspects).

F2.2 Stakeholder analysis

Important stakeholders for JRC-Karlsruhe include, in addition to the German nuclear regulatory authorities, peer nuclear scientists, journalists and influence makers, several Commission Directorates General such as DG ENER, EURATOM, co-operators on nuclear safety, young academics, local and regional politicians and the local Chamber of Commerce (see also chapter F10).

In 2018 (retrospectively for 2017) Karlsruhe prepared the first comprehensive stakeholder analysis clearly defining the various stakeholder groups, their main representatives as well as their interests or expectations. This was adapted and continued up to 2021 (retrospectively for the year before). The result is shown in table F3. The various groups are distributed according to their level of interest/influence and involvement on environmental matters, using a semi-quantitative approach.

Table F3: Stakeholders' description - JRC-Karlsruhe

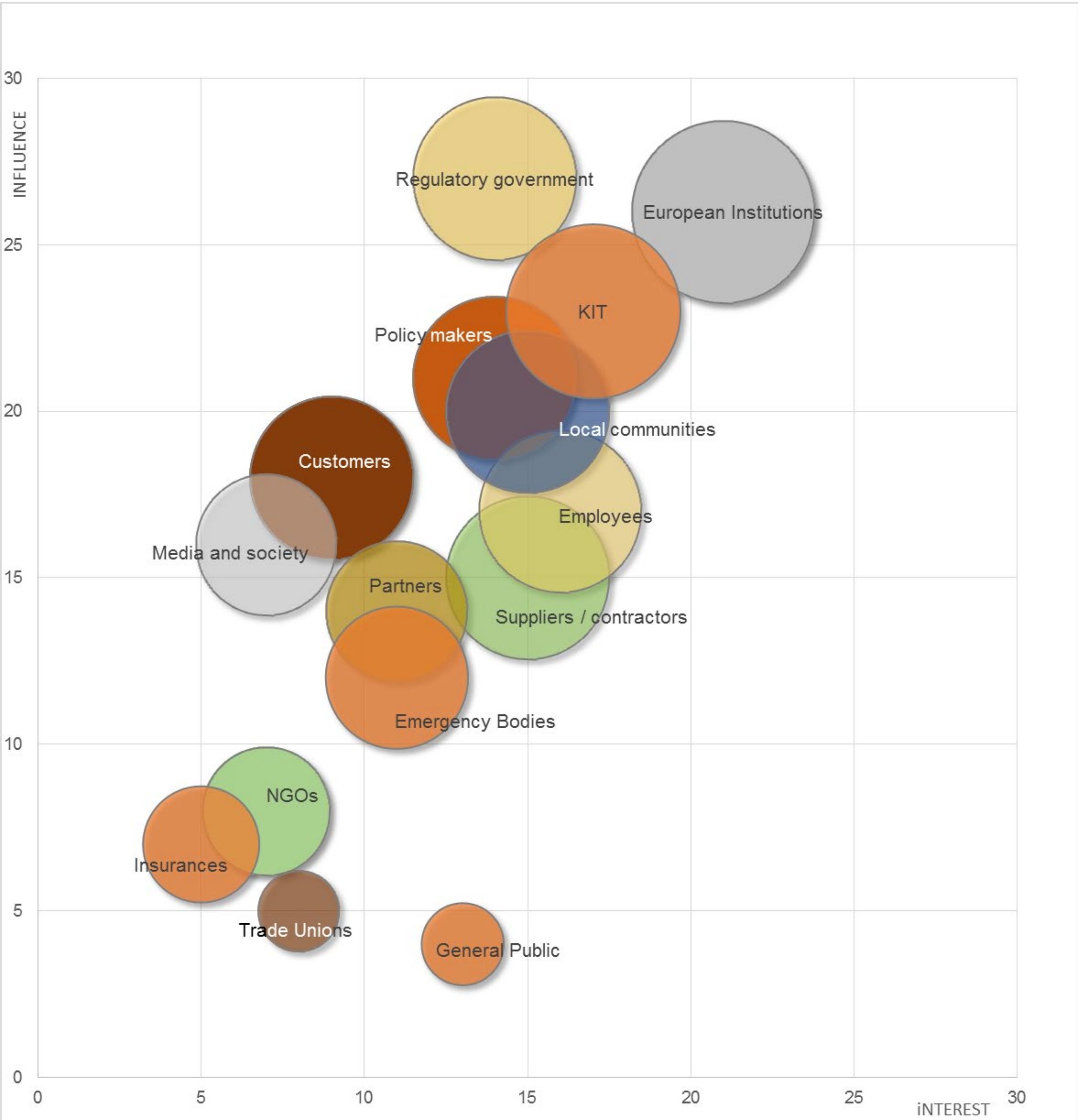
Stakeholder group	Main representatives	Interest, needs and expectations Obligations*	Necessary communication	Prio.
European Institutions (€)	- DG JRC, - EC, - Council & Parliament - Member States - Commission panels - EU citizens	- Services responding well to DG's demands - Minimal costs on energy/waste/soil - They define the policy - Multi-annual investment plans: that decide on investments: refurbishment, construction, … - Site development plan		1
KIT	Direct contacts: Fire response, medical, supplier for essential resources (heat, electricity), etc.	**Compliance with nuclear regulations**, operational control, active involvement Gründungsvertrag	Defined by respective legislation	1
Policy makers	- Baden-Württemberg - Germany - European Commission	Contribution to environmental policy and COP (Conference of Parties) 2030 targets on energy		1
Suppliers / contractors	- Products: e.g., lab chemicals, lab instruments, - Services: KTE, maintenance companies, cleaning, catering, gardening, waste company, architects and consultants, construction companies	Maintaining their contracts, continue their delivery		1
Employees	- Employees - Staff representation	Safe and modern working environment, trust and respect, be kept informed on environmental policy, targets and performance, employer that is caring about environment and sustainability		1
Customers	DGs: ENER, RTD, INTPA, TRADE, TAXUD, HOME, GROW, SANTE	Timely and correct delivery of reference materials and policy support, no specific requirements on environmental criteria		1
Local communities	- Neighbourhoods and municipalities - KIT - Landkreis Karlsruhe	No radiation, no calamities, minimized transports and waste. Local communities want to be timely informed about incidents / calamities. They want to be informed about the installations and their risks		1
Regulatory institutions	- Regulatory bodies / Environmental inspection authorities: UM Baden-Württemberg, Landkreis Karlsruhe - EMAS verifiers - IAEA - EURATOM	**Compliance with regulations**	Defined by respective legislation	1
Emergency Bodies	- KIT Fire brigade - Fire brigades of the surrounding communities - KHG - Civil protection institutions (Regierungspräsidium Karlsruhe, UM Baden-Württemberg)	**Notification in case of incidents**	Defined by respective legislation	2
Media and society	- Press/TV/radio - Society in general / public opinion	News value (when something goes wrong or ongoing projects). Indirect influence on impact through the image it conveys		2
Partners	- national laboratories - policy advisors - other JRC sites - OECD - other collaborators	Knowing our competences (to partner or compete)		2
NGOs	- NGO: e.g. BUND Naturschutz	Nature protection, no pollution		3
Insurances	- Fire insurances - Nuclear liability insurance	Minimized risk on incidents or calamities		3

Stakeholder group	Main representatives	Interest, needs and expectations Obligations*	Necessary communication	Prio.
Trade Unions	- Members	**Working conditions**, contract fulfilment	Defined by respective legislation	3
General Public	- Citizens	Transparency		3

*Obligations printed in bold letters

A clearer picture of the significance of the various stakeholder groups as well as the necessary means to deal with them can also be found in a bubble chart below (Figure F2).

Figure F2: JRC-Karlsruhe Stakeholder analysis



F2.3 Context analysis

The EMAS regulation as well as ISO 14001 (2015)[3] require that an organisation determines which external and internal issues can affect its ability to achieve the intended outcomes of its environmental management system, whether positively or negatively.

For external issues this has been done in a PESTLE[4] analysis and is shown below (Table F4a).

Table F4a: Context analysis JRC-Karlsruhe – external issues

PESTLE criterion	External issues & circumstances that influence JRC- Karlsruhe's environmental targets (4.1)[5] *(current conditions or future developments)*	Risks (6.1.1)	Opportunities (6.1.1)	Actions (6.1.4)
	Energy transition and COP (Conference of Parties) 2030 energy targets			
	German climate targets		Energy reduction measures, energy efficiency, renewable energy.	Set up Site Development Plan including measures to reach COP 2030 targets within the given boundary conditions.
	Changing policies can affect scientific activities on the site and use of resources. More precisely, 20% cut of EURATOM budget for the next	Budgetary constraints; impact on Human Resources		
	Requirements of national environmental and energy as well as health and safety legislation	Risk of missing requirements	Improve environmental performance (better control of impact)	Contract and keep expertise on key functions (incl. using an external service provider)
Political	Requirements of the Regulations: EMAS / ISO	Significant changes		Contract and keep expertise on key functions (incl. using an external service provider)
	Buildings' infrastructure	Budgetary constraints	Improvement in energy efficiency	Site development plan; Environmental Program 2021, No. A2a-A2c; IM1-IM3
	EURATOM budget	Significant cuts since 2020 lead to budgetary constraints		
	COVID-19 pandemic situation	Legal and general restrictions lead to reduced operations and may lead to reduced scientific output.	Possible energy savings to be expected due to reduced operations; in fact, only applicable when the site is almost shut down (hibernation mode, i.e., no activities at all except the operation of the safety relevant installations) Less emissions due to less commuting	

[3] ISO 14001 (2015) Chapter 4.1, 6.1, 6.4 and EMAS Regulation Annex 1 §1, §7
[4] https://en.wikipedia.org/wiki/PEST_analysis
[5] Numbering taken from ISO 14001 (2015) Chapter 4.1, 6.1, 6.4 and EMAS Regulation Annex 1 §1, §7

PESTLE criterion	External issues & circumstances that influence JRC- Karlsruhe's environmental targets (4.1)[6] *(current conditions or future developments)*	Risks (6.1.1)	Opportunities (6.1.1)	Actions (6.1.4)
Economic	The uncertain economic situation influences the investments, staffing and contractors	Budgetary constraints, so investments in energy reduction/shift cannot be realised		
	Increasing energy and resources costs have an influence on overhead costs of the site	Higher budgets needed for electricity and gas as well as other resources; can also lead to reduction in other budgets	Justification for new investments in energy reduction (refurbishment, insulation, new buildings)	Environmental Program 2021, No. A2a-A2c; IM1-IM3
	Largely captive market (for several suppliers/providers of staff and material)	High cost, reduced availabilities		
	EURATOM budget	Significant cuts since 2020 lead to budgetary constraints		
	COVID-19 pandemic situation	Costs for masks and COVID tests (both have to be provided by the employer acc. to German regulations)	Possible energy savings to be expected due to reduced operations; in fact, only applicable when the site is almost shut down (hibernation mode, i.e. no activities at all except the operation of the safety relevant installations).	
		Costs for contractors' staff staying at home shift-wise in order to have enough staff available in case of larger outbreaks.		
Social	Increasing awareness of society on environmental impact and demand for transparency and reporting.		Opportunity for developing good communication and commit to EMAS compliance	Publish environmental statement
	Skills shortage - demographic change	Positions cannot be re-staffed, number of specialised companies decrease (can lead to monopolistic position in the market), also problematic for business continuity		
	Phase out of nuclear technologies for energy production. Higher demand for specialists in radiation protection and decommissioning	Decrease in specialized manpower available on the market; increasing prices for contracts Can be intensified by the COVID-19 pandemic situation		
	COVID-19 pandemic situation	Reduced operations, shift work and partial closure of the site lead to reduced social interactions between staff. Lack of staff due to infections or quarantines can lead to problems with the safe operation of the site. Planned reduction of the infection prevention measurements by the German government can lead to higher risk of carrying and/or spreading a COVID 19 into or within the premises.	"Real-life test" of teleworking/home office. Communication to staff about COVID19 regarding prevention and especially vaccination	Regular unit -meetings by video Vaccination campaign COVID information included in annual training

[6] Numbering taken from ISO 14001 (2015) Chapter 4.1, 6.1, 6.4 and EMAS Regulation Annex 1 §1, §7

PESTLE criterion	External issues & circumstances that influence JRC- Karlsruhe's environmental targets (4.1)[6] *(current conditions or future developments)*	Risks (6.1.1)	Opportunities (6.1.1)	Actions (6.1.4)
Technological	Development of green energy technologies		Improvement in energy efficiency	Environmental Program
	Availability of electric cars can influence the emissions of the employees' cars			
	Phase out of nuclear technologies for energy production. This can influence the research work.	At the moment there are no clear risks identifiable, but these cannot be excluded. In any case, there will be problems with the availability of specialized staff on the market (cf. above)		
	Increasing digitalization of processes, computers become more important, techniques available for videoconferencing		Less paper use, less missions	Green Public Procurement, video conferencing (Environmental Program 2020, No. C1h)
Legal	More complex environmental regulations	Risk of missing requirements	Improve environmental performance (better control of impact)	By contract, and maintaining expertise on key functions (incl. using an external service provider) External Legal Compliance audits
	COVID-19 pandemic situation	Legal restrictions lead to reduced operations and may lead to reduced scientific output		
Environmental	Climate change effects: hot and cold periods- temperature peaks and average are increasing.	Risk for higher heating and cooling costs as well as worsened environmental performance		Infrastructure development plan; Environmental Program 2021, No. A2a-A2c; IM1-IM3
	COVID-19 pandemic situation	Large parts of staff working full or part time in home-office -> increased energy consumption in the private sector whereas the site installations and heating systems are running on almost normal level.	Large parts of staff working full or part time in home-office ➔ reduced emissions by commuting	
		General restrictions lead to reduced operations, but important installations have to be kept running due to the nuclear character of the site, additional energy consumption due to teleworking	Reduction in some environmental parameters due to reduced operations	
		Additional waste due to obligatory use of masks		

For the classification of the internal issues the following subjects were used: Activities, Strategic direction, Culture and staff, Processes and systems, and financial issues. The evaluation follows the same approach as with the external issues.

The result is presented below (Table F4b):

Table F4b: Context analysis JRC-Karlsruhe – internal issues

Criterion	Internal issues & circumstances that influence JRC- Karlsruhe's environmental targets (4.1) *(current conditions or future developments)*	Risks (6.1.1)	Opportunities (6.1.1)	Actions (6.1.4)
Activities	Nuclear activities require excellent operational control and safety measures	Risk of radiation releases with very high impact on neighbourhoods		Operational control procedures, regular meetings with inspection bodies such as UM
	The ventilation consumes a lot of energy (electricity)	Risk of high costs related to core activity as well as worsened environmental performance		Environmental Program 2021, No. A2a; Improvement of monitoring to allow optimal regulation
	Limited activities due to Covid-19 pandemic	Legal and general restrictions lead to reduced operations and consequently to reduced scientific output		
Strategic direction	JRC's restructuring towards the international level is affecting travelling needs	Higher travel emissions (CO_2), more complex reporting lines and decision making		Promote video conferencing (Environmental Program 2021, No. C1h); Green/sustainable events' organization
	Resource limitation increases every year (e.g. significant cuts in the EURATOM budget)	Direct negative influence on the environmental performance ➔ fulfilment of the environmental targets endangered		Constant demand for adequate resources to higher management
Culture & staff	Multi-culturalism at JRC-Karlsruhe has to be also considered from the point of view of impact on the environmental behaviour.	"Negative" behaviour can have negative influences on the environmental performance as well as negatively impact the general behaviour	"Positive" behaviour can have positive influences on the environmental performance as well as positively impact the general behaviour	Regular communication on environmental issues (Connected, info screens), awareness campaigns, specific training events (Environmental Program 2021, No.C4)
	Increased teleworking due to the pandemic situation	More difficult to evaluate environmental performance (data for home office can only be estimated)	Reduction of commuting emissions and partially decreased resources (e.g. printing paper)	
	Covid-19 pandemic	Reduced operations, shift work and partial closure of the site lead to reduced social interactions between staff. Lack of staff due to infections or quarantines can lead to problems with the safe operation of the site. Planned reduction of the infection prevention measurements by the German government can lead to higher risk of carrying and/or spreading Covid-19 into or within the premises	"Real-life test" of teleworking/home office. Communication to staff about Covid-19regarding prevention and especially vaccination	Vaccination campaign Covid information included in annual training

Criterion	Internal issues & circumstances that influence JRC- Karlsruhe's environmental targets (4.1) *(current conditions or future developments)*	Risks (6.1.1)	Opportunities (6.1.1)	Actions (6.1.4)
Processes & systems	Complex procurement-procedures and document system	Risk of time loss, more time spent on administration than on actual action. Risk of escalating deadlines		Training and guidance documents
	Contract management sometimes unsatisfying	Non fulfilment of contractual requirements on environmental issues, such as proper waste segregation		
Financial issues	Restrictions/reductions of the budget for infrastructure measures	Direct negative influence on the environmental performance ➔ fulfilment of the environmental targets endangered		Regular demand for adequate resources to higher management
	Significant cuts in the EURATOM budget	Budgetary constraints regarding running costs and means for renovation and also with respect to contractors (hiring costs for these are increasing constantly		
	Financial procedures are complex	It is sometimes difficult to obtain what is needed (due to missing points, deadlines, quality issues in the financial process)		Training and guidance documents
	COVID 19 pandemic	Costs for masks and COVID tests (both have to be provided by the employer acc. to German regulations)		
		Costs for contractors' staff staying at home shift wise in order to have enough staff available in case of larger outbreaks		

F3 Environmental impact of JRC-Karlsruhe activities

Karlsruhe undertook the first full update of the environmental aspects in 2007. These are described in the Environmental Aspects Register (IMS-KRU-S6.6-RGS-0001-V12). It is reviewed at least annually and updated, when necessary, most recently end of November 2021. Significant impacts associated with four main aspect groups were identified, as described in Table F5. Due to the mostly static character of the site, these have remained unchanged for several years. The other aspects described in the Environmental Aspects Register can be considered of minor significance or insignificant. There were two more aspects which were significant due to the methodology of the aspect register (missions and lights) but which were not considered as such because the actual data do not support this classification. In addition, the impact of Karlsruhe on the local environment can be considered as rather insignificant (cf. F7) because there are no potentially significant direct emissions to the environment except the ventilation system exhaust which is extensively filtered and strictly controlled. The premises were constructed to prevent any release of radioactivity. As a consequence, any release of other materials (e.g., hazardous substances) inside the building will not reach the outside, e.g., endangering the groundwater.

Table F5: Summary of significant environmental aspects at JRC-Karlsruhe

Aspect group	Environmental Aspect	Environmental Impact	Location/ Activity	Related Indicator
Use of natural resources, including energy	Electricity consumption	Resource depletion	Ventilation system,	1a
	Heating consumption	Resource depletion and air emissions	District heating	1a
Air emissions	Electricity and heating emissions	Global warming	Ventilation system, Lights, Heating system	2a
	Nuclear air emissions	Possible contamination of air	Nuclear research	Dose values
Waste generation	Radioactive waste	Potential contamination due to the existence of radioactive waste	Nuclear research	Chemie-III-Abwasser, nuclear waste volume and activity

It should be pointed out that due to the specific site characteristics and the regulations applicable to JRC Karlsruhe, only measures involving major infrastructure works (e.g., thermal insulation of the old parts of the building, renewal of the ventilation systems), which require high financial investments (more than €10 million per measure can be expected) will have a significant impact on the environmental performance. As the availability of these amounts of financial means cannot be foreseen, JRC Karlsruhe refrains from detailed planning in this context. Nevertheless, respective actions are listed in the Environmental Program, but it is clearly indicated that they depend on the availability of the necessary means.

F4 More efficient use of natural resources

F4.1 Energy consumption

F4.1.1 Buildings

The figures presented in this section are for Commission buildings only and do not include domestic energy consumption due to homeworking under the COVID pandemic, as this part can only be estimated which is not reliable enough to be included in the "official" figures. Energy consumption of teleworking is discussed in the general part of this Environmental Statement.

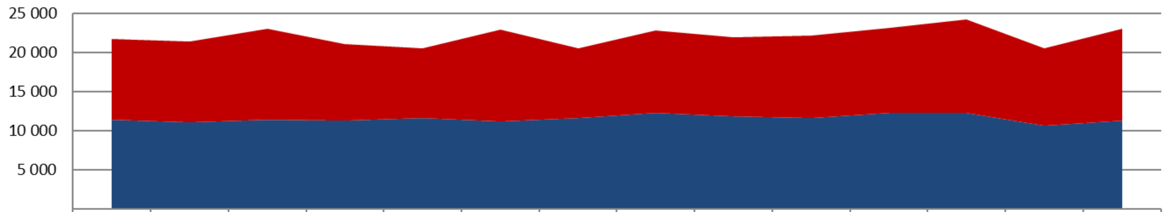
Buildings' energy consumption is one of the significant aspects. Figures F4 and F5 below show that most energy consumption parameters have been fairly steady during the last few years.

The site must comply with legal requirements, which is the dominant influence on energy consumption. For example, Karlsruhe is obliged to maintain an air flow of around 300,000 m^3 per hour, 24 hours per day throughout the year.

It should be noted that the 2020 values cannot be considered as "normal" due to the reduced operations because of the COVID-19 pandemic situation. On the other hand, as the installations cannot just be shut down, there were some but no significant reductions regarding the non-person dependent parameters (energy, CO_2 emissions). This is not unexpected, because the technical installations necessary for a safe operation of the site (e.g., ventilation) create a more or less constant basic level of energy consumption which is independent from the actual activities. As activities increased in 2021, this year can be considered as largely normal, at least when looking at energy consumption.

Total energy consumption shows an increase from 2016 to 2019, and a significant reduction in 2020 and some increase in 2021. The drop in 2020 can presumably be attributed reduced electricity consumption due to longer phases of reducing the ventilation system to 50 % (weekend mode) because of the almost total shutdown of the site. The 2021 value went up again but remained below the 2019 value. It has to be observed if this is a general trend or still under influence of the COVID-19-pandemic. The target for 2023 not to exceed the 2014 values could not be reached for the total consumption and also for the value per m². Hence, also the revised target taken from the Global Action Plan (+/-0 % energy per m² from 2014 to 2023) could not be reached. Nonetheless, the 2021 figures both in total and also per m² are still within the range of the values recorded since 2008.

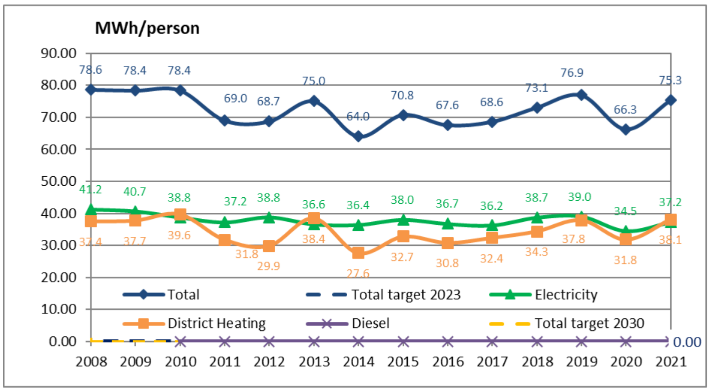
Figure F3: Annual buildings energy consumption (MWh) in the EMAS perimeter (indicator 1a)[7]

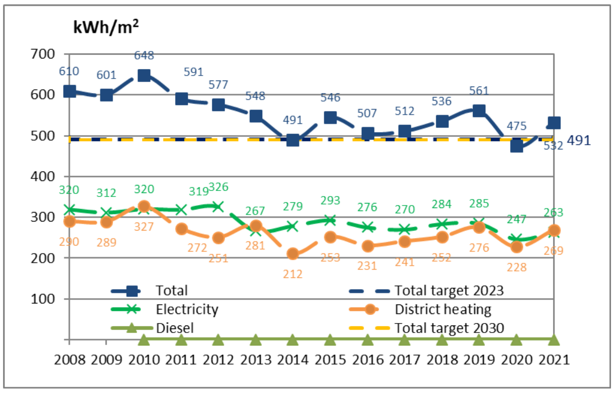


	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	21 705	21 393	23 059	21 046	20 544	22 882	20 489	22 786	21 889	22 104	23 158	24 222	20 486	22 977
Diesel			10.45	10.45	10.45	10.45	10.45	10.45	10.45	10.45	10.45	10.45	10.45	10.45
District heating and cooling	10 330	10 293	11 649	9 692	8 932	11 710	8 839	10 540	9 982	10 423	10 888	11 912	9 826	11 607
Electricity	11 375	11 100	11 400	11 344	11 602	11 162	11 650	12 236	11 897	11 670	12 260	12 300	10 650	11 360

[7] Diesel is only consumed by test runs of the emergency generators. These follow a regular schedule; hence, the values are the same for each year (i.e. 10 MWh; calculated value based on the consumption of 40 l diesel per generator and test run adding up to a total diesel consumption of 960 l per year).

Figures F4 and F5: Evolution of total annual energy consumption for JRC-Karlsruhe

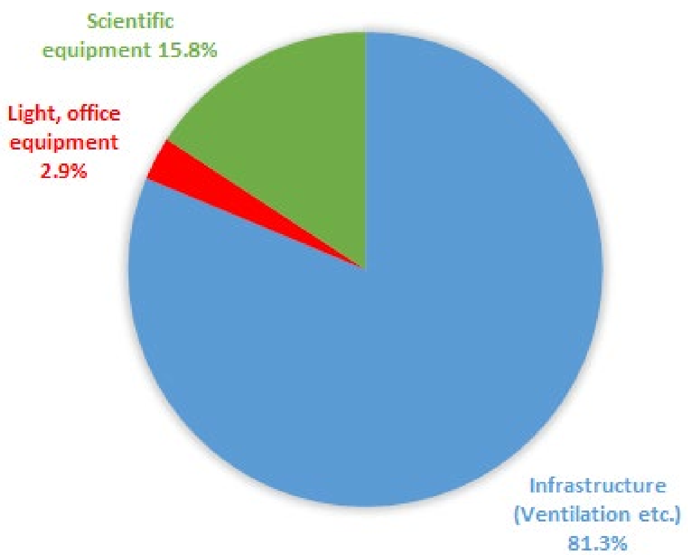




Electricity is provided by the KIT using a supplier contract with enercity AG in combination with 46% electricity generated on site by combined heat and power generation in a cogeneration plant and photovoltaics (1%). Electricity consumption has remained fairly constant in the last few years despite an increase in floor area of 22% since 2013. There is some reduction in 2020 which presumably can be attributed to longer phases of reducing the ventilation system to 50% (weekend mode) due to the almost total shutdown of the site. The 2021 value went up again but remained below the 2019 value.

The ventilation system is responsible for about 80% of Karlsruhe's electricity consumption. A breakdown by consumer group in 2021 is presented in Figure F6.

Figures F6: Distribution of electricity in 2021



Any changes to the ventilation system are subject to strict regulatory control as it represents the site's main component of nuclear safety and as such is heavily integrated into the nuclear licensing that is supervised by the authorities.

Karlsruhe does not use a municipal gas supply. It receives heating energy from the KIT district heating system. Until 2012, and as expected, heating energy consumption was mostly influenced by climate fluctuations because there have been neither major changes to the heating system nor to the buildings' insulation. In 2013 a new "state of the art" office building became operational but the variations between 2014 and 2019 can still be largely attributed to weather conditions. The drop in 2020 is once again due to the reduced operations. As the operation of the installations went back to normal in 2021, the heating consumption also went back to the usual range. But even with this extraordinary situation, the 2021 target not to exceed the 2014 values could not be reached for both the total consumption and the value per m².

In addition, Karlsruhe also subscribes to the commission wide proposal which was revised in 2018 to keep the 2014 value (i.e. +/-0%) of this parameter (for Karlsruhe). Karlsruhe opened several new buildings in the last years and will open another large laboratory building in the next years. These buildings require and will require additional energy therefore reducing total energy consumption will be difficult, at least when measured per capita. The development measured per m² could look more positive due to the increase of the surface area and also due to the weather conditions, but it remains uncertain whether this criterion can be met.

Looking over the development of the last ten years, the values for the last years are still close to the range of the long-time average both for the value per m² and also for the total consumption. In this context, it should be pointed out that the 2014 value was one of the lowest in the last years which is mostly due to a rather low heating consumption in that year (2014 was a relatively warm year).

Karlsruhe creates an Environmental Program for each year describing the various actions dealing with environmental aspects. Due to the specific site characteristics and the regulations applicable to JRC Karlsruhe, only measures involving major infrastructure works (e.g., thermal insulation of the old parts of the building, renewal of the ventilation systems), which require high financial investments (more than €10 million per measure can be expected), will have a significant impact on the environmental performance. As the availability of these amounts of financial means cannot be foreseen, JRC Karlsruhe refrains from detailed planning in this context. It should be pointed out that all of these measures are based almost exclusively on technical or regulatory requirements; the resulting improvements in environmental performance would be positive side effects of these measures. In any case, each of these measures would require too much money to be justified only by environmental reasons. Nevertheless, the respective actions are listed in the Environmental Program but clearly indicated as depending on the availability of the necessary means (cf. table F6a).

Actions prioritising the reduction of energy consumption (indicator 1a) and leading to significant improvements but require substantial financial means and, hence, have to be put on hold are summarised below.

Table F6a: Actions targeting indicator 1a (buildings' energy consumption) which can only be started when the necessary financial means are available

Goal	Action	Status
Reduction of consumption of energy and CO_2 -emissions	Renovation/replacement of the ventilation including installation of heat exchanger in the exhaust system in active areas	Included in Site Implementation Rolling Plan (under preparation). Does not apply to Wings F&G which will go into decommissioning after the start of operations in Wing M. Feasibility study for Wing B completed; planning for renovation of Wing A ongoing
	Thermal insulation of the "old" Wings of JRC Karlsruhe	Included in Site Implementation Rolling Plan (under preparation). Detailed concept/plan ready
	Installation of a more effective heating control system in Wing E (comparable to Wing A)	Included in Site Implementation Rolling Plan (under preparation); Continuation not earlier than start of operations in Wing M.

Actions focussing on the reduction of energy consumption (indicator 1a) that will lead to minor improvements are summarised below.

Table F6b: Actions targeting indicator 1a (buildings' energy consumption) producing only minor improvements

Goal	Action	Action type	Status
Reduction of consumption of energy and CO_2 - emissions	Replacement of illuminated safety signs by LEDs; complete Wings B, D, E, F, G	Multi-stage	Approx. 70%; was cancelled due to the COVID situation in 2020/21. Further replacements in the course of maintenance works
	Substitution of fluorescent tubes by LEDs during maintenance when replacement is necessary	regularly repeated	ongoing

F4.1.2 Vehicles

Table F7: Summary vehicle energy consumption (indicator 1b)

	2014	2015	2016	2017	2018	2019	2020	2021
Total (MWh/yr)	172.44	140.13	150.68	166.09	140.24	73.25	42.86	60.99
MWh/person	0.54	0.44	0.47	0.52	0.44	0.23	0.14	0.20
Diesel used (m^3)	5.71	7.79	12.47	14.30	11.71	4.59	2.50	3.86
Petrol used (m^3)	11.71	5.87	1.58	1.10	1.35	2.60	1.74	2.13

JRC-Karlsruhe operates a very small fleet of 12 vehicles of which five are mostly or only used on the premises. Two of the latter are electric cars. Their combined fuel consumption of 61 MWh per year can be considered as relatively insignificant compared to the total energy consumption (0.4% of the total energy consumption in 2021 and 0.2% in 2020). The rise in 2021 compared to 2020 is not unexpected because of the "more normal" conditions in 2021.

The Environmental Program 2021 describes the following action regarding the vehicles' consumption:

Table F8: Important actions targeting indicator 1b (vehicles' energy consumption)

Action	Action type	Status of target achievement	Date
When replacing service cars, take environmental aspects into consideration (i.e., low consumption, low emissions, etc.)	Multi-stage	Ongoing (purchase criteria: 50% CO2 for new service cars); manufacturer values for CO2	started in 2015

F4.1.3 Renewable energy use in buildings

Table F9 shows that the trend of increasing the proportion of renewable energy in the electricity supply continuing till 2020 ended in 2021 due to changes in the supply of electricity by the KIT (See below).

Table F9: Non-renewable energy use in the buildings (indicator 1c)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Electricity from renewables (MWh)	2 220	2 280	2 269	2 320	2 232	3 681	4 833	4 640	4 855	5 603	6 273	5 687	3 953
Renewables (%)	20	20	20	20	20	31.6	39.5	39	41.6	45.7	51	53.4	34.8
Electricity from non renewables (MWh)	8 880	9 120	9 075	9 282	8 930	7 969	7 403	7 257	6 816	6 657	6 027	4 963	7 407
Non renewables (%)	80	80	80	80	80	68.4	60.5	61	58.4	54.3	49	46.6	65.2
supplied diesel (MWh non renewable)	0.0	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Non renewables (%)	100	100	100	100	100	100	100	100	100	100	100	100	100
Dist. heating/cooling (MWh non - ren)	10 293	11 649	9 692	8 932	11 710	8 839	10 540	9 982	10 423	10 888	11 912	9 826	11 607
Non renewables (%)	100	100	100	100	100	100	100	100	100	100	100	100	100
Total renewables (MWh)	**2 220**	**2 280**	**2 269**	**2 320**	**2 232**	**3 681**	**4 833**	**4 640**	**4 855**	**5 603**	**6 273**	**5 687**	**3 953**
Total renewables (%)	**10.4**	**9.9**	**10.8**	**11.3**	**9.8**	**18.0**	**21.2**	**21.2**	**22.0**	**24.2**	**25.9**	**27.8**	**17.2**
Total renewables (MWh/p)	**8.1**	**7.8**	**7.4**	**7.8**	**7.3**	**11.5**	**15.0**	**14.3**	**15.1**	**17.7**	**19.9**	**18.4**	**13.0**
Total renewables (kWh/m^2)	**62.4**	**64.1**	**63.7**	**65.2**	**53.5**	**88.2**	**115.8**	**107.5**	**112.5**	**129.8**	**145.3**	**131.7**	**91.6**
Total non. Ren energy use, (MWhr/yr)		20 779	18 778	18 224	20 650	16 808	17 953	17 250	17 249	17 556	17 949	14 799	19 024
Total non renewables, (%)	0.0	90.1	89.2	88.7	90.2	82.0	78.8	78.8	78.0	75.8	74.1	72.2	82.8

Since 2021 the general situation regarding electricity supply has changed to a certain extent which explains the significant drop of electricity by renewable sources. The distribution of supplied electricity is: 53 % purchased by KIT, 46 % generated by KIT from natural gas in a combined heat and power plant which also supplies the district heating and 1 % by a photovoltaic installation operated by the KIT. According to the supplier of the KIT (enercity AG, responsible for 53% of the electricity), approximately 66% of its supplied electricity mix is generated by renewable sources. There are no renewable energy sources directly on site. Since 2021, KIT operates a new gas driven heat and power plant for the production of steam and electricity, hence, the percentage of purchased electricity is lower than in the years before. According to KIT it is to be expected that this trend will be intensified, i.e., less purchased but more self-generated electricity. There were no specific targets in 2021 because Karlsruhe does not directly influence the electricity mix. JRC-Karlsruhe is committed to a 7% reduction in non-renewable energy use from 2014-2023 and is on track to meet this target at least when considering the values per m². However, due to the new situation at KIT (as explained above), it might be more difficult to meet the target.

Any estimation regarding the percentage of renewable energy for teleworking would be based on assumptions and is therefore not discussed here.

F4.1.4 Emergency generators

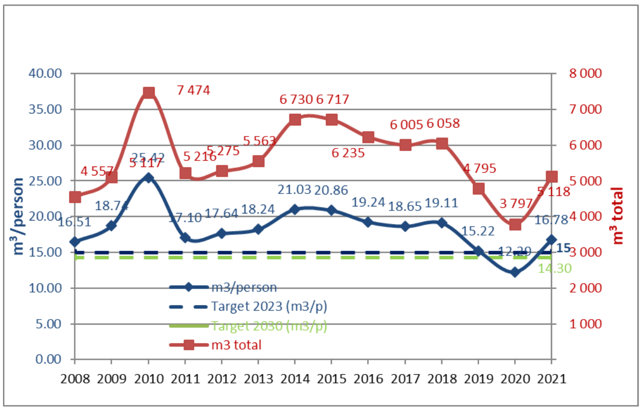
JRC-Karlsruhe operates two diesel emergency generators to produce electricity for the operation of essential systems in case of an electrical power outage. These are tested monthly. Each test run consumes about 40 l diesel per generator adding up to a total diesel consumption of 960 l per year. This consumption produces approximately 10.5 MWh which is less than the consumption of the service cars and represents 0.046% of the total energy consumption in 2021.

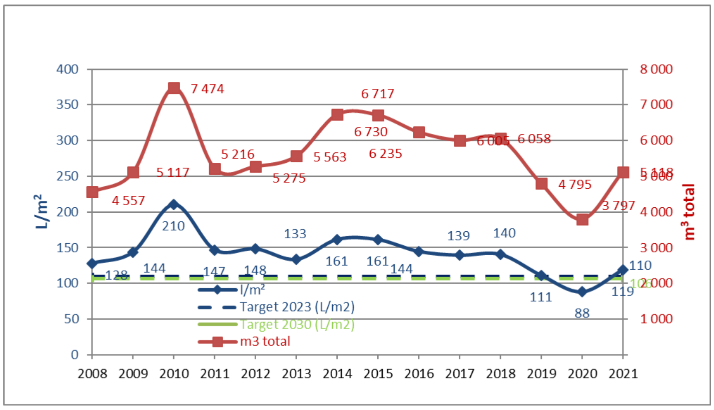
F4.2 Water use

The figures presented in this section are for Commission buildings only and do not include domestic water use due to homeworking under the COVID pandemic, as this part is based on assumptions (although using published data) which are considered not reliable enough to be included in the “official” figures (see end of the chapter).

The evolution of total water use per capita and per square metre, are presented below.

Figures F7 and F8: Evolution of per capita (left) and per square metre (right) water use for Karlsruhe (indicator 1d)





These figures indicate a continuing decreasing trend since 2014. The higher value recorded in 2010 was due to a malfunction in the hydrogen generating plant.

Not unexpectedly, water use was also affected by the pandemic situation. After a significant drop in 2019 and the "irregular" value in 2020 there is a slight increase in 2021. The drop in 2019 as well as the low values in the following years (2020 of course with some constraints) can be largely attributed to weather conditions. A significant part of the used water is used for the humidification of the incoming air of the laboratory wings which is depending on the weather conditions. Cold and dry weather requires more humification whereas other weather conditions may need no humidification at all. Weather conditions since autumn 2019 often did not require significant humidification which might be a result of the beginning climate change. For example, this can be seen in the winter 2020/2021 when the humidification system was not running at all most of the time. Nevertheless, as the values are still significantly lower than the years before 2019 this parameter needs further observation in the coming years. The 2021 target for this parameter not to exceed the 2014 values could be reached (even exceeded).

The Global Action Plan sets a target of -32% water use per m² from 2014 to 2023 which can be reached but which probably has to be adjusted.

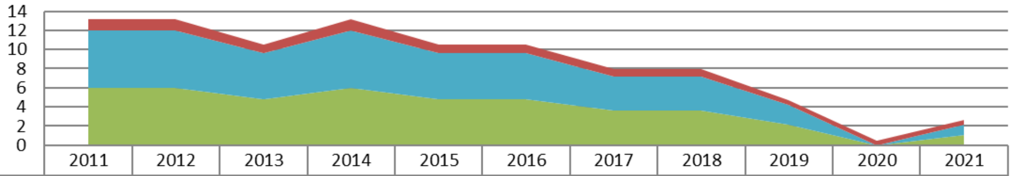
The home-office share can only be estimated. Based on an estimation of 20 l water per person and day while teleworking and an estimated office presence of 40% in 2021, this would generate additional 771 m³ water used in total for homeworking[8].

F4.3 Office and print shop paper

The evolution of office paper at Karlsruhe and per capita breakdown is presented below. No offset paper was used. This section does not include printing in the home-office, which can only be estimated and, thus, the respective figures have to be considered as not reliable enough for "official" data.

[8] The value 20 l per person and day is based on data of the Statistische Bundesamt (Federal Statistical Office) and the BDEW (Bundesverband der Energie-und Wasserwirtschaft - Federal Association of the Energy and Water Industries). The average value of 128 l per person and day for Germany was combined with the percentage shares of the activities relevant while teleworking (toilet flushing, hand washing, eating and drinking) and correlated with their share of the actual working time in the home-office (8h per day).

Figure F9: Evolution of paper consumption at Karlsruhe (totals)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Office (A4 sheet equivalent) x1 000 000	1.2	1.2	0.96	1.2	0.96	0.96	0.72	0.72	0.48	0.48	0.48
Total paper consumption (tonnes)	6.00	6.00	4.80	6.00	4.80	4.80	3.60	3.60	2.10	0.00	1.05
Offset paper consumption (tonnes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Office paper consumption, (tonnes)	6.00	6.00	4.80	6.00	4.80	4.80	3.60	3.60	2.10	0.00	1.05

Figure F10: Evolution of paper consumption per capita at Karlsruhe

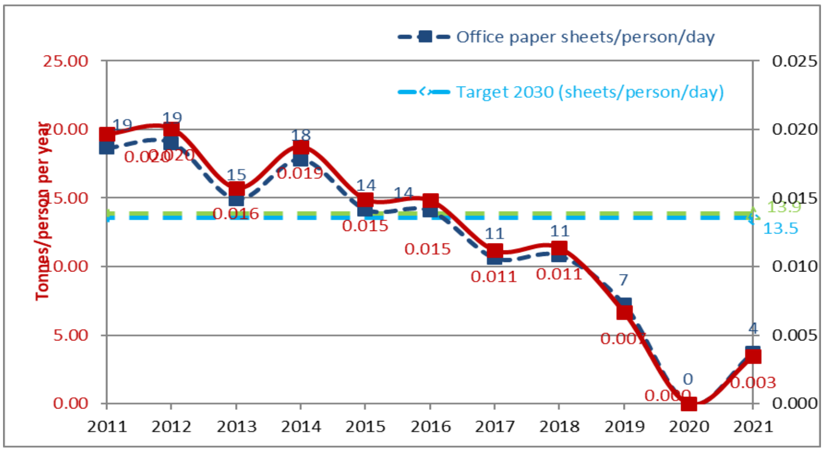


Figure F10 shows that office paper consumption decreased over the years. Since 2013 office paper has the Nordic Swan and EU Ecolabel (EU Flower) designations. In 2019, the paper density was changed from 80g/m² to 70 g/m². Due to the pandemic situation, a significant part of the staff has been working a major part of the time at home since April 2020. As a consequence, no paper was purchased in 2020 and only a reduced amount in 2021. Nevertheless, the targets of the Global Action Plan were clearly met.

The home-office share can be considered as not important. Based on an estimation of 0.5 sheets per person and day while teleworking and an estimated office presence of 40% in 2021 this would generate additional 0.1 t of printed paper in total at the home-office.

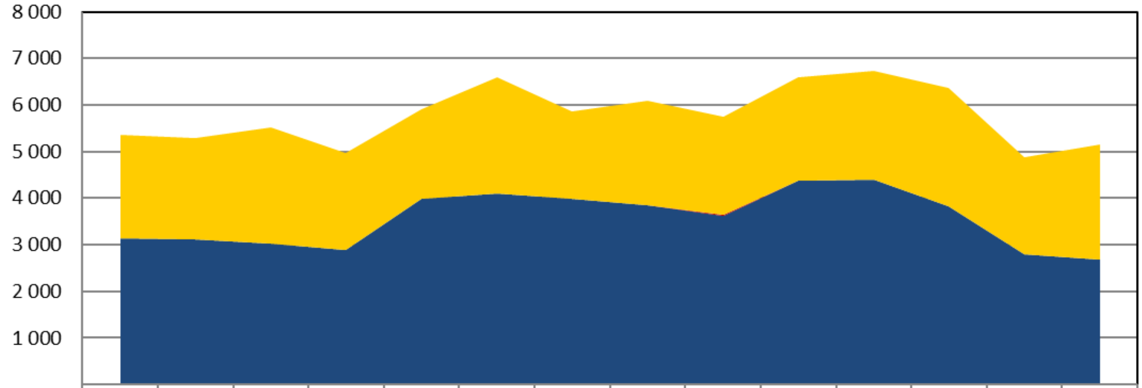
F5 Reducing air emissions and carbon footprint

F5.1 CO2 emissions from buildings

F5.1.1 Buildings (energy consumption)

Buildings emissions currently account for a large majority of CO_2 emissions recorded at Karlsruhe and are therefore one of the significant environmental aspects.

Figure F11: CO_2 emissions from buildings energy consumption, tonnes (indicator 2a)[9]



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total (tonnes)	5 347	5 300	5 515	4 960	5 896	6 591	5 868	6 085	5 757	6 605	6 724	6 364	4 880	5 148
District heating/cooling	2 200	2 192	2 481	2 064	1 903	2 494	1 883	2 245	2 126	2 220	2 319	2 537	2 093	2 472
Diesel			3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Electricity	3 147	3 107	3 030	2 892	3 990	4 093	3 982	3 837	3 627	4 381	4 402	3 823	2 783	2 672

Figure F12: CO_2 emissions from buildings energy consumption, per square metre (indicator 2a)

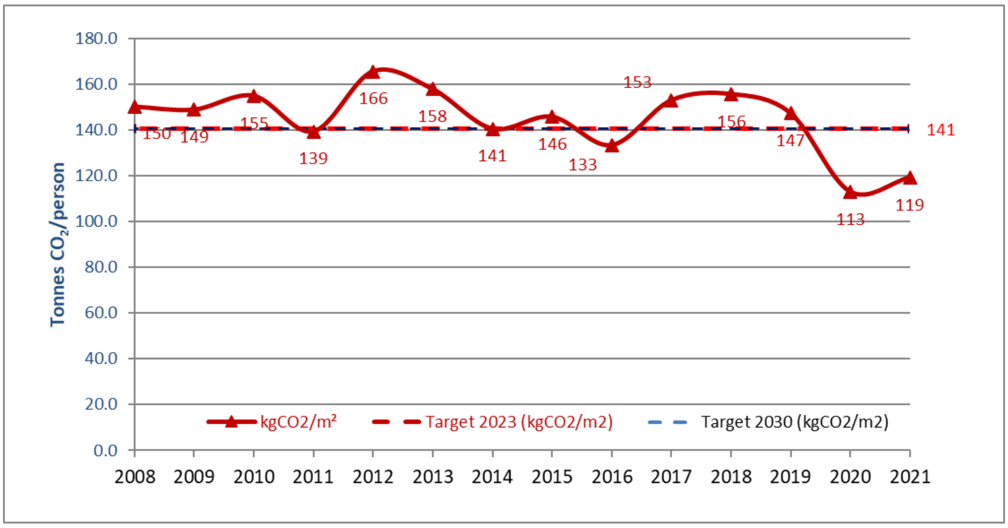


Figure F12 shows that the evolution of CO_2 emissions from buildings is, as expected, strongly linked to energy consumption and with the same trends described in section F4.1. But also, the CO_2 conversion factor for electricity plays an important role. In 2017 an increase could be recorded due to a change of the electricity supplier of the KIT which also included an increase of the CO_2 conversion factor. From 2018 to 2021, the CO_2 conversion factor of supplied electricity decreased significantly (about 37%) despite a further change of supplier by KIT in 2021. Due to the reduced CO_2 conversion factor for electricity, in combination with the reduced activities due to the pandemic situation in 2020 and 2021, there is a significant decrease of the CO_2 generation in 2020 with a slight but not significant increase in 2021. The 2021 target for this parameter not to exceed the 2014 values was reached for both, the total emissions and the value per m². The target taken from the Global Action Plan (CO_2 per m²: +/- 0% from 2014 to 2023) was also reached.

Due to the fact that the vast majority of CO_2 emissions are due to energy in buildings, no additional specific CO_2 emissions actions were planned. However, measures introduced to reduce energy consumption, as described in section F4.1 will inevitably also reduce emissions. In this context, it should be clear that, due to the specific site characteristics and the regulations applicable to JRC Karlsruhe, only measures involving major infrastructure works which require high financial investments will lead to substantial decreases of the CO_2 output.

[9] Diesel is only consumed by test runs of the emergency generators. These follow a regular schedule, hence, the values are the same for each year.

F5.1.2 Emissions from household energy use

Homeworking emissions were estimated for the first time in 2021 in response to the change in behaviour under the COVID pandemic and include emissions from work and domestic appliances used while teleworking and energy consumption from heating. But as these values are largely based on assumptions, these are not considered as reliable enough and, hence, not included in the "official" figures.

F5.1.3 Buildings -other greenhouse gases (refrigerants)

Karlsruhe operates approx. 60 (mostly small) air conditioning systems with a combined inventory of 325 kg of different HFCs (mostly R407c and R410a). Emissions of refrigerants can only occur through leakage from these air conditioning systems which, owing to a rigorous maintenance programme, has so far been prevented. Up until 2020, there were no losses during normal operations, and there were no "abnormal" operations. The same applies to four electric cabinets which contain small amounts of SF_6 as an insulating agent (approx. 6 kg). These cabinets are completely closed systems; thus, there is no possible loss during normal operation. Other greenhouse gases (like CH_4, N_2O, HFCs, PFCs and NF_3) are not used on site and are therefore not reported.

Hence, at JRC-Karlsruhe the potential for global warming due to emissions from refrigerants or comparable substances is considered insignificant. As a consequence, there were no specific targets in 2020. The 2022 objective is to repeat 2021's performance of no leakage during normal operation.

F5.2 CO_2 emissions from vehicles (indicator 2c)

F5.2.1 Commission vehicle fleet

JRC-Karlsruhe operates a very small fleet of 12 vehicles of which five are mostly or only used on the premises. Two of the latter are all-electric cars. All cars had a combined CO_2 output of 18,2 t in 2021. This is, of course, an increase compared to the extraordinary 2020 value but still a decrease of 17 % compared to 2019. It should be pointed out that the CO_2 emissions of all cars can be considered as rather negligible compared to the total CO_2 emissions (e.g., 0.4 % in 2021 or 0.3 % in 2020).

F5.2.2 Missions and local work-based travel (excluding Commission vehicle fleet)

Missions' emissions were not among the significant aspects identified in Table F5, and there were no specific targets in the last years associated with them. Nonetheless, due to an increase in video conferencing facilities from two to nine since 2013 and also the expansion of VC possibilities on "normal" PCs via MS Team, WebEx or comparable software since 2020, as well as an almost complete ban of missions due to the pandemic situation there is a substantial reduction of travel in favour of video conferences. Like in 2020 business travels were cancelled to a large extent in 2021 due to the COVID-19 pandemic situation.

F5.2.3 Commuting

The CO_2 footprint of staff commuting was estimated in 2016 from survey data using a simple approach considering the main and potentially second modes of transport along with the distance to the workplace. The CO_2 footprint for commuting resulted in approx. 1.24 t per day or approx. 273 t per year respectively (cf. also F5.3). Unfortunately, the follow up survey planned for September 2018 as a part of the actions of the EU mobility week could not be performed and was then put on hold due to the lack of staff.

As most of the staff was teleworking the CO_2 footprint of staff commuting presumably can be considered as insignificant in 2020.

The Environmental Program 2021 describes the following action regarding vehicles' consumption which were continued despite of the pandemic situation:

Table F10: Important continuous actions promoting more sustainable commuting behaviour

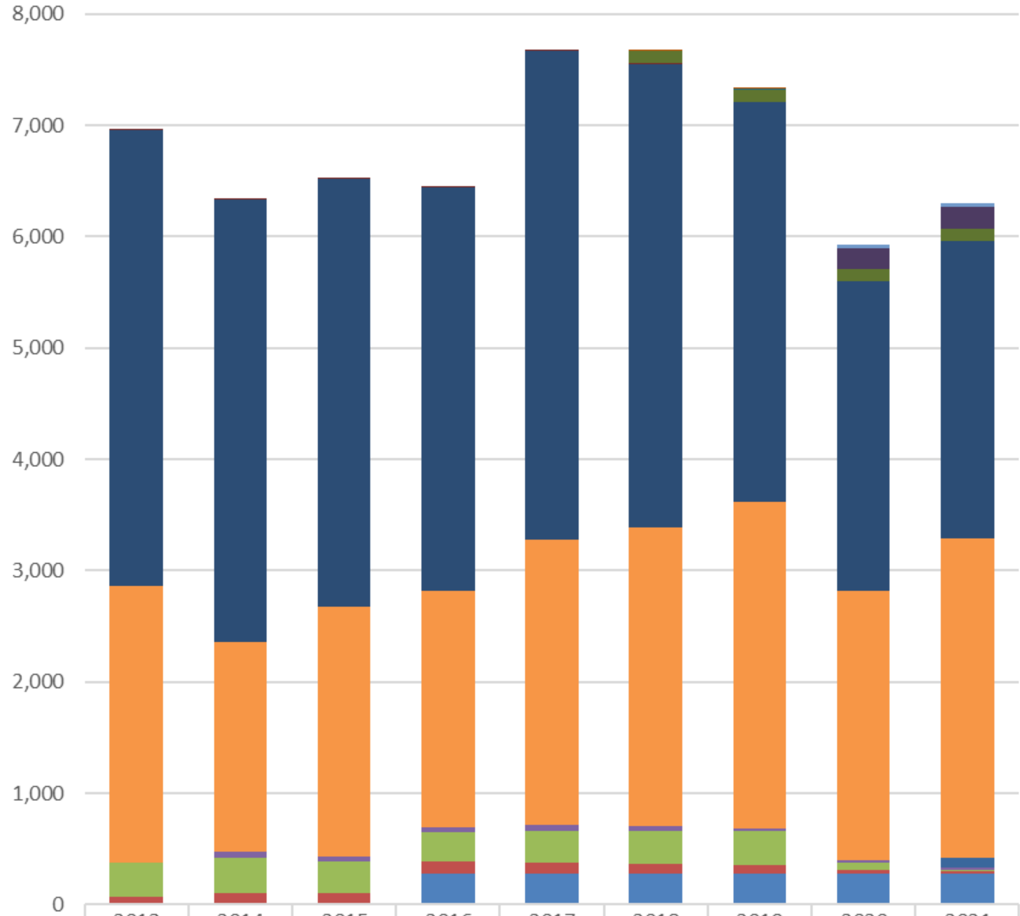
Action	Action type	Status of target achievement
Free tickets for public transport	Continuous	Implemented
Car-pooling: intranet site for staff	Continuous	Car-sharing inter-institutional portal
Equip, maintain and manage service bicycles	Continuous/single	Regular service (includes also monthly servicing)

F5.2.4 Emergency generators

The two diesel generators (cf. chapter F4.1 - d)) generate approximately 3.4 t CO_2, which is even less than the CO_2 emissions of the service cars (0.05% of the total CO_2 emissions).

F5.3 Carbon footprint

Figure F13: JRC-Karlsruhe, carbon footprint (CO_2 or equivalent emissions 2013-2021 (in tonnes)



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	6,962	6,339	6,517	6,451	7,667	7,674	7,327	5,927	6,298
Own waste	0	0	0	0	0	0	0	0	0
Catering	0	0	0	0	0	0	0	0	0
Service contracts	0	0	0	0	0	0	0	27	27
Paper supply	0	0	0	0	0	4	2	0	1
Fixed assets - Commission vehicles	0	0	0	0	0	5	4	5	5
Fixed assets - IT	0	0	0	0	0	0	0	182	194
Fixed assets -buildlings	0	0	0	0	0	111	111	111	111
Buildings - fuel for heating	3	3	3	3	3	3	3	3	3
Buildings - electricity	4,093	3,982	3,837	3,627	4,381	4,164	3,585	2,783	2,673
Buildings - district heating/cooling	2,494	1,883	2,245	2,126	2,571	2,686	2,938	2,424	2,863
Buildings coolant losses	0	0	0	0	0	0	0	0	0
Teleworking emissions						0	0	0	91
Vehicle fleet fuel consumption	0	51	41	44	48	41	22	13	18
Missions air (RFI=2)	300	322	293	263	290	291	311	75	9
Missions excluding air	72	98	98	115	101	97	78	32	31
Experts' travel	0	0	0	0	0	0	0	0	0
Staff commuting	0	0	0	273	273	273	273	273	273

Figures F13 shows that buildings' energy consumption, whether through electricity or district heating, are the most important components of the carbon footprint. The next significant components are fixed assets (IT and buildings). Due to the COVID 19 pandemic situation commuting and business air travel are significantly lower than in the last years. Nevertheless, all these next components are far below the buildings' energy consumption. Teleworking emissions are included.

Table F11 (below) gives a more detailed overview.

Table F11: Carbon footprint

	Total								
Scope 1: Fuel consumption and fugitive emissions	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Fuel for bldgs: mains gas	0	0	0	0	0	0	0	0	0
Fuel for bldgs: tanked gas (1)	0	0	0	0	0	0	0	0	0
Fuel for bldgs: diesel	3	3	3	3	3	3	3	3	3
Biomass	0	0	0	0	0	0	0	0	0
Commission vehicle fleet	0	41	33	35	38	32	17	10	15
Refrigerants	0	0	0	0	0	0	0	0	0
Scope 2: Purchased energy									
External electricity supply (grey),	3,773	3,670	3,536	3,343	4,038	3,837	3,260	2,556	2,454
External electricity supply contract (renewables), combustion	0	0	0	0	0	0	0	0	1
District heating (combustion) (2)	2,494	1,883	2,245	2,126	2,220	2,319	2,537	2,093	2,472
Scope 3: Other indirect sources									
Fuel for bldgs: mains gas (upstream)	0	0	0	0	0	0	0	0	0
Fuel for bldgs: tanked gas (upstream) (1)	0	0	0	0	0	0	0	0	0
Fuel for bldgs: diesel (upstream)	1	1	1	1	1	1	1	1	1
Commission vehicle fleet (upstream)	0	10	8	9	10	8	4	3	4
Site generated renewables (upstream) (3)	0	0	0	0	0	0	0	0	0
External grey electricity supply, line losses	321	312	301	284	343	326	326	227	218
External 'renewables' electricity contract (upstream with line loss	0	0	0	0	0	0	0	0	0
District heating (upstream) (2)	0	0	0	0	351	366	401	331	391
Business travel: air (combustion)	300	322	293	263	290	291	311	75	9
Business travel: air (WTT)									
Business travel: rail (combustion)	10	3	7	5	5	4	4	0	5
Business travel: rail (WTT)									
Business travel: hire car (combustion)	62	56	60	75	58	61	57	22	7
Business travel: hire car (WTT)									
Business travel: private car (combustion)	0	39	32	34	37	32	17	10	19
Business travel: private car (WTT)									
Experts' travel: air emissions	0	0	0	0	0	0	0	0	0
Experts' travel: rail emissions	0	0	0	0	0	0	0	0	0
Commuting (combustion) (4)	0	0	0	273	273	273	273	78	78
Commuting (WTT) (4)									
Fixed assets - buildings						111	111	111	111
Fixed assets - IT						0	0	182	194
Fixed assests - Commission vehicles						5	4	5	5
Paper supply						4	2	0	1
Service contracts						0	0	27	27
Catering						0	0	0	0
Own waste						0	0	0	0
Teleworking emissions (equipment electricity use)						0	0	0	41
Teleworking emissions (fixed assets, equipment)						0	0	0	0
Teleworking emissions (space heating)						0	0	0	50
Total	**6,962**	**6,339**	**6,517**	**6,451**	**7,667**	**7,674**	**7,327**	**5,732**	**6,103**

F5.4 Total air emissions of other air pollutants ($S0_x$, NO_x, PM)

Karlsruhe's non-CO_2 air emissions are not significant for the environmental aspect. The site does not operate heating installations, hence, there are no processes generating either NO_x or SO_x. VOC (Volatile Organic Compounds) emissions are not measured as air flow from the chemical laboratories passes through activated-carbon filters and thus can also be considered negligible. Consequently, there were no relevant specific targets for 2021 and also no 2022 targets**.** The emergency generator is tested monthly for a very short period and would be responsible for a very small quantity of particulate matter emissions.

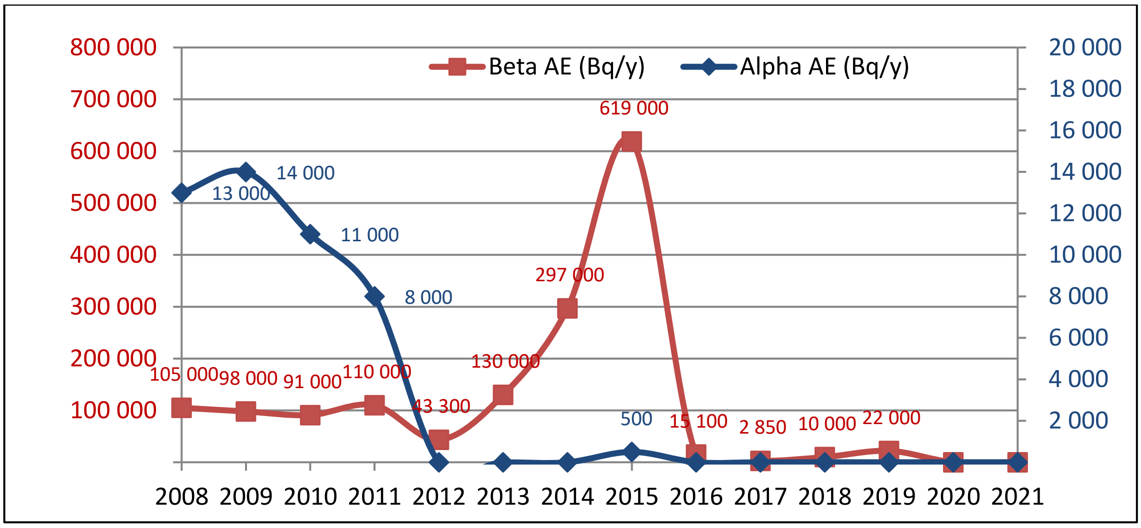
F5.5 Nuclear emissions

For official values relating to potential radioactive emissions to the surrounding environment, JRC-Karlsruhe participates in the KIT Campus Nord's surveillance program in addition to constant measurements made by JRC-Karlsruhe itself. The latter are mostly used for operative purposes and not for official surveillance.

KIT has an extensive surveillance program measuring air, soil, water, and vegetation for radioactivity and is obliged to give regular reports about these measurements to the Umweltministerium Baden-Württemberg, the supervising authority for nuclear installations in Baden-Württemberg.

Due to extensive filtering systems, emissions of radioactive substances are far below the legal limits as shown in Figure F14. The fluctuations in the values can be largely attributed to the measuring method. In 2021, both values were 0 resp. below the detection limit.

Figure F14: Exhaust air: declaration to authority on aerosol emissions



Note: The y-axis of the graph is scaled to 20% of the maximum value for beta-aerosols (4.000.000 Bq/y) and alpha aerosols (100.000 Bq/y); the value "0" means below the detection limit

Owing to the already low values, a further reduction in nuclear emission is practically unachievable. Karlsruhe's 2022 target is, nonetheless, to maintain this very good level of performance, given that site policy is to keep emissions as low as reasonably possible, regardless of the authorised limits.

In 2011, as a consequence of the mediation process regarding the construction of the new laboratory Wing M, Karlsruhe's management declared a voluntary reduction of the authorised limit of "nuclear" emissions by 10%.

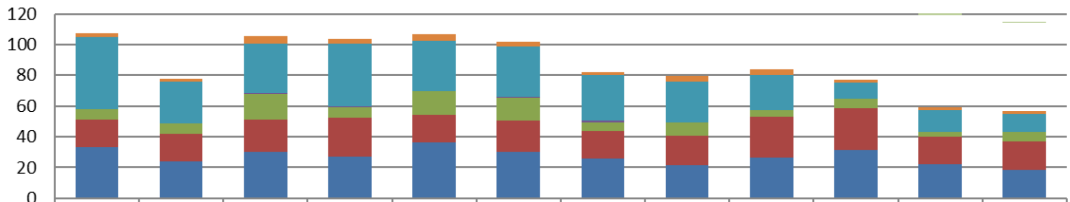
F6 Improving waste management and sorting

F6.1 Non-hazardous waste

The figures presented in this section are for Commission buildings only and do not include domestic waste due to homeworking under the COVID pandemic, as this part can only be estimated which is not reliable enough to be included in the "official" figures (see end of the chapter).

Figure F15 shows a decreasing trend in waste generation since 2012. Most waste data are provided by the waste contractor. Some household and paper waste disposal are managed by a different company (due to specific requirements of the German waste legislation) and quantities were calculated using the average number of containers counted over four weeks and bulk density values for the waste types given in the literature[10]. It should be noted that these latter values were probably too high in 2020 but there was no possibility to re-evaluate them. In 2021, these estimations were reduced to 75%. The site has developed a policy of waste partitioning and recycling through which it constantly seeks to reduce overall waste production. Without construction and dismantling waste, there is a significant reduction since 2014 as shown in figure F15. It should be pointed out that some kind of dismantling waste might be included in municipal waste (e.g., drywall waste because there is no other waste fraction to dispose of this kind of material).

Figure F15: Evolution of total non-hazardous waste in Karlsruhe (in tonnes)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Green waste									1.25	0.50	1.00	0.50
Total non hazardous waste, (tonnes)	107.5	77.9	105.7	103.7	106.5	102.0	81.9	79.8	85.3	77.6	60.0	57.1
Total non haz.waste (tonnes/person)	0.37	0.26	0.35	0.34	0.333	0.317	0.253	0.248	0.269	0.246	0.194	0.187
Plastic	2	2.4	4.9	3.0	4.1	3.3	1.6	3.9	3.9	1.8	2.0	1.8
Metal (scrap)	47.0	26.6	32.7	40.8	32.9	32.8	29.9	26.7	23.1	10.7	13.7	11.6
Glass	0.2	0.0	0.6	0.6	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0
Wood	6.7	7.1	16.6	6.9	15.4	14.4	5.6	8.3	3.8	5.9	3.5	6.2
Paper and cardboard	18.0	18.0	20.8	25.7	18.0	20.6	18.0	19.3	27.0	27.3	18.0	18.6
Municipal waste	33.2	23.8	30.3	26.7	36.1	30.1	26.0	21.6	26.2	31.5	21.8	18.4

The 2014-2023 target of 22% non-hazardous waste reduction (tonnes /person) has already been achieved and will continue to be met through increased awareness of the established procedures and staff awareness campaigns. Non-hazardous waste is an insignificant environmental aspect and depends to a large extent on the research as well as renovation and construction activities which are not predictable. The significant drop in 2020 and 2021 can be attributed to the reduced operations due to the pandemic situation. Nonetheless, the target to keep the 2014 values was reached (and even significantly exceeded). The target of the Global Action Plan for non-hazardous waste (- 22%, kg per person from 2014 to 2023) was already reached. In addition, there was a share of about 4 tons of construction waste in 2021 which was not included in the graph for better comparability with the other sites. This is less than 10 % of the 2019 value for construction waste, which is presumably also due to the reduced operations.

The home-office share can only be estimated. Based on an estimation of 0.1 kg waste per person and day while teleworking and an estimated office presence of 40% in 2021, this would generate additional 4 t of domestic waste in total for homeworking.

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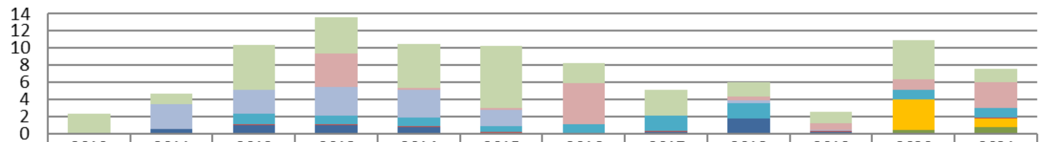
[10] Görner, Hübner - Abfallwirtschaft und Bodenschutz; Springer; 2002

F6.2 Hazardous Waste

Figure F16: Evolution of total hazardous waste in Karlsruhe (in tonnes)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total hazardous waste (tonnes)	2.33	4.65	10.32	13.58	10.51	10.26	8.23	5.07	6.02	2.59	6.99	5.76
Total hazardous waste, (tonnes/person)	0.01	0.02	0.03	0.04	0.0328	0.0319	0.0254	0.0157	0.0190	0.0082	0.0226	0.0189
Electrical equipment (WEEE)	2.33	1.18	5.20	4.27	5.20	7.25	2.32	3.03	1.72	1.38	4.64	1.59
Insulating glass fibre				3.86	0.18	0.3	4.88	0	0.46	0.76	1.21	2.98
Asbestos from dismantling works	0	3	2.82	3.38	3.32	1.84	0	0	0.25	0.14	0	0
Lead-acid battery			1.19	1.016	0.902	0.704	0.908	1.79	1.79	0	1.14	1.08
Flourescent lamps	0.000	0.000	0.134	0.134	0.212	0.166	0.124	0.108	0.088	0.113	0.000	0.105
Mixed chemical waste	0.00	0.47	0.98	0.92	0.70	0.00	0.00	0.14	1.71	0.20	0.00	0.00
Other hazardous waste											3.58	1.00
Filters											0.400	0.800

Figure F16 shows the evolution in the generation of total hazardous waste. Some categories of hazardous waste are disposed according to specific laboratory waste procedures and therefore accounted together as “mixed chemical waste”. This approach has delivered the highest safety standards while reducing the administrative burden.

Excluding 2016 and again in 2021, electrical equipment (WEEE) has been the largest component of hazardous waste since 2011 but under German law it must all be recycled. The next largest component of hazardous waste for several years was asbestos generated through renovation works. This is a historic liability as large parts of Karlsruhe were built in the 1960s. Although most of the renovation works removing asbestos elements are completed, some small amounts might appear from time to time. In 2021, a large amount of glass fibre material deriving from an exchange of incoming air filters and some larger amounts of lubricants and bituminous roofing felt (summarised in other hazardous waste) are responsible for the rather high amount of hazardous waste.

Established procedures are working well, and awareness campaigns will be continued. Therefore, there are no specific management approved actions for continued improvement. Hazardous waste can be considered as an insignificant environmental aspect according to the environmental aspects’ analysis and in relation to the activities of the site.

It can be assumed that there is almost no hazardous waste generated during home-office.

F6.3 Waste sorting

This parameter as it is listed in table F12 can only be used for informational purposes because the new revision of the German Gewerbeabfallverordnung (German ordinance on industrial waste; taking effect from August 2017) defines different criteria regarding the waste separation than those used by the Commission for this Environmental Statement and consequently leads to different values. This ordinance requires a minimum separation of 90%. The criteria used by the Commission would lead to values far below the required percentage. According to the criteria given in this ordinance the percentage sorted in 2021 is 99.0%. The target for 2022 is therefore to fulfil the requirements of this regulation.

For better comparability with the other Commission EMAS sites, the values according to the criteria used by the Commission since 2010 are shown in table F12.

Table F12: Percentage of waste sorted at the JRC-Karlsruhe (acc. to Commission criteria)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Percentage of unsorted waste	0.0	28.8	26.1	22.8	30.8	26.8	28.8	25.4	28.7	39.2	32.5	29.3
Percentage of sorted waste	100.0	71.2	73.9	77.2	69.2	73.2	71.2	74.6	71.3	60.8	67.5	70.7

F6.4 Radioactive waste and waste water

Nuclear waste management includes the disposal of radioactive waste as well as the unrestricted disposal of non-contaminated waste from the controlled area. Disposal of radioactive waste can be separated in three processes:

1. Handling and disposal of radioactive waste, decontamination and dismantling
2. Dismantling of disused glove-boxes, waste characterisation
3. Glove-box waste packages measurements, gamma-spectrometry and neutron coincidence

The amounts of nuclear waste since 2011 are shown in table F13a. A trend cannot be determined as the amount of disposed nuclear waste is caused by changing parameters, e.g., the research activities, glove box disassembling and also the capacity of KTE (the official collecting facility for low and middle radioactive waste in Baden-Württemberg).

Table F13a: Nuclear waste

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Waste volume	168	112	179	152	108	127	127	74	44	31.9	71
Evolution (%)	*0*	*-33*	*60*	*-15*	*-29*	*18*	*0*	*-42*	*-41*	*-28*	*123*
Activity (TBq)	5	2	13	2	10	9	5	7	2	0.25	0.45
Evolution (%)	*0*	*-60*	*550*	*-85*	*400*	*-10*	*-44*	*40*	*-71*	*-88*	*80*

In addition to the usual handling of nuclear waste, non-contaminated waste from the controlled area can be cleared acc. to §33 and §35 StrlSchV (new version since 2019) respectively acc. to § 29 StrlSchV (old version until 2019) by respective measuring for unrestricted disposal. This waste is registered under “normal waste” (chapter F6.1).

Waste water coming from the Hot Cells and the decontamination processes in Wing B (so called Chemie-III-Abwasser) is collected separately and disposed by KTE as radioactive waste. The amounts of nuclear waste water since 2011 are shown in table F13b. Due to construction works at the collection facility in wing B, no Chemie-III-Abwasser was disposed in 2020 and 2021.

Table F13b: Nuclear waste water

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Chemie-III-Abwasser (m^3)	3	6	9	10	6	3	3	3	3	0	0
Evolution (%)		*100*	*50*	*11*	*-40*	*-50*	*0*	*0*	*0*	*-100*	*0*

F7 Promoting biodiversity

The total area of the site is about 234,000 m². The part occupied by impermeable surfaces including buildings, parking lots, paved roads, and paths, etc. is approximately 72,000 m^2; equivalent to 236 m² for each staff member in 2021. The built surface area between 2012 and 2015 was about 68,000 m². In 2015, it increased by around 3,500 m² due to the new buildings already mentioned as well as new walkways, driveways, parking lots and container positions in the vicinity of these buildings. In 2018, it increased again by about 500 m² due to the construction of the new laboratory wing which was necessary because of regulatory requirements. The "natural" proportion of the site decreased accordingly and covers now approximately 162,000 m^2 or 69% of the total surface area. A large part of this area is natural forested area like the surrounding forests providing a natural habitat for different species (cf. figure F16). The respective development is shown in table F14.

Figure F16: Aerial view of the site including "natural" parts

Table F14: Biodiversity

	2015	2016	2017	2018	2019	2020	2021
Total area (m²)	234 000	234 000	234 000	234 000	234 000	234 000	234 000
Sealed area (m²)	68 000	71 500	71 500	72 000	72 000	72 000	72 000
Nature-oriented area on site (m²)	166 000	162 500	162 500	162 000	162 000	162 000	162 000
Sealed area per person (m²)	211	221	222	227	229	233	236

There is no total nature-oriented area off site. There was no related target for 2021 and there is also no related target for 2022.

Imminent effects of the site on the local environment can be considered as mostly insignificant, restricted to the effect of impermeable surfaces represented by the buildings and paved areas. Karlsruhe has no significant air emissions apart from the air from the ventilation systems, which is constantly monitored for radioactive contamination.

Although the site is situated close to an aquifer there is also no significant influence because the installation is a completely closed system with no possible discharge to groundwater (other than rainwater draining from the roofs). The impact on the surrounding biota is also negligible as the site occupies a small area in comparison to the surrounding landscape (comprising mostly forests) and there are virtually no impacts on the neighbourhood (neither air, water nor noise). JRC-Karlsruhe ensures that during site developments, environmental considerations are taken into account. Consequently, there were no specific targets in 2021 and there are also no specific targets for 2022.

F8 Green Public Procurement

F8.1 Incorporating GPP into procurement contracts

Karlsruhe aims to incorporate GPP into contracts exceeding 60,000 EUR and has increased the number of contracts incorporating "green" criteria in the last few years. During the procurement process, the applicability of GPP criteria is defined by the procurement software "PPMT" (see below). In 2021, 54% of contracts exceeding 60,000 EUR included such criteria. All of these could be classified as "light green" (using the classification recommended by the Court of Auditors). Hence, the 2021 target of incorporating GPP criteria in more than 3% of contracts, was reached. The 2022 target is to again exceed 3%.

The JRC uses a tool integrated into the procurement management software (PPMT), which makes the units preparing contracts aware of the potential (and obligation) of applying GPP standards, including links to DG Environment and EU Green Public Procurement criteria and also requiring the approval of the Environmental Coordinator for certain types of orders/contracts (included in the system).

F8.2 Office supply contracts

Most office supplies are provided through framework contracts arising from the Commission's (OIB) call for tenders. The Commission applies "green" criteria to select suitable contractors and products. Examples of the Commission's current framework contracts used by JRC Karlsruhe are those for office supplies, office furniture or the supply of PCs and peripherals (through DG-DIGIT's contracts). There is no specific management approved action to support further improvement.

F9 Demonstrating legal compliance and emergency preparedness

F9.1 Management of the legal register & legal compliance

Karlsruhe is a nuclear installation under German legislation and as such is bound by a tight regulatory framework under the Atomic Energy Act 2 (Atomgesetz, last updated in July 2018), the Radiation Protection Act (Strahlenschutzgesetz, last updated in December 2019) and the respective Radiation Protection Ordinance (Strahlenschutzverordnung, completely new version since December 2018). The former Ordinance for X-Ray Devices (Röntgenverordnung) was integrated in the new Radiation Protection Act. The nuclear licences and amendments governing Karlsruhe's operation include:

1. Genehmigung/licence Nr. K/30/65 [07/65]
2. Genehmigung/licence K/46/66 - LU/101/66 [10/66]
3. Nachtrag 1 zur Genehmigung/amendment 1 to licence Nr. K/30/65 [09/66]
4. Nachtrag 1 zur Genehmigung/amendment 1 to licence Nr. K/46/66 - LU/101/66 [10/66]
5. Nachtrag 2 zur Genehmigung/amendment 2 to licence Nr. K/30/65 - LU/95/66 [10/67]
6. Nachtrag 3 zur Genehmigung//amendment 3 to licence Nr. K/30/65 - LU/95/66 [11/71]
7. Nachtrag 4 zur Genehmigung/amendment 4 to licence Nr. K/30/65 - LU/95/66 [07/74]
8. Nachtrag 5 zur Genehmigung/amendment 5 to licence Nr. K/30/65 - LU/95/66 [08/77]
9. Nachtrag 6 zur Genehmigung/amendment 6 to licence Nr. K/30/65- LU/95/66 [06/81]

10. Nachtrag 7 zur Genehmigung//amendment 7 to licence Nr. K/30/65 - LU/95/66 [04/82]
11. Nachtrag 8 zur Genehmigung/amendment 8 to licence Nr. K/30/65 - LU/95/66 [07/82]
12. Änderungsgenehmigung zum Nachtrag 8/licence for modification to amendment 8 [09/84]
13. Genehmigung/licence S1/97 [10/97]
14. Änderungsgenehmigung nach § 9 AtG (Flügel M)/ licence for modification acc. to § 9 AtG (wing M) Nr. K/132/2012 [03/12]

All of these are publicly available on the internet pages of the Ministerium für Umwelt, Klima und Energiewirtschaft Baden Württemberg (Ministry of the Environment, Climate Protection and Energy Sector).

Another aspect of Karlsruhe's status as nuclear installation according to German legislation is the fact, that for safety or security relevant technical installations, only reliable and time-tested components may be used (§9, Para 2, Nr. 3 AtG). More detailed subordinated regulations also require a time period of ten years for "new" equipment.

Other applicable regulations are listed and assessed in the Legal Register IMS-KRU-S6.5-RGS-0007-DE, which was created in cooperation with an external company, which also provide an update twice a year, most recently in January 2022.

Karlsruhe operates under the close scrutiny and constant surveillance of the Competent Supervisory Authority which is the Ministry of the Environment, Climate Protection and Energy Sector (cf. also F9.2). There have been no legal proceedings against Karlsruhe and consequently neither penalties nor fines since operations started. In order to assess legal compliance, Karlsruhe commissioned an external company to undertake legal compliance audits annually. The latest took place in January 2022 (postponed from December 2021 due to scheduling problems). As usual there were no deviations. Due to this and also due to the constant surveillance by the authorities, JRC Karlsruhe is compliant to all relevant legislations.

F9.2 Prevention, risk management and emergency preparedness

As an installation subject to German nuclear legislation, the entire site and its activities are conceived and operated with a focus on prevention, risk management and emergency preparedness. The applicable legislation requires these topics explicitly. Procedures are based on and tailored to this legislation. Significant procedures have to be approved by the supervising authority (Ministry of the Environment, Climate Protection and Energy Sector of Baden-Württemberg) before becoming effective. The supervisor undertakes inspection visits regularly at least monthly which could be mostly kept even under the pandemic restrictions.

Some practical examples demonstrating the rigour with which legal compliance and emergency preparedness are addressed include:

- all safety and security relevant equipment and installations are subject to stringent recurring check programs which are also under the supervision of the commissioned experts of the supervising authority;
- the site operates its own semi-professional firefighting team and cooperates with the professional fire brigade of the surrounding research site (KIT);
- there are regular firefighting and evacuation exercises partially in cooperation with the fire brigade of the KIT; almost all could be performed in 2021 despite the COVID-19 pandemic situation;
- most technical works are subject to a working permit procedure;
- the admission to the site is strictly limited.

F10 Communication

F10.1 Internal communication

Internal communication may involve Commission staff and contractors. Details of the site level actions are described in the individual (action) Fact Sheets. Due to general situation during the COVID pandemic situation and also to lack of staff, there was almost no internal communication on site level.

A summary of the actions is included below. The corporate actions are detailed in the corporate summary.

Table F15: Internal communication actions at the JRC-Karlsruhe

Action description	Organisation	Dates in 2021	Participation at Karlsruhe site level	Participants (numbers when applicable)
Local Actions at Karlsruhe site				
Continuous awareness via slides on info-screens on the EMAS ("EMAS internal communication - info screens")	Karlsruhe site (partially based on centrally provided slides)	2021	Awareness	Internal and external staff
Dialogue with internal stakeholders	Karlsruhe site	2021	Possibility for staff to ask questions received to be answered via the JRC-Karlsruhe Connected page	Internal staff (0 questions)

F10.2 External communication

Karlsruhe holds licences under German Atomic Law and the Radiation Protection Ordinance as described in Section F9.1. These cover all operations and plant components and therefore all modifications must be approved by the competent supervisory authority, the Ministry of the Environment, Climate Protection and Energy Sector of Baden-Württemberg.

Karlsruhe and the supervisory authority are responsible for compliance with the licences and the latter therefore regularly monitors Karlsruhe's nuclear area. Karlsruhe and the Ministry of the Environment, Climate Protection and Energy Sector share objectives for the safety and security of Karlsruhe's nuclear area. In this context Karlsruhe and the competent authority enjoy a close collaboration based on regular meetings, solving problems and verification exercises. This could be continued despite the boundary conditions due to the COVID-19 pandemic situation. Most of the regular meetings could take place as planned.

External dialogue usually also involves, in addition to local communities and stakeholders, international stakeholders through activities such as site visits and information campaigns. Due to the COVID-19 pandemic situation there were no respective actions at all in 2021. Only the visit of the "new" DG and DDG of the JRC in October 2021 could take place.

As in 2020, the European Nuclear Security Training Centre (EUSECTRA) at Karlsruhe site had a rather reduced training programme in 2021 due to the ongoing pandemic situation (cf. table F16).

Table F16: EUSECTRA training courses at JRC-Karlsruhe

Event Title: Description	Date	Participants' profile	Country (Countries)/Region(s)
Hybrid training on radiological expert support (NDA Characterization of Nuclear Material) for the German Federal Office for Radiation Protection (Bundesamt für Strahlenschutz)	Mar. 2021	Experts	Germany
Hybrid training on radiation technique for front line officers	Sep. 2021	FLO Customs officers	Belgium, Latvia, Croatia, Greece + observers from US/DoE
On-site training on radiological expert support for the German Federal Office for Radiation Protection (Bundesamt für Strahlenschutz)	Nov. 2021	Experts	Germany
Hybrid training on gamma spectrum evaluation with PC FRAM for Western Balkan countries	Nov. 2021	Experts	Serbia, Bosnia and Herzegovina, North Macedonia

F11 Training

F11.1 Internal training

Internal training partially includes also includes external staff working on the premises. Most trainings were cancelled due to the COVID-19 pandemic situation; only those that were legally necessary were given (cf. table F17).

Table F17: Internal trainings at the JRC-Karlsruhe

Description	Organisation	Dates in 2021	Participation at Karlsruhe site level	Participants (estimated)
Local Actions at Karlsruhe site				
Newcomer training for hazardous substances and lab work	Karlsruhe site	Whole year	Newcomers working in the laboratories	2 (internal staff)
Annual radiation protection and safety instructions	Karlsruhe site	Nov-Dec	Health, Safety, Environment	all internal and external staff
Workshop: "2021 legal updates Arbeitssicherheit und Umweltschutz"	Karlsruhe site	01/22 postponed from 2021 due to scheduling problems	Limited to staff in relevant functions	16 (internal staff)

F11.2 External training

No external training took place in 2021.

F12 EMAS Costs and saving

Table F18: EMAS administration and energy costs for buildings in the EMAS area

	Costs:										Change in
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	last year
Total Direct EMAS Cost (EUR)		81 000	71 000	72 000	72 000	74 000	79 000	80 000	81 000	83 500	2500
Total Direct Cost per employee	0	266	222	224	222	230	249	254	262	274	12
Total buildings energy cost (Eur)	1 669 420	1 824 280	1 667 240	1 839 040	1 769 470	1 779 927	1 865 560	1 940 840	1 646 320	1 834 890	188570
Total buildings energy cost (Eur/person)	5 583	5 981	5 210	5 711	5 461	5 528	5 885	6 161	5 328	6 016	688
Total water costs (Eur)	10 550	12 239	14 806	14 777	13 717	13 211	13 328	10 549	8 353	11 260	2906
Water (Eur/person)	35	40	46	46	42	41	42	33	27	37	10
Total paper cost (Eur)	7 080	5 664	7 080	5 664	5 664	4 248	4 248	2 473		1 239	1239
Total paper cost (Eur/person)	24	19	22	18	17	13	13	8	0	4	4

The direct EMAS costs were calculated using the average costs for an official as determined by DG BUDG in relation to the estimated time used for EMAS (full time equivalent – FTE) in combination with external costs (e.g. consultants). The consumption costs were calculated using the consumption values and the prices for the relevant units (e.g. MWh for energy).

F13 Conversion factors:

Parameter and unit	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
kWh of energy provided by one litre diesel	10.89	10.89	10.89	10.89	10.89	10.89	10.89	10.62	10.58	10.58
kWh of energy provided by one litre petrol	9.42	9.42	9.42	9.42	9.42	9.42	9.42	9.42	9.46	9.46
Paper Density (g/m2)	80	80	80	80	80	80	80	70	70	70
O2 from 1 kWh of electricity (supplier) combustion	0.317	0.338	0.315	0.289	0.281	0.346	0.313	0.265	0.24	0.216
Kgs CO2 from 1 kWh diesel (combustion)	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.266	0.266	0.266
O2 from 1 kWh natural gas (combustion)- for LLV	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.21
gs CO2 from one litre of diesel (combustion)	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
gs CO2 from one litre of petrol (combustion)	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28
Annual cost of one FTE (EUR)	132000	132000	132000	134000	134000	138000	148000	150000	152000	157000

Data sources

(1) www.carbontrust.com

(2) www.carbontrust.com

(3) EN BW (2010 – 2016); KIT/Stadtwerke Karlsruhe (2017-2020), KIT/enercity since 2021

(4) www.carbontrust.com (2011-2013); Base Carbone, ADEME, 2017, including upstream emissions (2014-2017)

(5) Umweltbundesamt

(6) Base Carbone, ADEME, 2017, including upstream emissions (2014-2017)

(7) Base Carbone, ADEME, 2017, including upstream emissions (2014-2017)

(8) DG BUDG circular of the financial unit network (RUF) with average administrator staff cost for the upcoming year

EUROPEAN COMMISSION

Environmental Management System

VERIFIED ENVIRONMENTAL MANAGEMENT
BE-BXL-000003

Environmental Statement 2022
2021 results
Annex G: JRC-Ispra

Foreword

The European Commission (EC) site in Ispra is the third largest Commission premises after Brussels and Luxembourg. Located on the eastern shore of Lago Maggiore some 60 km north of Milan, the site hosts many research activities conducted by the Joint Research Centre (JRC) in the fields of Sustainable Resources and Transport, Space, Security, Migration, Health and Consumer Protection, Energy Efficiency and Climate Change, Nuclear Security as well as selected aspects of Growth & Innovation. The site is also hosting services of three other Commission Directorates General (OIB, HR and PMO) as well as local detachments of Italian authorities (Carabinieri, fire brigade, customs and post office) and of one national research organisation (Ente Nazionale Energie Alternative, ENEA).

With its 167 ha geographical extension; the built surface area (about 190 000 m^2 in March 2021), largely devoted to laboratories and other research facilities, combines with a 36 km road network and a relevant woodland coverage, making the site comparable, in size and complexity, to a small municipality. We have a long-standing commitment to reducing our environmental footprint, which is vital for our staff, the neighbouring communities and the wider region.

EMAS is the most rigorous environmental management system available and is regarded as the premium standard for environmental excellence. Since early 2012, we have committed to the EMAS scheme building on and extending the ISO 14001 certified management system. Our environmental policy aims to make sure that sites operate in such a way that all activities, which have an environmental impact, are planned and executed in order to minimise damage to the environment, prevent pollution and improve environmental performance.

EMAS has helped us focus on the environmental aspects of our processes and services, and this guiding principle has been fully integrated into the task of site management services, by the construction, refurbishments or decommissioning and demolition of our building stock, purchase of supplies, energy and waste management, mobility and transport. They integrate eco-friendly work processes, methods and materials whenever possible.

With the "Ispra Site Development Plan", laid down in 2018 and reviewed in 2021, we have set the strategic goals for the development of the site until 2030. Our vision is to develop into the European reference point for a modern and open research facility that is managed in the most sustainable and efficient way, whilst being a stimulating, pleasant, safe and secure working environment for over 2000 people daily. This caring approach goes in the same direction as the great new challenge ahead, namely implementing the Commission’s commitment to sustainable growth and fighting climate change, at the Ispra site.

We are therefore planning to cut drastically our carbon footprint by maximising the use of renewable energy, enhancing the energy efficiency of our buildings and commuting more sustainably and seeing how this can be done in the covid-19 era. For instance, also in 2021 the pandemic impacted strongly on our energy consumption, e.g. by ventilating buildings 24h/7

This said, the EMAS results for the Ispra site during 2021 went generally beyond the targets set in 2014, particularly due to the excellent work done to reduce our impact on the environment carried out in recent years.

In 2021, activities continued for the definition of the "Greening the Commission" strategy with the aim of achieving carbon neutrality by 2030. This will be the way that the Commission intends to implement the European Green Deal internally and thereby lead by example. In 2022, we will be defining further the actions to achieve this goal. Our ambitious targets will be supported by our environmental core indicators, which facilitate multi-annual comparability within and between organisations. In all this, transparent communication of our performance to authorities and the general public is key.

Rien Stroosnijder
Site Manager

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ANNEX G: JRC-Ispra site

In 1957, the Euratom Treaty signed in Rome by six European founding Members (Belgium, France, Germany, Italy, Luxembourg and the Netherlands) created the European Atomic Energy Community (EURATOM). Since its creation, EURATOM has supported the establishment and growth of safe nuclear power related industries contributing to the peace, health and prosperity of European citizens. To support this mission, Article 8 of the Treaty established a Joint Research Centre (JRC) with sites located (initially) in four Member States to perform top-level research and disseminate findings for policymaking and to set uniform safe standards. Ispra was selected as the Italian site.

The activities of what has become the JRC-Ispra site began in 1958 with the construction of the Ispra-1 nuclear reactor by the Italian "Comitato Nazionale per l'Energia Nucleare" (CNEN). Subsequently, under the agreement between the Italian government and the EURATOM, the Ispra site came under the jurisdiction of the European Community, with an act ratified on 1st August 1960 (Italian Law 906). Initially the site was dedicated to nuclear research. At the beginning of 1990s, however, it was decided to focus on new areas of research, mainly related to environment and sustainability, health and consumer protection and protection and security of the citizen. Currently, most of the nuclear facilities located within the site are in the process of pre-decommissioning (see Chapter G2.1b).

The Ispra site hosts a large variety of scientific, technical and support services, with all the Directorates of the JRC being at least represented physically on the site. Please consult the JRC's organigramme for more details, at https://joint-research-centre.ec.europa.eu/index_en .

The site's portfolio of activities breaks down as follows:

- Focal points of non-nuclear research: Sustainable Resources and Transport, Space, Security, Migration, Health and Consumer Protection, Energy Efficiency and Climate Change, as well as selected aspects of Growth & Innovation.
- Nuclear activities including Nuclear Security and the Decommissioning of the existing historical nuclear facilities.
- Horizontal research activities in support of Knowledge Management and Competence Building.
- Site management support services covering Site Development, Maintenance, Logistics as well as Safety at Work, Security and Environmental Protection.
- Resources Management including finance, procurement, HR, IT, etc.
- Non-JRC Commission services such as the Medical Service (DG HR), the Paymaster's Office (PMO) and the management of the Social Infrastructure through the Office for infrastructure Brussels (OIB).

The average daily presence of staff and intramuros contractors at the JRC-Ispra site on regular years is about 2,400 people. Under normal conditions, the site hosts over 40,000 visitors yearly.

G1 Overview of core indicators at JRC-Ispra since 2011

<u>Reporting and the covid-19 pandemic</u>:

The year 2021 was still affected by the covid-19 pandemic but there is an increase in environmental indicators compared to 2020 as a result of a greater presence of staff on the site. However, generally, data is still lower than in 2019, the last year not affected by the effects of the pandemic.

JRC-Ispra has been reporting on EMAS indicators since 2014 with data mostly stretching back at least to 2011. The variation of the core Key Performance Indicators (KPIs), including performance trends and targets, is shown below.

Table G. 1 - Historical data, performance and targets for core indicators for Commission level reporting[1]

Physical indicators:	Historic data values						Performance since:		Future targets		Future targets	
(Number, desciption and unit)	2011 (1)	**2014**	2018	2019	2020	2021	2011	2014	2014-23	2014-30	2023	2030
							Δ %	Δ %	Δ % (2)	Δ % (2)	value(2)	value (2)
1a) Energy bldgs (MWh/p)	53,13	**44,24**	43,31	41,82	36,59	38,98	**-26,6**	**-11,9**	-10,0	-16,0	39,81	37,16
1a) Energy bldgs (KWh/m^2)	501	**404**	378	377	341	363	**-27,4**	**-10,0**	-10,0	-16,0	363	339
1c) Non ren. energy use (bldgs) %	93,1	**95,5**	89,4	91,4	87,7	86,5	**-7,1**	**-9,4**	-14,0	-30,0	82,1	66,9
1d) Water (m^3/p)	234	**125**	163	112	95	88	**-62,6**	**-30,0**	-11,0	-13,0	112	109
1d) Water (L/m^2)	2 209	**1 144**	1 426	1 011	889	818	**-63,0**	**-28,5**	-11,0	-13,0	1018	995
1e) Office paper (Tonnes/p)	0,024	**0,017**	0,012	0,010	0,004	0,004	**-83,3**	**-77,5**	-55,0	-65,0	0,008	0,006
1e) Office paper (Sheets/p/day)	22,4	**16,5**	12,2	11,0	4,4	4,3	**-81,0**	**-74,3**	-55,0	-65,0	7,4	5,8
2a) CO_2 buildings (Tonnes/p)	12,36	**10,25**	9,68	9,39	7,31	7,74	**-37,4**	**-24,5**	-23,0	-41,0	7,89	6,05
2a) CO_2 buildings (kg/m^2)	116,5	**93,5**	84,5	84,7	68,1	72,2	**-38,1**	**-22,8**	-23,0	-41,0	72,0	55,2
2c) CO_2 vehicles (g/km, manu.)	n.a.	**185,5**	111,2	109,1	104,2	90,9		**-51,0**	-50,0	-97,0	92,8	5,6
2c) CO_2 vehicles (g/km, actual)	345,8	**343,4**	280,7	270,8	235,9	244,2	-29,4	-28,9				
3a) Non haz. waste (Tonnes/p)	0,474	**0,491**	0,546	0,508	0,218	0,387	**-18,4**	**-21,2**	-2,0	-5,0	0,481	0,467
3b) Hazardous waste (Tonnes/p)	0,057	**0,021**	0,021	0,019	0,010	0,016	-72,5	-26,7				
3c) Unseparated waste (%)	28,7	**18,5**	14,2	13,3	17,7	11,5	**-59,8**	**-37,6**	-2,0	-5,0	18,1	17,6
3c) Unseparated waste (T/p)	0,000	**0,095**	0,080	0,070	0,040	0,046		**-51,0**	-2,0	-5,0	0,093	0,090
Economic indicators (Eur/p)												
Energy consumption (bldgs)	n.a.	**1 772**	1 496	1 087	858	2 168		22,3				
Water consumption	n.a.	**28**	20	13	14	15		-45,9				
Non haz. waste disposal	120	**115**	119	113	86	93	-22,6	-18,8				

The reporting of 2021 retains the same approach for continuity purposes, as previous years, and is therefore based on site activity and total staff numbers. Almost all 2023 targets for JRC-Ispra's core KPIs, having 2014 as baseline reference, were met. A detailed analysis of the relative causes of these indicators is described in the dedicated chapters.

It is to be noted that the JRC-Ispra EMAS baseline parameters, such as population or useful surface area for buildings, may vary on a yearly basis and may therefore indirectly affect some EMAS core indicators. The relative evolution is shown below:

Table G. 2- EMAS baseline parameters

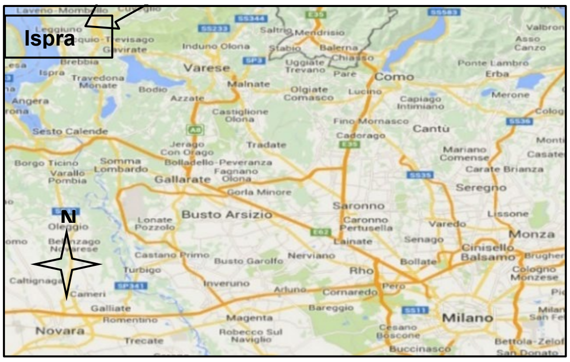
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Population: total staff (internal and external)	2 087	2 110	2 223	2 337	2 296	2 258	2 277	2 285	2 332	2 411	2 475
Total no. operational buildings	422	423	421	419	409	410	402	402	384	376	366
Useful surface area for all buildings, (m^2)	221 444	222 148	223 077	256 077	253 428	254 356	259 828	261 713	258 539	258 546	265 519

The site's usable surface area in 2021 increased following the opening of the new building 102.

G2 JRC-ISPRA activities[2], context and key stakeholders, environmental aspects

G2.1 Activities

Figure G. 1 - Geographical overview of JRC-Ispra site (source Google Maps)



The Ispra site occupies about 167 hectares, and is located about 70 km northwest of Milan, in Italy, as shown in Figure G. 1. The site is in a hilly area between Lakes Maggiore and Varese, at an altitude of approximately 230 m above sea level. The site contains several ponds and many hectares of groves comprising mainly pine, birch, oak, acacia and chestnut trees.

The main surface watercourses that flow close to the site are the Rio Novellino, a stream originated within the site and flows mainly NW bound, and the Acquanegra stream which flows alongside the north-eastern boundary. Both streams discharge into "Lake Maggiore".

[1] Notes: (1) Earliest reported data; (2) compared to 2014;

[2] The corporate NACE codes associated to the JRC-Ispra site activities are: 99.00 - Activities of extraterritorial organisations and bodies; 71.2 – Technical testing and analysis; 72.1 - Research and experimental development in natural sciences and engineering; 35.11 - Production of electricity; 35.30 - Steam and air conditioning supply; 36.00 - Water collection, treatment and supply; 37.00 – Sewerage.

Figure G.2 - Location of Rio Novellino and Acquanegra Stream (source Regione Lombardia – Geographic Viewer)

The meteorological conditions of the site are extremely variable and the weather can change rapidly. The coldest months are typically December and January, while during summer average temperatures exceed 20°C. The average rainfall in the area is about 1 300 mm over the reference period. Table G. 3 below shows the annual trend of the main meteorological data[3].

Table G. 3 - Annual trend of the main meteorological data

	2014	2015	2016	2017	2018	2019	2020	2021
Total yearly rainfall [mm]	1976	1118	1468	798	1268	1448	1088	1192
Total annual mean temperature °C	13.3	13.5	12.9	13.0	13.2	12.9	12.7	12.3
Solar Radiation Annual mean [W/m2]	140.4	150.9	149.6	154.9	148.6	150.6	155.4	149

The humidity registered in the JRC site is generally high due to the presence of two large lakes nearby. The site is generally well protected from the winds; analysis of the multi-year wind rose indicates that the dominant wind direction is southbound, and it is in this direction that higher speeds can be registered.

Core based activities and utility plants of the Ispra site are located inside the fence, as shown in Figure G. 3. Some facilities are outside the fence, such as the water pumping station located on the Lake Maggiore shore, about 3 km from the Ispra site, and the social areas (the JRC apartments and guest quarters; about sixty flats and twenty lodgings; the Club House; childcare and sports facilities; building 51 which currently is subject to relocation of activities). All these premises are within the EMAS scope.

The following premises, even if hosted on the Ispra site, are excluded from the EMAS scope:

- the nuclear reactor named 'Ispra-1';
- the Italian Fire Brigade station;
- the *Carabinieri* offices;
- the Italian Post office;
- the travel agency;
- the bank office;
- the ENEA building (a subsidiary site of the Italian national agency for new technologies, energy and sustainable economic development);
- the EUROPOL data centre.

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3 Source: Atmosphere – Biosphere – Climate Integrated monitoring Station: http://abc-is.jrc.ec.europa.eu/

Within the boundaries of the site, there are 366 so-called *buildings*, out of which approximately 140 are technical installations (gas cylinder cabinets, transformer cabinets, etc.) and only 80 are buildings permanently occupied by staff. Site buildings have been constructed since the 1960s. Recently, a high-density zone has been created, in which scientific activities are concentrated. In particular, two new energy efficient buildings (buildings 100 and 101), hosting about 250 staff each and building 102 a Nearly Zero Energy Building (NZEB), hosting about 300 staff. These new highly energy efficient buildings have significantly influenced the portfolio of buildings and marked a new sustainable approach to on-site constructions. The JRC-Ispra site map can be seen in Figure G. 3.

Figure G. 3 - The JRC-Ispra site map

G2.1.1 JRC-Ispra utility plants and infrastructure

The *Site Management Ispra, Department R.I,* is responsible for providing an appropriate site service level by means of the following utility plants.

Table G. 4 - JRC-Ispra utility plants

Utility plant	Function	Operation period
Tri-generation plant supplied with methane	Electricity, hot water and cold water production	From 2004
Wastewater treatment plant	Wastewater treatment before discharge in the Lake Maggiore	From 1978
Pumping station	Water supply from the Lake Maggiore	From 1960s
Filtering station	Water disinfection and distribution through the site network	From 1960s
Sewage network	Collection of wastewater from buildings to wastewater treatment plant	From 1960s
Electrical energy transformer station (Bld. 14)	Reduction of the electric voltage and distribution through the site network	From 1960s

Utility plant	Function	Operation period
Electrical energy transformer cabins	Reduction of the electric voltage and distribution through the buildings	From 1960s
Petrol station	Supply of fuel for internal fleet and other utilities	From 1960s and totally refurbished in 2012
Technical tunnels	Distribution of all utilities needed for the ordinary operation of the JRC-Ispra site (e.g. electric cables, hot and cold water pipes, drinking and cooling water pipeline, optical cables).	From 1960s
Heat recovery pump station	To produce heat and cold energy for the new buildings (100-101).	From 2015
Renewable energy plants	To produce electricity and heat from renewable sources (solar photovoltaic and thermal plants)	From 2015
Lamination basin	To reduce the flow of meteoric water to the Novellino stream and increase the sedimentation process.	From 2016

G2.1.2 Nuclear installations

Activities for the development of a nuclear research centre in Ispra started in 1958 after the EURATOM ("EURopean ATOMic Energy Community") Treaty was signed in Rome in 1957. In March 1959, the first reactor (Ispra-1) became operational and in 1960, Italy ratified the agreement to transfer the Ispra-site to EURATOM. The initial research topics at Ispra were focused on nuclear reactor and fuel cycle development. Over the years, further research facilities were completed including the nuclear reactor ESSOR ("ESSais ORgel "), and research reactor ECO ("Esperienza Critica Orgel") which has already been dismantled in 1974 and its facility converted to FARO (Fuel Assemblies melting and Release Oven). During the years, the European Framework Programmes for Research and Innovation progressively reduced their focus on nuclear research. Therefore, most of installations within the Ispra site are currently shut down and in a state of safe conservation. In 1999, a Decommissioning & Waste Management Programme was started.

Nowadays the nuclear installations occupy about 18 ha. However, as the Ispra-site is largely covered by woods, only the top of chimneys of ESSOR (80 m height) and Ispra-1 (40 m height) are visible from the site borders (a small part of the buildings of SGRR is visible only in winter).

The facilities still operating are:

- ADECO – "Atelier Démantèlement Eléments COmbustibles", Laboratory for the dismantling of nuclear fuel elements. ADECO includes TSA (Transit Safe Area), a hot cell specifically modified for the containment of irradiated nuclear fuel
- PERLA – PERformance LAboratory;
- PUNITA - PUlsed Neutron Interrogation Test Assembly;
- SGRR – "Stazione di Gestione dei Rifiuti Radioattivi", Radioactive Waste Management Plants, the supporting facility for the characterization, treatment, conditioning and storage of radioactive waste coming from decommissioning activities. In the same area are present:
  - The old fissile material and irradiated nuclear fuel storage (Dry Wells). The storage has its own authorization, is currently empty and no further use is foreseen.
  - STEL - "Stazione Trattamento Effluenti Liquidi", plant for low and intermediate activity contaminated liquid (aqueous) effluents, 300 m3/y can be treated by precipitation and ultra-filtration to acceptable levels prior to their authorised discharge off-site. STEL is operative since 2007;
- ISF - "Interim Storage Facility", the 5.500 m2 building is designed as prescribed by law and to endure threats such as natural calamities and all man-made failures. The ISF was built in 2013 and is surrounded by special green embankment to

minimise the visual and environmental impact. This building is designed to safely store low and intermediate level conditioned radioactive waste. The ISF will temporarily host only the JRC-Ispra radioactive waste. The final destination of the JRC-Ispra radioactive waste will be the future Italian national repository;

- Tank Farm, temporary storage facility for Low Level sludge and Intermediate Low Level Waste.

There are also on-site several laboratories functional to the operation of the above facilities, management of radioactive waste and decommissioning of the shutdown installations.

Currently the long-term shutdown nuclear installations are:

- Cyclotron: a type of particles accelerator in which charged particles are accelerated by an alternating electric field between two large electrodes in a constant magnetic field created by two large magnets. Shutdown was carried out in 2014;
- ECO-FARO: the research reactor in the past was converted in FARO. The dismantling of the FARO facility was completed in May 2014;
- ESSOR – nuclear research reactor, in permanent shut down since 1983.
- LCSR – "Laboratorio Caldo Studi e Ricerche", Hot cells facility: a laboratory progressively shutdown in the 90's;
- STRRL – "Stazione di Trattamento dei Rifiuti Radioattivi Liquidi", Radioactive liquid effluent treatment facility: shut down after 40 years of operation and replaced by the new "Stazione di Trattamento degli Effluenti Liquidi", Liquid effluent treatment plant facility (STEL). A modification of the authorization enabled JRC to build the new Tank Farm, a temporary storage for Low Level sludge and ILLW.

Ispra-1 reactor is shutdown since 1973 and in safe conservation status. On November 2009, a “Settlement Agreement” was signed between Italian Government and the European Atomic Energy Community. The purpose was to regularize the historical nuclear liabilities on the Ispra-site by transferring the responsibility of the decommissioning of Ispra-1 nuclear plant to the Italian Government and leaving to the European Commission all other liabilities on the site. The Italian Parliament approved in its budget the handover of Ispra-1 to SOGIN (SOcietà Gestione Impianti Nucleari) SpA, the Italian company appointed to dismantle this facility. The ratification of the “Settlement Agreement” was published in the Italian Official Journal (Law n° 40, May 8th 2019) and, on September 26th 2019; the nuclear plant Ispra-1 was signed over to SOGIN.
Radioactive Waste produced by dismantling of Ispra-1 will be managed by JRC-Ispra and stored within ISF. The final destination, jointly with the other radioactive waste of JRC-Ispra, will be the future Italian national repository.

An example of complete decommissioning is the RadioCHemistry Laboratory –RCHL. This lab has been progressively shutdown in 1990s. The RCHL decommissioning was completed in 2010 (green field status) and the building is currently being used as the JRC Visitors' Centre.

The nuclear activities at the JRC-Ispra impact the environment in essentially three ways:

1. Radioactive emissions during the operating and the future decommissioning activities phase (see Chapter G5.4 on Radioactive emissions);
2. The management of old radioactive waste and the generation of radioactive decommissioning waste (see Chapter G6.5 on Radioactive Waste Management System);
3. Indirect use of conventional industrial resources (i.e. not due to the nuclear nature of the operations).

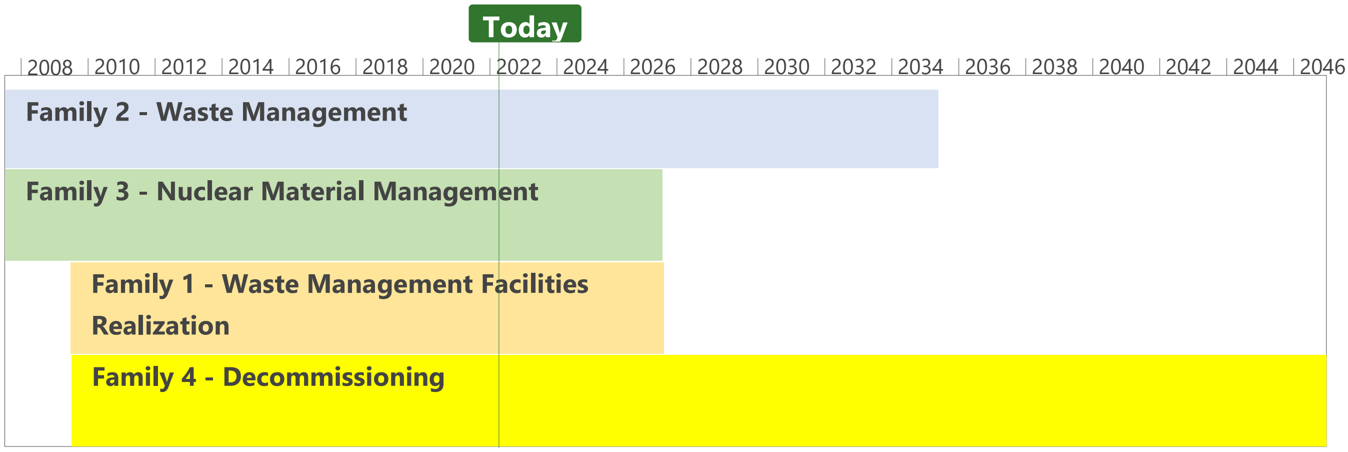
G2.1.3 The Decommissioning programme

The main objective of the Ispra site Decommissioning and Waste Management Programme is to decommission the shutdown nuclear facilities and to manage the resulting waste together with the legacy waste. The site's nuclear plants and most of nuclear research installations are currently either undergoing or in preparation for decommissioning[4] which has the ambitious goal of restoring the site to its original condition (also called "green field" status) by 2046. The programme, having a budget of approximately 926 million Euro, includes the following steps:

1. Removal of nuclear materials;
2. Management of legacy waste;
3. Dismantling installations and management of the arising radioactive waste;
4. Reduction of any residual radioactivity and a final radiological survey;
5. Re-establishing "green field" status having no radiological constraints.

A simplified planning of the Ispra-site's decommissioning programme is reported in Figure G. 4.

Figure G. 4. Simplified planning of the Ispra site decommissioning and waste management programme.



In 2021, the following milestones have been achieved:

- Submission of the Operational plan for the management (in including treatment by melting) of the radioactive metals waste stream;
- Final authorization of the Transit safe area and collection of all nuclear material in it;
- Contracts for feasibility studies for irradiated nuclear material management signed;
- Transition towards the new Italian system for radioactive waste inventory declaration (STRIMS, "Sistema Tracciabilità Rifiuti Materiali e Sorgenti"), i.e. a traceability system for waste materials and sources.

In 2022, the following milestones are expected:

- Shipment of first batch of soft waste to an external service provider for supercompaction;
- Accomplishment of the Interim Storage Facility (ISF) upgrading, with first batch of unconditioned Very Low Level Waste (VLLW) loaded to the facility;
- Completion of feasibility studies for the off-site storage of irradiated nuclear material;
- Launch of a call for tender for the alienation of fresh nuclear material;
- Conclusion of the donation of part of the cyclotron lab and submission of a decommissioning application for the cyclotron.

In the mid-term (up to 2027) work will focused on:

- For waste management facilities realization: completion of the retrieval facility for the bituminized drums, completion of the new grouting station;
- For waste management: start of the retrieval and treatment of the bituminized drums, opening of the metal melting waste treatment route with the first campaign and restart of the retrieval of the Roman Pits from underground.

[4] Decommissioning the last major licensed phase of a nuclear installation. It involves taking the installation out of operation while ensuring the health and safety of personnel and the general public and the protection of the environment, and culminates in the termination of the installation license.

- For waste management: complete the design and construction of the electro-mechanical equipment of the new grouting station in SGRR.
- For waste management: sign the framework contract regarding incineration service, submit the operational plan to Italian Authority and obtain its approval, prepare the first incineration campaign.
- For waste management: implement the strategy identify to treat/condition VLL sludge and ILLW.
- For nuclear material management: removal from site of the largest possible fraction of fresh nuclear material and establishment of a management strategy for irradiated nuclear material.
- For decommissioning: complete the decommissioning of the cyclotron and submit decommissioning application for STRRL and LCSR, obtain the decommissioning license for ESSOR and start significant pre-decommissioning tasks.

The Ispra-site decommissioning programme, as well as all the nuclear activities performed on the JRC-Ispra site, is developed and implemented under Italian legislation and inspected by the Italian “Ispettorato nazionale per la Sicurezza Nucleare” (ISIN). The evaluation of the environmental impacts associated with decommissioning of nuclear plants (both power and research reactors) is subject to the EIA (Environmental Impact Assessment) process. In September 2015, JRC-Ispra sent a request to the Italian Environmental Ministry (MATTM, "Ministero dell'Ambiente, della Tutela del Territorio e del Mare" since 1st March 2021 MiTE, Ministero della Transizione Ecologica) to start the EIA process. The preliminary and voluntary EIA phase, also called Scoping, defines the steps in the evaluation methodologies and the procedures for the environmental analysis involved in the EIA study. Moreover, the scoping process aims at involving local communities and all relevant stakeholders. The stakeholder information is facultative in the scoping phase but strongly suggested in order to give transparency and information of planned project activities, according to EMAS requirements applied at JRC. During 2016, JRC received from MATTM[5] and Lombardy region a positive evaluation on the Scoping report and the guidelines for the preparation of the EIA document called EIS (Environmental Impact Study). The finalisation of the writing of the EIS and its submission to MATTM/MiTE took place in the first semester of 2020 and during 2020 JRC received a positive assessment from Provincia of Varese (September 2020) and Ministero dei Beni e delle Attività Culturali e del Turismo (November 2020). The last opinion was received in March 2022 by Lombardy region and the final approval is expected by 2022.

Unit JRC-J.1 – Ispra Operational Nuclear Decommissioning and Waste Management - has signed a Material Transfer Agreement with the Radiopharmaceutical Chemistry Unit of Czech Technical University of Prague about the donation, and indeed the re-use of the Cyclotron lab, an amazing example of circular economy. Several shipment have occurred since the signature of the agreement with the last one planned for September 2022.

G2.1.4 Research activities

The non-nuclear research activities of the JRC in Ispra are a combination of desktop research and experimental research. The latter encompasses chemical, biological and physical testing and analysis in dedicated laboratories onsite, and includes the following major facilities (non-exhaustive list[6]):

- European Union Reference Laboratory for alternatives to animal testing (EURL ECVAM);
- European Crisis Management Laboratory (ECML);
- European Interoperability Centre for Electric Vehicles and Smart Grids;
- European Laboratory for Structural Assessment (ELSA);
- European Microwave Signature Laboratory (EMSL);
- European Reference Laboratory for Air Pollution (ERLAP);
- European Solar Test Installation (ESTI)
- Greenhouse gas monitoring facilities;
- JRC air pollution observatory;
- Marine Optical Laboratory;
- Nanobiotechnology Laboratory;
- NGS-Bioinformatics infrastructure;

[5] http://www.va.minambiente.it/it-IT/Oggetti/Info/1571

[6] Further details can be found on the JRC internet, currently on: https://ec.europa.eu/jrc/en/research-facilities

- Vehicle Emissions LAboratory (VELA);
- JRC Makerspace.

G2.1.5 Site Development Plan 2030 (SDP2030)

The SDP2030 is a holistic vision document, first laid down in 2018, that comprises all ideas and plans for a modern site, that will continue leading the European Union's research by being smart, sustainable, open, and efficient, as is described hereafter:

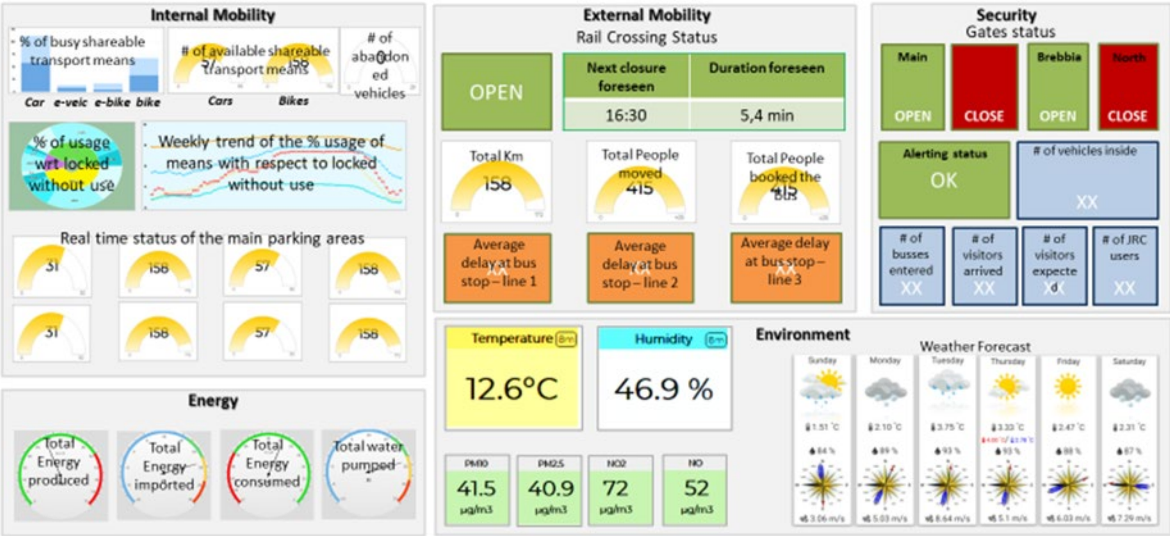
- Smart – enhance the site appearance as a place to do cutting-edge research ("Smart Site"), by turning it into a Living Lab featuring hands-on advanced technology demonstrators and by innovating the way we live, work and move on the site;
- Sustainable – cutting down drastically our carbon footprint by maximising the use of renewable energy, enhancing the energy efficiency of our buildings and commuting more sustainably, thus aiming at lowering the site's global energy demand by at least one quarter by 2030;
- Open – turn the site into a more open, welcoming and collaborative space for many, adapting our infrastructure to foster inspiration and sharing, while keeping the site safe and secure;
- Efficient – lean and modernise the site's support services.

The SDP2030 looks therefore at site development' in its broadest sense, encompassing not just the 'brick & mortar' aspect of buildings construction and maintenance, but all the relevant facets of site management, including energy, eco-friendly waste management, sustainable mobility, biodiversity, safety and security. The plan was reviewed in 2021, adapting it to important changes including a new Commission and a new Multi-Annual Financial Framework, the post-covid-19 context and the emphasis on digitalisation and new ways of working. In the review, we remained loyal to the four principles listed above, and to our vision for modern near-zero energy buildings that will host our research facilities and staff, a modern energy tri-generation plant, a fully modern grid and renewable energy forms that will reduce to the minimum our need for non-renewable energy. This does not only include the objective to gradually increase the number of photovoltaic (PV) energy production installations, but also other possible measures to increase energy efficiency and to pilot the use of green energy.

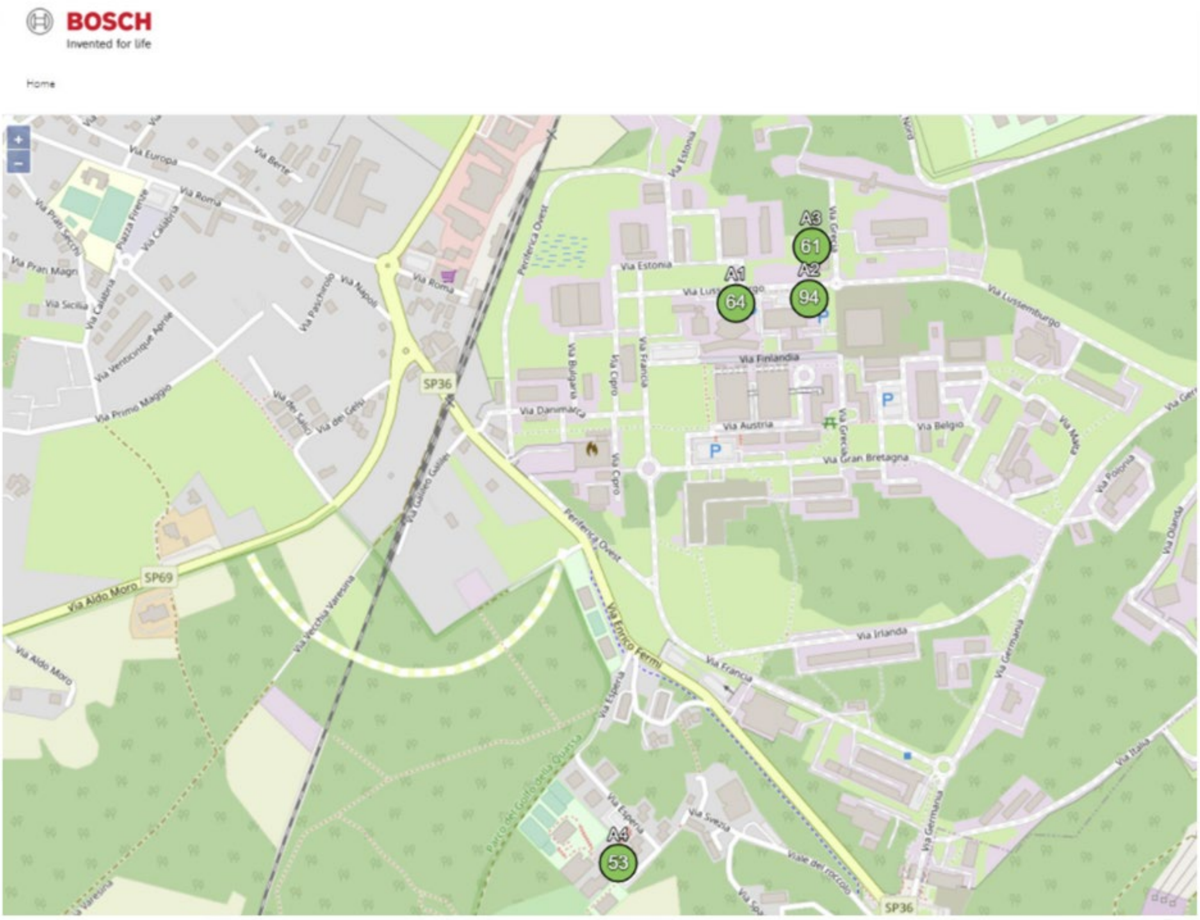
The reviewed SDP2030 also confirms our vision for efficient and sustainable forms of transportation inside the site, connecting efficiently with the transportation offered by local authorities outside the site. In particular, Ispra Site Management continued analysing possibilities to enhance the use of sustainable means of movement and transportation, encouraging in particular walking, cycling and use of electrical vehicles. The use of sustainable means of transportation will be greatly supported by the modification of the external/public bus service itineraries negotiated with the local bus company. Although the implementation of the agreed changes (originally due to start in June 2021) was temporarily interrupted on account of the covid-19 situation, three bus lines will be modified, creating a major terminal bus stop in front of the Ispra Site. Finally, the Living Labs under the “Smartness” pillar of the SDP2030 continued playing a role in promoting the change in mind-set towards more sustainable mobility patterns, agreeing to implement a new project to test a Mobility-as-a-community service infrastructure fit for the needs of JRC Ispra. The site management has continued offering service bicycles and a dedicated maintenance service, to be further enriched with a new station for self-servicing bicycle repair. Plans are on-going for further development of the bicycles using technology to better exploit their use. For example, the bicycles will be equipped with trackers that will allow calculation of kilometers ridden and the preferred routes. This will allow the site management to understand if and where more infrastructure is needed in order to maximise safety for bicycles.

Finally, but not less importantly, the site management is continuing to pursue the development of a unified Site Operation Control Platform (SOCP), where the energy and mobility aspects will be among the mostly addressed fields. Its purpose would be to ingest and federate data streams originating from separate back office systems into one single platform for visualizing them on dedicated dashboards, enabling integrated monitoring and smart management of site operations (demonstration figures follow).

Figure G. 5 - Operations platform



With the assistance of this platform, the site would be significantly modernised, thanks to various modern features, for example the smart parking management:



In addition, the SDP2030 considers improving traffic management, e.g. through the introduction of one-way segments on the Ispra site, in order to improve traffic flow and safety of cyclists and pedestrians. This would be studied as part of an overall mobility plan which will connect buildings and areas for pedestrians and cyclists.

G2.2 Context – risks, and opportunities

Fully understanding the context in which an organisation operates provides a high-level understanding of the important issues and circumstances that may influence its environmental commitment and responsibilities. Furthermore, the context analysis helps to avoid risks and to seize opportunities.

G2.2.1 External issues and circumstances affecting JRC-Ispra's environmental performance

JRC-Ispra defined the external circumstances that influence its targets by using the PESTLE (Political, Economic, Social, Technological, Legal, Environmental) criteria. The highlights of this analysis are listed hereunder.

1. **Political:** new policies such as the response to Covid-19 (e.g. triggering the increase in energy use for the need to increase ventilation in buildings). In the near future, the implementation for the European Green Deal will be changing our way of working, e.g. promoting teleworking.
2. **Economic:** changing scenarios may influence the site's budget. For instance, the increase in costs of energy and raw materials implies needing a higher budget to manage business as usual or to revise the current budget.
3. **Environmental:** Climate change effects are progressively impacting more on the Ispra site. Extreme weather conditions are increasing possibly resulting in more rainfall, storms, wind, higher temperature (average and peaks). In addition, anthropic external factors may affect JRC (e.g. fire coming from neighbouring woods or incoming air or groundwater pollution). Practical examples of this are increased frequency of discharging untreated wastewater via bypass upstream for the wastewater treatment plant or having to face higher cooling costs.

JRC-Ispra is trying to seize the opportunities that are present by implementing actions finalised to improve its environmental sustainability. This is currently done by implementing the Ispra Site Development Plan, which addresses the improvement of the energy management of the site, including increasing efficiency of buildings and facilities and the promotion of sustainable mobility. At the same time, progress is being made in terms of seizing the opportunity of using the site itself as a test bed for research purposes in the format of a "Living Labs", particularly for mobility (Future Mobility Solutions) and energy (Testing Digital Energy Solutions) purposes.

G2.2.2 Internal issues and circumstances affecting JRC-Ispra's environmental performance

These have been analysed using ASCPF[7] criteria. With regard to risks and opportunities, the two most important are as follows:

JRC-Ispra defined the internal circumstances that influence its targets by using the ASCPF (Activities, Strategic direction, Culture & employees, Processes & systems, Financial) criteria. The highlights of this analysis are listed hereunder.

1. **Activities**: the Ispra-site is constantly under refurbishment to take its portfolio of buildings to modern standards. Given the considerable amount of on-going work at the same time, there is a risk of reduced environmental management control of all the yards. On the other hand, there is a clear opportunity to use the best available technologies for such constructions. To this end, the Ispra-site has consolidated the use of the BREEAM (Building Research Establishment Environmental Assessment) methodology to manage programming, construction and maintenance of relevant buildings (>3 million €).
2. **Processes and system:** the Ispra-site environmental team can face relevant environmental challenges providing an added-value. However, lately, not all necessary positions are filled risking to cause delays in work or missing some relevant environmental analysis.

[7] ASCPF criteria – Activities, Strategic direction, Culture and employees, Processes and systems, Financial

G2.3 Stakeholders (interested parties), compliance obligations risks and opportunities

JRC-Ispra has identified its internal and external stakeholders and is committed to relate to them in a transparent and timely way, in accordance with the EMAS regulation. In particular, JRC-Ispra has identified their main needs and expectations classifying these as "political role", "legal requirements", "collaboration" and "communication". When JRC-Ispra decides to adopt a "need" or an "expectation" of a stakeholder that is not legally mandatory, it becomes part of its compliance obligations. The main risks highlighted in the analysis are image loss or loss of trust.

The actions deriving from these risks are focused on communication activities. In particular, JRC-Ispra is committed to communicate its environmental performance in a yearly EMAS Round Table meeting with external stakeholders, whereas internal stakeholders are constantly involved by means of awareness-raising actions and related communication campaigns. For instance, the aforementioned implementation by JRC-Ispra of the European Green Deal responds to the stakeholder's expectation to have the European Commission being an example for others.

In 2021, it was not possible to organise face-to-face meetings. When possible, meetings were held by videoconference. This also impacted on the organisation of the EMAS Round Table postponed till 2022.

JRC-Ispra’s internal stakeholders include staff, mostly management as well as the Unions, whereas JRC-Ispra’s external stakeholders are:

- neighbouring Municipalities (Ispra, Brebbia, Cadrezzate, Travedona Monate);
- other Municipalities;
- other Public Administration (e.g. Region Lombardy, Province of Varese, Italian fire brigade);
- the Italian EMAS Competent Body (Comitato Ecolabel Ecoaudit) and the environmental control bodies (I.S.P.R.A., A.R.P.A. Lombardia);
- suppliers and subcontractors;
- environmental Associations (e.g. Legambiente);
- other Associations (e.g. Unione degli industriali, Confindustria, Camera di commercio);
- neighbouring citizens and EU citizens at large.

The table in Section 12.2 summarises the main interested parties, organised in “clusters”.

G2.4 Environmental aspects

This section addresses the site's significant environmental aspects and relative indicators (see table on paragraph G.12.3), analysed by means of a specific procedure[8]. JRC-Ispra takes measures to reduce pollution (airborne emissions, waste production, wastewater discharge) and to achieve more efficient use of natural resources (mainly energy and water).

[8] P01, "Identification and evaluation of environmental aspects", Environmental Management system

G3 More efficient use of natural resources

G3.1 Energy consumption of Commission buildings and vehicles

G3.1.1 Energy consumption of buildings

Electrical energy consumed by the JRC-Ispra site is mostly provided by the internal tri-generation natural gas plant and complemented by:

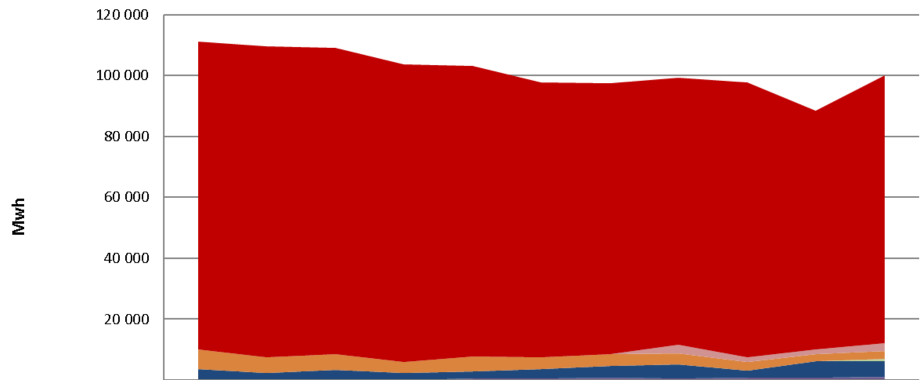
- Electric energy purchased from the grid (this is an important backup power supply for the Ispra-site, in case the site tri-generation plant reduces production);
- On site photovoltaic (PV) plants producing a relatively small amount of renewable electric energy which, in terms of peak value, is increasing continually.

Thermal and cooling energy: The tri-generation plant, in permanent operation since September 2004, is also the main source of thermal and cooling energy for the entire JRC-site. Currently only a small number of buildings, including INE (which stands for "Impianto Nucleare ESSOR") remain unconnected to the site's refrigeration system, which is provided either by independent coolers or by pumping water from Lake Maggiore, which passes through the site's filtering station, and is then distributed as cooling water.

The canteens and the Club House of the site are supplied with methane gas directly from the distribution network for cooking purposes, as are the sports centres and the residential areas located outside the fence.
An energy recovery heat pump exchanges hot and cold energy from the wastewater discharged from the site's wastewater treatment plant and the water used in the site's district cooling network.
Diesel liquid fuel is used to run emergency power plants. Both diesel and petrol liquid fuel are used for VELA laboratories and small portable devices such as chainsaws and lawn mowers.

In 2021, a system using geothermal energy has been inaugurated. The cooling energy thus produced is currently entirely used for EUROPOl's Decryption Platform cooling purposes (which is however also connected to the site's district cooling network).

Figure G. 6 - Evolution of total annual energy consumption for buildings



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total energy consumption (MWh) purchased or produced on site	111076.2	109506.6	108982.7	103555	103141.5	97809.5	97590.9	99152	97748.9	88549.2	99985.1
Mains supplied gas	101 028	101 954	100 544	97 609	95 413	90 333	89 141	87 542	90 361	78 389	87 771
Cooling energy from heat exchange with wastewater								2834.5	1447.8	1535.0	2692.1
Cooling energy from heat exchange with lake water	6,480	5,140	5,140	3,610	4,800	3,900	3,717	3,636	2,932	2,385	2,554
Cooling energy from heat exchange with groundwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	714.3
Electricity purchased from the grid	3 502	2 328	3 236	2 232	2 493	3 033	4 052	4 504	2 175	5 420	5 324
Electricity generated on site from PV	13.20	14.69	17.00	52.20	391.41	430.88	594.07	543.92	716.87	731.07	850.18
Diesel and petrol for laboratories and facilities	53	70	45	52	44	102	78	91	116	89	80
Heat energy from thermal solar panels						11	8	0	0	0	0

During 2021, the total primary energy from natural gas consumption was 11.7% higher compared to 2020 basically due to the increased presence of staff on site and the restarting of many activities almost completely stopped during 2020, such as laboratory activities. At the same time, in 2021, the same parameter decreased by 3.1% compared to 2019, pre-pandemic year. This is mainly linked to a different management approach that promotes the integration of the tri-generation plant production along with the renewable energies both on-site and off-site (e.g., more "green" electric energy purchased).

Similarly, the total energy consumption of the site has also increased in 2021 by 12.9% compared with the previous year.

At least three factors have had a negative impact on the general consumption during 2021:

1. Covid-19 internal safety requirement measures that obliged keeping air treatment units always on and the use of most of offices as single ones, with a significant spread of staff throughout buildings. To be noted that Ispra-site registered higher amounts of presence on site than other European Commission premises due to the particular kind of activities;
2. Technical obsolescence of the actual tri-generation plants with low values of efficiency production, with several stoppages throughout the year;
3. New activities with a significant demand in terms of energy.

Buildings energy consumption data should take into consideration the context of climatic conditions too. Analysis of degree data for 2021 (figures at the end of the document, ref. G12.1)[9] suggests that climatic conditions were warmer over the summer (+14%, requiring more cooling) and colder over the winter (+4.7%, requiring more heating) than the previous year. In this regard, it is interesting to note that, despite the need to increase heating during the winter, thermal energy produced on site has been reduced in recent years (see figure below G. 7). This was surely due to the efforts of site management to reduce the site energy consumption, first by reducing the office temperature to 19 degrees instead of the usual 20 degrees and increasing staff-awareness.

Figure G. 7 - Total thermal energy produced for heating and cooling purposes

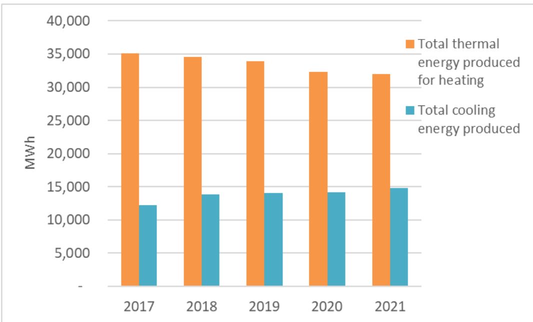


Table G.5 - Evolution of electric energy consumption breakdown for buildings

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total electric energy consumption [MWh]	32 886	32 131	32 576	31 394	31 013	30 316	29 935	30 549	29 440	27 803	32 044
Share of electricity from tri-generation plant[MWh]	29 371	29 788	29 323	29 110	28 128	26 852	25 288	25 501	26 548	21 652	25 870
Share of electricity purchased from the grid [MWh]	3 502	2 328	3 236	2 232	2 493	3 033	4 052	4 504	2 175	5 420	5 324
Share of electricity generated from PV [MWh]	13	15	17	52	391	431	594	544	717	731	850

Table G.5 confirms the above-mentioned trend also in the case of the total electricity consumption during 2021 (+15,2% in respect to 2020). The share of electricity purchased from the grid does not differ much from the 2020 data, confirming the choice to favour other energy sources over natural gas consumption.
In 2021, the production of electricity from photovoltaic plants installed on the site increased by 16.3% thanks to the activation of the PV plants installed on buildings 102 and 23b.

The Ispra-site energy consumption is influenced by the consumption of VELA 10-11 and EUROPOL, highly energy-intensive activities that began in 2021. In order to assess the site's consumption as much as possible attributable to the activities actually under the responsibility of JRC-Ispra, it was decided to remove the energy consumption rates (where available) of the following activities from the EC EMAS reporting (since 2006):

- EUROPOL Decryption platform (in force since 2021);

[9] Hourly data is collected from the "JRC - Ispra Atmosphere – Biosphere – Climate Integrated monitoring Station" located at the 77r building of JRC Ispra:
- Winter heating degree-days: 20°C is the reference temperature during month from January to April and from October to December, It is a measurement designed to quantify the demand for energy needed to heat a building.
- Summer cooling degree-days: 26°C is the reference temperature during month from May to September. It reflects the amount of energy used to cool a building.

- Ispra-1 nuclear facilities (under SOGIN administration since end of 2019);
- Bank office, Carabinieri station, Bus transport company office;
- VELA 10-11 laboratories (in force since November 2021).

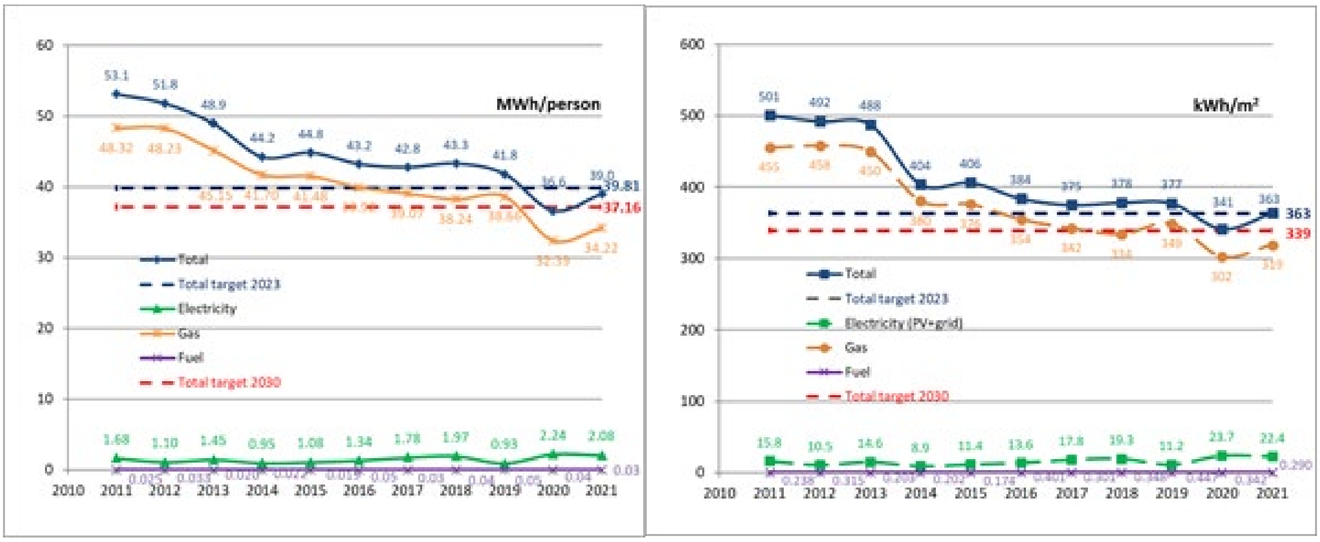
All these activities are outside the EMAS scope of JRC-Ispra, with the exception of VELA 10-11, whose consumption has been removed because the activities carried out, i.e. tests on vehicle emissions on the market, have been planned after the definition of EMAS targets. This is necessary because the assessment of energy consumption performance must be based on activities that can be compared with each other over the years in order to demonstrate the efforts made to reduce JRC-Ispra site's energy consumption compared to the set baselines.

The total energy consumption was therefore recalculated removing the above mentioned contributes[10]:

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total buildings energy consumption [MWh]	108,983	103,555	103,142	97,809	97,591	99,151	97,749	88,549	99,985
Total primary energy for other activities consumption (MWh)	191	193	201	201	200	189	229	327	3,500
Total buildings energy consumption net of other activities consumption [MWh]	108,792	103,362	102,941	97,597	97,393	98,970	97,519	88,223	96,485

These considerations were used for the evaluation of the total energy consumption performance of the JRC-Ispra site, as per capita and square metre. The results are presented in the graphs below and show that the total energy consumption, calculated as above mentioned, confirms its downward trend in recent years, except for the increase compared to 2020 (justified by the higher presence of staff on the site), practically reaching the target set for 2023.

Figure G.8 - Evolution of total annual energy consumption for buildings



Some of the 12 measures ongoing, prioritising the reduction of energy consumption, are grouped and summarized here below. They are included in the EC EMAS Annual Action Plan.

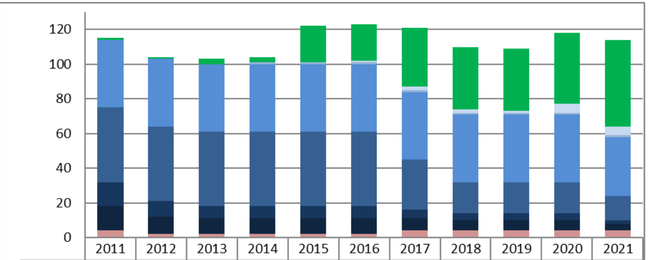
Ongoing active measures to reduce energy consumption
Substitution of old lamps with LED lighting systems
Installation of presence sensors for automatic light switch on
Application of BREEAM standard to buildings having budget above 3 Million €
Progressive removal of the old non performing buildings
Total installation of 2 MWp of PV plants by 2024
Implementation of site generated renewable thermal energy (heat pumps)
Improvement of the thermal insulation of buildings, prioritising the refurbishing interventions

[10] The JRC-Ispra energy mix has been calculated to account for the energy consumption attributed to third parties. This takes into account both the renewable and non-renewable energy. For the latter, we also considered the transformation losses in the tri-generation plant.

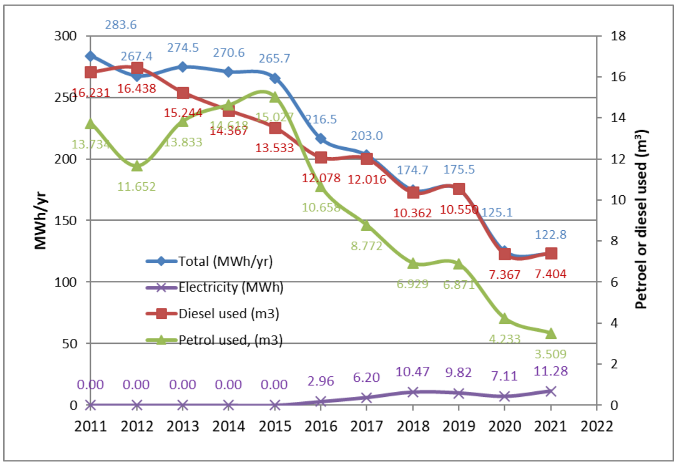
G3.1.2 Energy consumption of fleet vehicles

JRC-Ispra service vehicles has a fleet of 115 vehicles, which support site staff in their research and other technical and operational activities, providing mostly internal mobility. The fleet includes mobile laboratories, internal postal service, firefighting, ambulance and other work vehicles. In addition to the related vehicle emissions, JRC-Ispra has further vehicle emissions from the VELA laboratories, which are accounted for in the dedicated chapter addressing buildings and facilities (see the above paragraph).

Figure G.9 - Internal fleet engine types (number of vehicles) and total energy used by service vehicles



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Electric	1	1	3	3	21	21	34	36	36	41	50
Euro 6						1	2	2	1	5	5
Euro 5	0	0	0	1	1	1	1	1	1	1	1
Euro 4	39	39	39	39	39	39	39	39	39	39	34
Euro 3	43	43	43	43	43	43	29	18	18	18	14
Euro 2	14	9	7	7	7	7	5	4	4	4	2
Euro 1	14	10	9	9	9	9	7	6	6	6	4
Euro 0	4	2	2	2	2	2	4	4	4	4	4



JRC-Ispra vehicles fleet: the left hand graph above highlights the reduction trend of thermal vehicles (-16.6% compared to 2020) and the increase in electric vehicles (+ 22% vs 2020).The electrical vehicles (EVs) represent almost 44% of the entire vehicle fleet. The right-hand graph shows a constant decrease in petrol consumption while a slight increase in diesel.

The right-hand-side graph also shows the volumes of petrol and diesel used for the internal fleet and the corresponding total energy consumption[11]. The total energy has decreased by 30% since 2019. However, there is a total reduction of about 56.7% from 2011 to 2021.

The older, less efficient and more polluting vehicles with Euro 0[12] and Euro 1 engines are still required for some special purposes such as towing mobile laboratories and firefighting. However, they are seldom used and their impact is therefore limited.

To put the above figures in context, it should be noted that the total annual vehicle energy consumption represents only 0.13 % of that of buildings.

17 recharging points for internal EVs have been installed since April 2016, two of which were installed in 2018. The relative monitoring systems allow us to monitor the EV's electrical consumption (11.28 MWh in 2021 with a 58.6% increase with respect to 2020) and their indirect upstream CO_2 emissions. This monitoring also helped us understand that some recharges were unaccounted for because ordinary schuko-sockets were being used. A corrective action to address this involved providing appropriate communication to concerned staff and applying stickers to remind staff about the internal recharge policy. This ongoing action has yielded positive results to make sure that all EVs abide to this policy.

In an effort to promote sustainable mobility, JRC-Ispra has also put in place a fully operational service bicycle policy, which comprisesa dedicated service which manages 140 service bicycles (of which 27 are electric). In order to encourage staff further to use service bicycles and therefore reduce emissions of polluting vehicles, a pilot initiative to improve ease-of-access to bicycles is ongoing: bicycle locks have been removed from all non-electric service bicycles.

11 More precisely, it includes internal and external refueling for service cars, but not fuel consumption for VELA laboratories' activities, "operating machinery", lifter, generator and other little machinery.

12 By "Euro 0" we either refer to vehicles of standard prior to Euro 1 or to vehicles non-classified under Euro standards, such as escavators or operating machinery. For instance, 2 operating machineries have been acquired in 2017.

The actions contained in the Commission's 2022 Global Annual Action Plan for vehicles addressing the energy saving targets are: promoting sustainable mobility on the site including a multi annual renovation plan to increase electric and hybrid vehicles and implement a site plan for sustainable mobility.

G3.1.3 Renewable energy use in buildings and vehicles

The JRC-Ispra tri-generation plant is fuelled with fossil natural gas, which cannot be classified as a renewable energy source, even though it provides greater efficiency than traditional means of energy generation. JRC-Ispra has analysed the possibility to acquire bio-methane but there are currently important technical and market capability obstacles.

The installations thatcan produce energy (heat, cold or electric) from renewable sources within the site are:

- The cooling systems, which use lake water. Several buildings use this source, the main ones are the INE buildings ;
- Water: water heat pumps in building 46i and building 58;
- The energy recovery heat pump located in building 59x that produces cooling energy from the wastewater discharged from the site's wastewater treatment plant and produces heat recovering waste energy from water used in the site's district cooling network (installed in 2016 but data available since 2018);
- PV panel systems installed, with a global PV peak capacity of 894.58 kWp at the end of 2021;
- A small geothermal heat pump for the heating and cooling of 4 residences;
- Geothermal wells with groundwater withdrawal constructed to meet the significant cooling energy needs required by building 102, particularly due to a relevant project collaboration between JRC and EUROPOL (the internal authorisations for the excavation of wells and for withdrawal of groundwater and discharge to surface water basin shared with stakeholders in 2021). A heat pump is operational for heating purposes in building 102.

Table G. 6 - Total Renewable and non-renewable energy use in the buildings

Energy source	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total electricity from renewables - purchased from the grid (MWh)	1 199	976	993	737	1 199	1 965	2 175	5 420	5 324
Total electricity from renewables (%)	37.1	43.7	39.8	24.3	29.6	43.6	100.0	100.0	100.0
Mains supplied gas (% renewables)	0.0	0.0	0.0	0.0	0.0	23.9	0.0	0.0	0.0
Mains supplied gas (MWh)	100 544	97 609	95 413	90 333	89 141	87 542	90 361	78 389	87 771
Site generated renewables (PV, MWh)	17.0	52.2	391.4	430.9	594.1	543.9	716.9	731.1	850.2
Site generated renewables - lake water heat exchange, (MWh)	5 140	3 610	4 800	3 900	3 717	3 636	2 932	2 385	2 554
Site generated renewables - heat pumps (MWh)	0.0	0.0	0.0	0.0	0.0	4,327.5	2,618.3	2,382.6	4,718.8
Total renewables (MWh)	**6 356**	**4 638**	**6 184**	**5 079**	**5 518**	**10 473**	**8 443**	**10 919**	**13 487**
Total renewables (%)	**5.8**	**4.5**	**6.0**	**5.2**	**5.7**	**10.6**	**8.6**	**12.3**	**13.5**
Total non-renewables (%)	**94.2**	**95.5**	**94.0**	**94.8**	**94.3**	**89.4**	**91.4**	**87.7**	**86.5**

The total renewable energy thus calculated was then proportioned, in order to also take into account the share of energy supplied to all those activities that have been removed from the calculation of total energy consumption (ref. § G.3.1). The following values of total renewable energy are obtained:

Total renewables (MWh)	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
JRC site (not including VELA 10-11, EUROPOL, ISPRA-1, Carabinieri etc)	**6,345**	**4,629**	**6,173**	**5,068**	**5,506**	**10,452**	**8,423**	**10,880**	**13,015**
VELA 10-11	-	-	-	-	-	-	-	-	76
EUROPOL	-	-	-	-	-	-	-	-	346

Despite the 2021 increase in the use of mains supplied gas, the simultaneous increase in the electric energy produced on site by PV plants and heat pumps have largely contributed to the increase of the renewable energy as part of total (+9,4% compared to 2020).

JRC-Ispra will further increase its renewable site energy consumption in the next few years by:

- Installing other PV systems (2MW by 2024);
- Running pilot projects to produce and use hydrogen on site.

There are 50 EVs and 17 charging stations on site. The energy supplied to the charging stations comes either from the tri-generation plant, an external energy supplier or from PV panels. As reported in Table G. 6, only 13.5% of the energy produced comes from renewable energy source.

G3.2 Water use

Figure G. 10 – Scheme of the water withdrawal and treatment system at Ispra-site

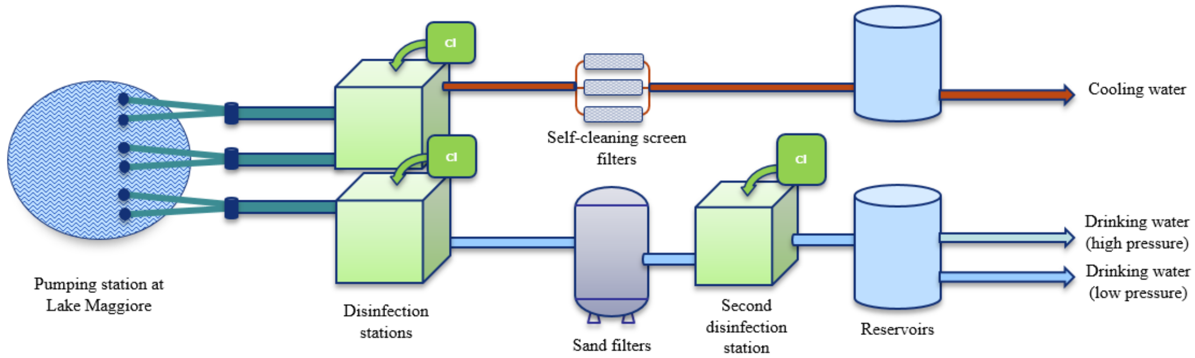


Figure G. 10 schematizes the water treatment phases from withdrawal from Lake Maggiore to the distribution to the site through three different networks:

1. A cooling water circuit for cooling buildings and facilities and other technical purposes, including most of the fire extinguishing circuits and the evaporative towers serving the tri-generation plant. This cooling energy acquired through water is considered a renewable energy source;
2. A high pressure drinking water circuit (fire extinguishing networks and activities that are further away including social and sport areas, nursery facilities, ALER apartments, etc.);
3. A low-pressure drinking water circuit: mostly for staff use (canteens, toilets, etc.).

In Ispra, we have decided to distinguish between the part of water that we want to minimize (“drinking water”) from the water we want to maximize (“cooling water”) since it is a renewable energy source. To be noted that, as the lake temperature is increasing with time, more water will have to be used to obtain the same cooling result. For this reason, only the volume of water for drinking purpose is used as core EMAS indicator (indicator *1d*).

Lombardy Regional Decree n. 9082 was signed on 15th October 2012, regulating the abstraction of water from Lake Maggiore. In 2006, JRC-Ispra had signed an agreement to supply water to the Brebbia Municipality, especially during summer months and for emergency purposes (fire extinguishing). The total amount of water distributed to the municipality is insignificant in relation to the site's hydrological balance (4,776 m^3 in 2021), but it is constantly increasing if compared with that of previous years.

In Figure G.11, the evolution of "drinking" water use from 2014 to 2021 is displayed. In this period, there was a reduction of drinking water per person and per square metre of, respectively, 30% and 28.5%. Data from the last two years are surely influenced by the reduction of staff on the site due to the covid-19 pandemic: should the trend be confirmed even when the “new normal” will be implemented, the 2023-2030 targets could be reassessed.

Figure G.11 - Evolution of total drinking annual water use (indicator 1d)

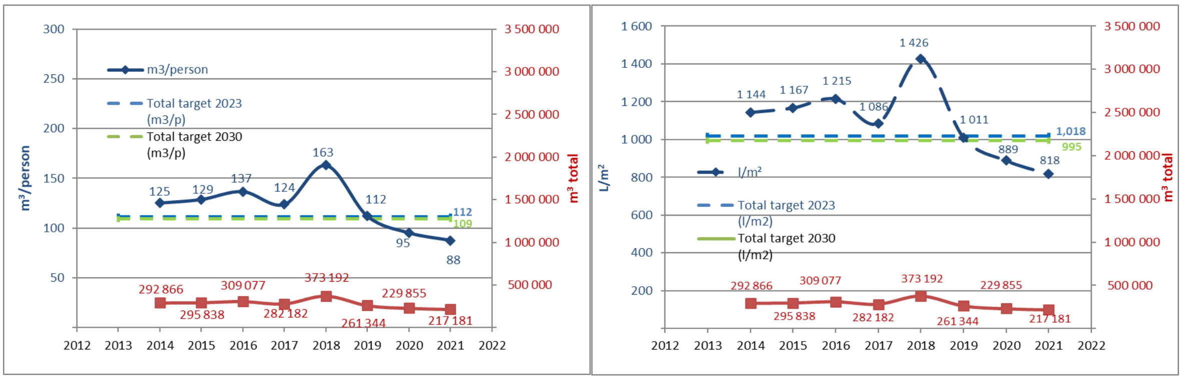
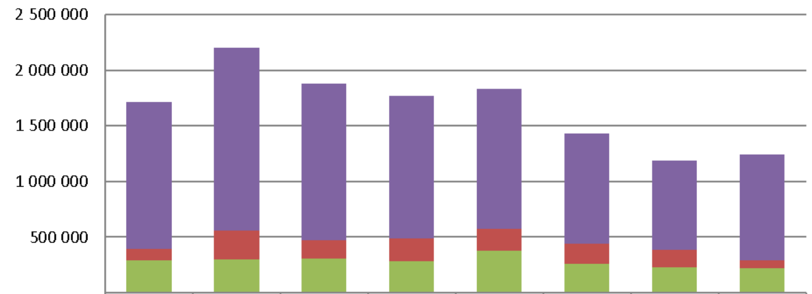


Figure G.12 - Water consumption (m³) breakdown for different uses in 2014 - 2021



	2014	2015	2016	2017	2018	2019	2020	2021
Total site water use	1 717 056	2 201 344	1 875 214	1 768 919	1 827 458	1 434 107	1 183 936	1 238 601
Share of cooling water used by JRC	1 326 586	1 641 749	1 407 017	1 280 615	1 255 665	996 967	797 520	944 266
Share of cooling water used by INE	97 604	263 757	159 120	206 122	198 601	175 796	156 561	77 154
Total site drinking water use	292 866	295 838	309 077	282 182	373 192	261 344	229 855	217 181

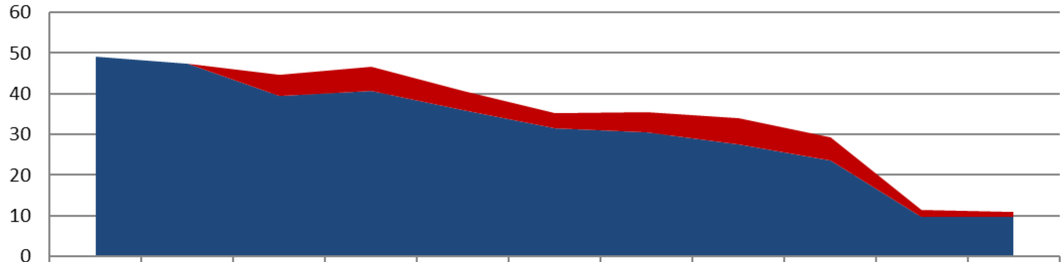
Figure G.12 shows how water uses have evolved from 2014 to 2021, with an overall reduction of about 28% in this time frame. In 2021, the gradual return of staff on site has certainly led to a slight increase in the amount of water used for cooling purposes compared to 2020, even if during these years, most of the activities continued to operate at their usual pace despite the covid-19 restrictions. Considerable cooling water savings were obtained by INE-Impianto Nucleare ESSOR (-50% vs 2020) thanks to dedicated maintenance works carried out (e.g. leak repairs in several places and replacement of valves to regulate temperature automatically). While canteen consumption has returned to pre-pandemic levels due to the greater presence of staff on site compared to 2020 (+67%).

Saving measures undertaken since 2013 include: improved water management, identification and repair of various leaks in the drinking water network (especially in 2018, 2019 and 2021), the regulation system of the lake water withdrawal which prevents exceeding water from being wasted, some improvements done in INE (including the replace of a water cooling battery and some water leaks repair), the installation of new water consumption metering devices.

G3.3 Office and print shop paper use in Commission buildings

The evolution of office and offset paper at JRC-Ispra and per capita breakdown is presented below (Figure G.13).

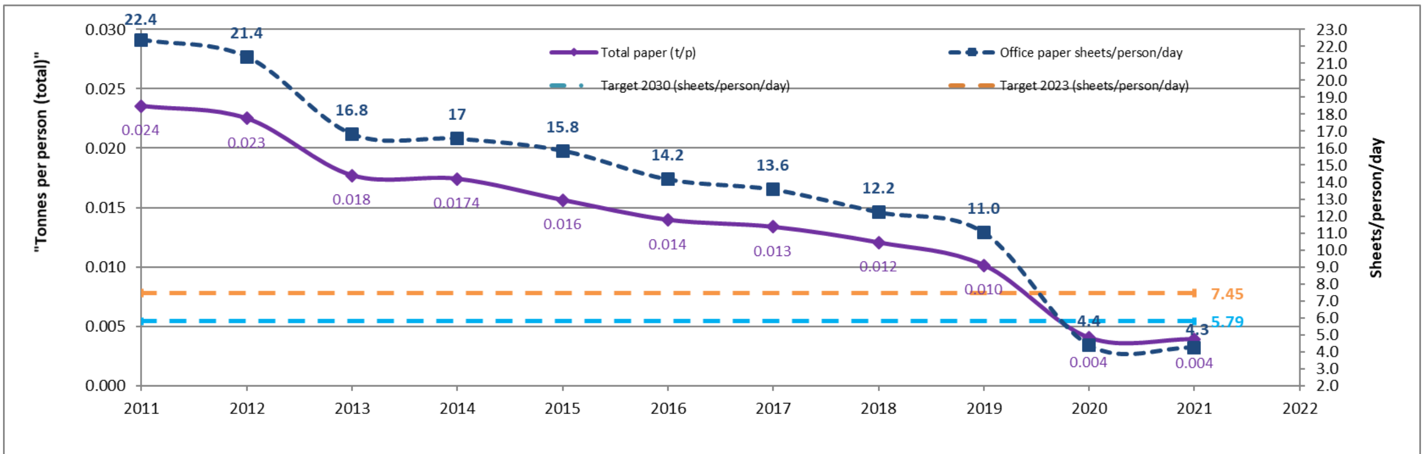
Figure G. 13 - Evolution of paper consumption at JRC-Ispra (totals)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Office (A4 sheet equivalent) x 1Mil	9.85	9.52	7.89	8.16	7.67	6.74	6.51	5.89	5.42	2.23	2.22
Total paper consumption (tonnes)	49.16	47.49	44.59	46.53	40.72	35.30	35.52	33.92	29.17	11.52	10.99
Printshop paper consumption (tonnes)			5.21	5.82	4.82	3.76	5.06	6.37	5.50	1.76	1.28
Office paper consumption, (tonnes)	49.163	47.488	39.374	40.710	35.897	31.540	30.456	27.553	23.666	9.757	9.711

The total paper consumption is progressively reduced over the years with a 2021 value that stands at -77.6% compared to 2011 and -76.4% compared to 2014 in total paper consumption.

Figure G.14 - Evolution of paper consumption at JRC-Ispra (tonnes/person and sheets/person/day)(core indicator 1e)



In 2021 the sheets/person /day indicator decreased by 80.8% compared to 2011 and 74.7% compare to 2014 with a respective value of 4.3 sheets/person/day in 2021 vs 22.4 in 2011, respectively. The targets for 2023 (7.45) and 2030 (5.95) have already been reached. These targets might be reviewed during the 2024 mid-term review.

All 2021 data is similar to 2020 although there has been an increase in staff presence on site. This suggests that the continued trend of less use of paper is still ongoing. This confirms the importance of carrying out activities such as improving paperless electronic processes and fostering the use of electronic signatures and e-documents.

The print shop also prints for other JRC sites. In 2021, this was the case for Seville and Petten, totalling 0.231 and 0.0053 tonnes, respectively. From 2021 onwards, these paper consumptions are communicated to the various sites so this impact can be added within the site's carbon footprint.

G4 Reducing carbon footprint and air emissions

G4.1 Overall carbon footprint

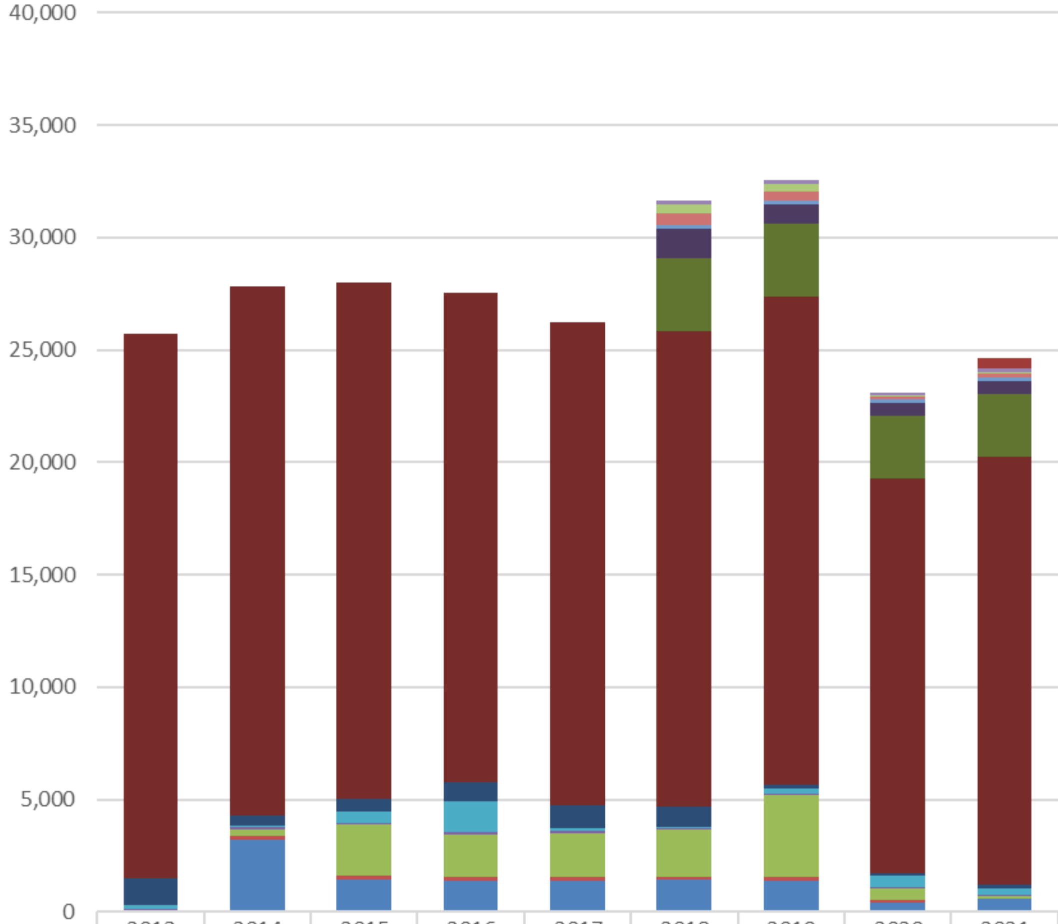
The figures below show the relative importance of emissions under Scopes 1, 2 and 3.

Scope 1 emissions: CO_2 equivalent (CO_2 eq) emissions directly made from the JRC-Ispra site including those produced by the tri-generation plant (from natural gas combustion), by the JRC-Ispra vehicle fleet (from diesel and petrol combustion) and by refrigerants machinery (from cooling gases leaks). These are overall the most impacting carbon footprint contributions covering over 50% of total site CO_2 eq emissions.

Scope 2 emissions: CO_2 eq emissions that are generated indirectly, particularly by consuming electricity on-site.

Scope 3 emissions: CO_2 eq emissions that are a consequence of the activities of the organisation but occur from sources not controlled by JRC-Ispra itself, including emissions associated with business travel and commuting to work (private car, motorcycle, public transport). The emissions of all the supply chains are also calculated: e.g. fixed assets such as buildings, IT, Commission vehicles, service and supply contracts, own waste (calculated for the first time in 2018) and "other upstream emissions" including i.a. water supply, wastewater treatment and furniture.

Figure G. 15 - Carbon footprint emissions (Tonnes CO_2 eq)



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	25,728	27,819	27,989	27,527	26,254	31,631	32,550	23,108	24,620
Teleworking emissions						0	0	0	460
Other upstream emissions (JRC Ispra)						168	143	143	143
Own waste	0	0	0	0	0	405	385	48	73
Catering	0	0	0	0	0	517	397	129	180
Service contracts	0	0	0	0	0	134	134	133	130
Paper supply	0	0	0	0	0	34	29	12	11
Fixed assets - Commission vehicles	0	0	0	0	0	10	10	7	7
Fixed assets - IT	0	0	0	0	0	1,264	845	586	556
Fixed assets -buildlings	0	0	0	0	0	3,260	3,247	2,786	2,835
Buildings - fuel for heating	24,224	23,492	22,967	21,760	21,485	21,118	21,706	17,515	18,989
Buildings - electricity	1,215	460	533	817	1,014	955	163	99	178
Buildings - district heating/cooling	0	0	0	0	0	0	0	0	0
Buildings coolant losses	162	92	513	1,410	161	37	208	540	315
Vehicle fleet fuel consumption	90	89	87	70	65	54	54	35	33
Missions air (RFI=2) and JRC Navette	37	274	2,282	1,916	1,961	2,091	3,687	533	87
Missions excluding air	0	177	176	145	148	158	149	132	21
Experts' travel	0	0	0	0	0	0	0	0	0
Staff commuting	0	3,236	1,431	1,409	1,420	1,425	1,392	410	601

Figure G. 15 shows the evolution of the site's total CO_2 equivalent emissions subdivided into the different goods and processes. 77.1% of the emissions (18 989 tonnes CO2eq) are accountable for the use of natural gas to produce electrical energy, as well as heating and cooling by the tri-generation plant.

The overall CO_2 eq emissions increased by 6.5% compared to 2020 due to a greater presence of staff on site. In 2021, the contribution of teleworking was also included.

As can be seen in Figure G. 15, the other upstream emissions include information on emissions deriving from activities such as wastewater treatment or goods (e.g. furniture). The impact of these emissions is calculated on the basis of the Ispra Organisation Environmental Footprint (OEF) methodology, i.e. a methodology that has been developed in-house and might also be used as a standard to implement the European Green Deal.

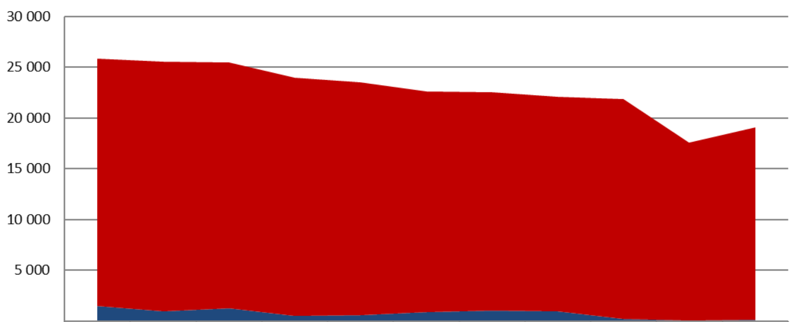
G4.1.1 Buildings' emissions from energy use

CO_2 emissions are generated through combustion of the main energy sources:

1. Operation of tri-generation plant, i.e. production of electricity and hot /cold water for heating and cooling site buildings
2. Upstream combustion produced by the external supplier to produce electricity supplied to the grid;
3. Petrol and diesel used for laboratory activities and specific facilities, including fuel consumption of VELA activities, operating machinery, fork lift, generator and other small machinery. This contribution was monitored starting from 2016;
4. Cooking in the canteen and Club House.

Total CO_2 emissions from buildings energy consumption are shown below (Figure G.16 and Figure G.17) together with per capita and per square metre. Total CO_2 emissions have been decreasing steadily since 2011, due largely to a reduction in emissions associated with gas consumption. Please note that the values shown were obtained by proportioning the total emissions due to the total energy consumption between the JRC-Ispra site and the other activities that use the energy of the internal JRC grid but have been eliminated from the scope of this environmental statement (ref. G3.1).

Figure G.16 - CO_2 emissions from buildings energy consumption in the EMAS perimeter, tonnes / year (indicator 2a)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total (t/y)	25 804	25 570	25 439	23 952	23 500	22 576	22 499	22 110	21 898	17 614	19 166
Mains gas	24 364	24 588	24 209	23 475	22 952	21 727	21 459	21 089	21 668	17 487	18 964
Electricity	1 423	958	1 215	460	533	817	1 014	925	124	35	107
Diesel and petrol (laboratories and facilities)	17.3	23.0	14.8	16.8	14.4	33.1	25.4	29.6	37.3	28.7	24.9

Figure G.17 - CO_2 emissions from buildings energy consumption in the EMAS perimeter, tonnes / person / m^2 (indicator 2a)

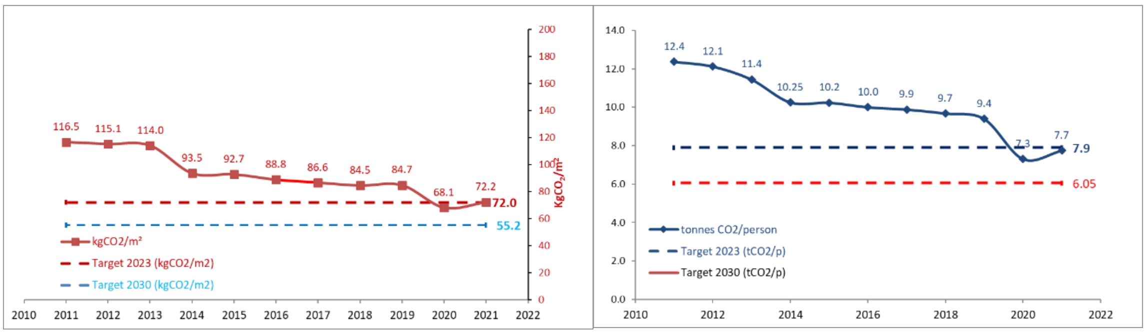


Figure G.17 shows that, as with energy consumption, per capita CO_2 emissions have slowly decreased in the last few years and, overall, have decreased by 38% with respect to 2011. During 2021, both the indicators have increased compared to 2020 on account of the higher presence of staff on site and the related activities but are inferior to the 2019 numbers.

G4.1.2 Emissions from household energy use (460 tCO_2e in 2021, 1.9 % of total carbon footprint)

Homeworking emissions were estimated for the first time in 2021 in response to the change in behaviour under the covid-19 pandemic. It comprises emissions from i) work and domestic appliances used while teleworking ii) energy consumption from space heating and cooling, and iii) from the embodied energy of IT fixed assets that the Commission financed (see fixed assets section below).

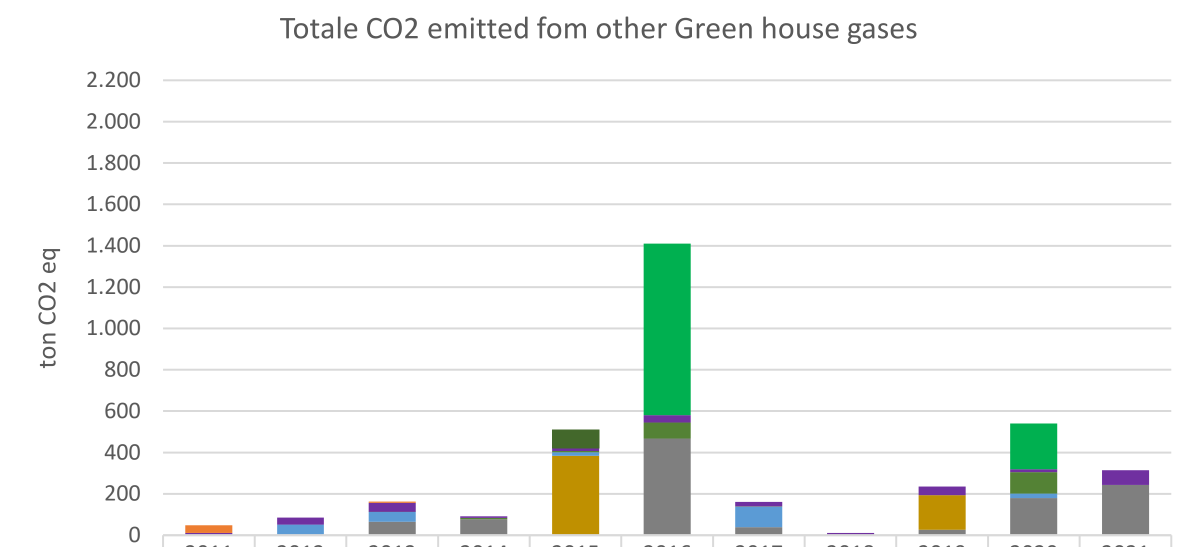
G4.1.3 Fugitive emissions from Commission buildings (refrigerant/coolants) – (315 tCO_2e in 2021, 1.3% of total carbon footprint)

A refrigerant is a substance, commonly a fluid, used in technical installations such as air conditioning, fire prevention systems, cold rooms and fridges. The impact of refrigerants on the environment is accounted for in terms of their relative coefficient, i.e. Global Warming Potential (GWP) value, using carbon dioxide as a reference value (GWP =1). Refrigerants include old generation Ozone Depleting substances (ODS), Greenhouse Gases (GHG) and Hydrocarbons (HCs), which are a better option for the environment, having a lower GWP (even if their use involves major risks at an operational level).

Since 2011 JRC-Ispra updates on a yearly basis a general census of all technical installations using refrigerants in order to limit as much as possible refrigerant losses that impact the environment. In fact, each kilogram of refrigerant is equivalent to somewhere between 1 000 and 5 000 kg of CO_2 losses.

Following a regulation change in 2018 addressing GHG, JRC-Ispra communicates leakage data to the Italian Authorities through the "Banca Dati F-Gas". In 2020, the relative work instruction has been reviewed and a training has been organised for all parties managing GHG. In addition to this, a case-by-case support concerning the implementation of environmental legal requirements is provided yearly at the time of data collection.

Figure G. 18 - Losses of refrigerants in JRC-Ispra EMAS perimeter (tC02eq)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
R600a							-	-	-	-	-
R290							-	-	-	-	-
R227ea	-	-	-	-	-	-	-	-	-	-	-
R508b	-	-	-	-	91,092	-	-	-	-	-	-
R507a	-	-	-	-	-	828,80	-	-	-	221,76	-
R427a	-	-	-	-	-	-	-	-	-	-	-
R422d	37,050	-	6,1750	-	-	-	-	-	-	-	-
R410a	8,0256	33,158	42,547	8,2560	12,384	36,211	21,292	7,0080	41,376	13,248	72,00
R407c	2,7216	-	0,9720	5,8158	6,4800	77,079	2,1060	3,3210	-	104,32	-
R404a	-	52,008	47,674	-	16,154	-	98,500	-	-	21,670	-
R23	-	-	-	-	384,40	-	-	-	166,16	-	-
R134a	-	-	65,000	78,000	-	468,00	39,455	-	27,300	179,40	243,10
NAF S IIII	-	-	-	-	-	-	-	-	-	-	-
R22	-	-	-	-	-	-	-	-	-	-	-

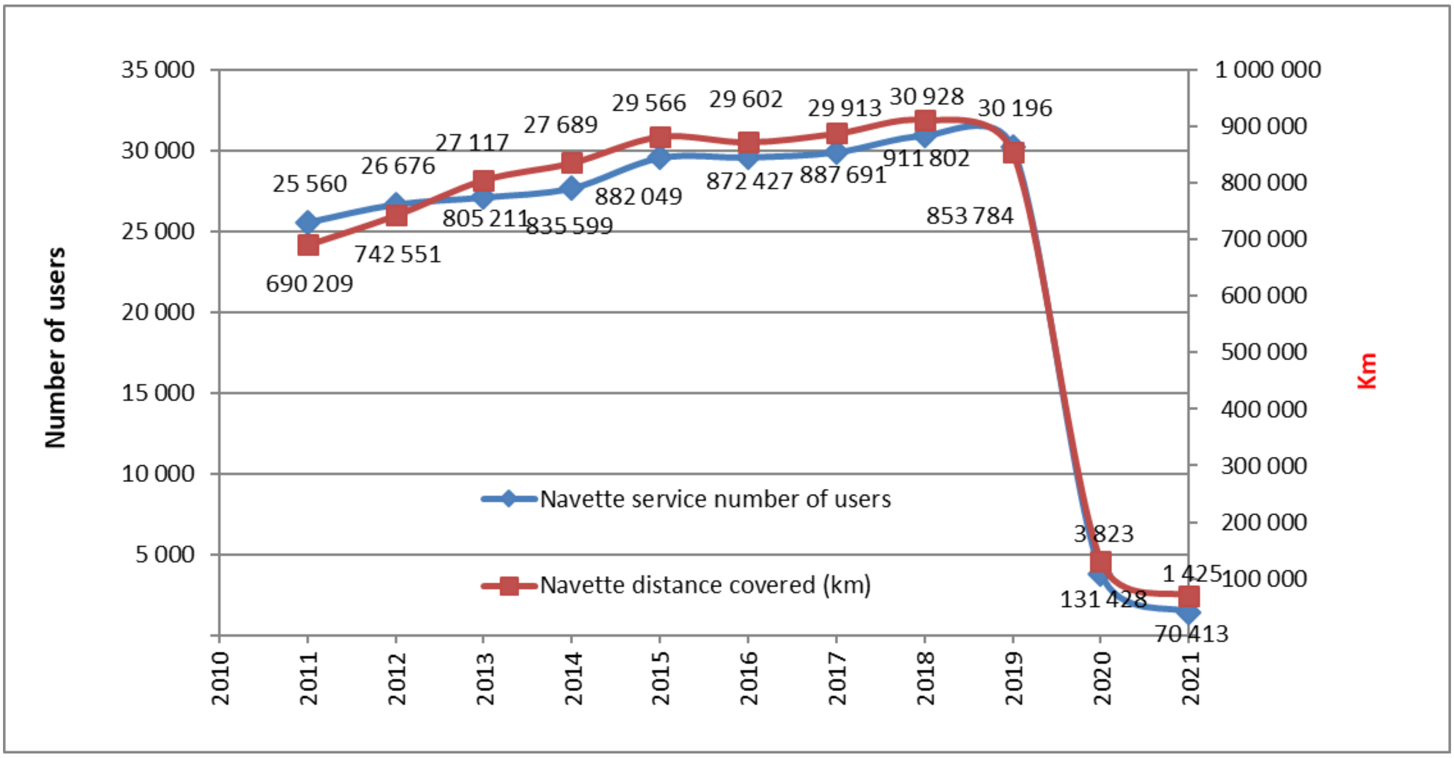
The 315 tonnes of CO_2e losses recorded in 2021 originated from five out of the 486 equipment that were monitored. These include the chiller of the tri-generation plant (accounting for 74% of all losses), the laboratory HVAC in building 77R (21% of all losses) and the HVAC of CED room in 101 building (around 2% of all losses).

JRC-Ispra makes an in-depth cause-analysis for each leakage to avoid further incidents. Leakages are generally detected during periodic checks and are linked to the breakage of a component of the system, pipes or its connecting parts, as it was the case for 2021. Furthermore, with the aim of achieving continuous improvement, old equipment is gradually replaced and HCs are recommended to be used within new equipment

G4.1.4 Staff travel for missions (108 tCO_2e in 2021, 0.4% of total carbon footprint)

Following the spread of the pandemic, the number of missions was significantly reduced by promoting meetings through videoconferences. This has led to a sharp decline in CO_2 emissions in 2020 (665 tonnes of CO_2) and a further decrease in 2021 (108 tonnes of CO_2). This reduction was also confirmed by the data from the so-called Ispra navette service (a taxi service for transporting staff from the site to the most important neighbouring transport interchanges, chiefly Malpensa and Linate airports and Milan railway station). Navette service usage is shown below in Figure G. 19.

Figure G. 19 - Navette service users and covered distance (km)



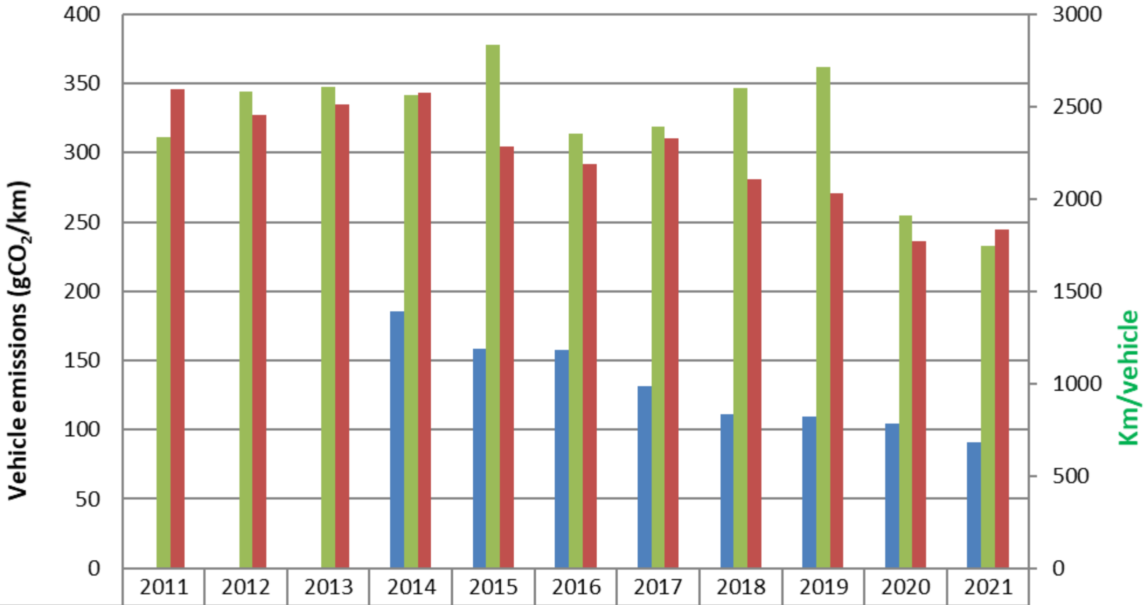
Data shows a further decrease between 2020 and 2021 -63% in the number of people using the Navette service and a reduction of about 95% in 2021 compared to 2019. There was also a sharp decrease in km travelled compared to 2020 (-46%).

Following the beginning of the pandemic, the entire EC is moving to a new approach by using extensively IT devices to connect to online meetings. This means that physical VC meeting rooms will have a reduced relevance. Consequently, new indicators will be developed to monitor this. In any case, further 10 VC rooms have been built in Ispra in 2021 reaching a total of 54.

G4.1.5 Staff travel missions by Commission vehicle (171 tCO_2e in 2021, 0.7% of total carbon footprint)

Fuel consumption was used to calculate JRC-Ispra's internal vehicle fleet emissions. A theoretical value was calculated using data from the vehicle manufacturer's log book. In order to account also for older vehicles for which manufacturer's information on CO_2 emissions was not available, the total emissions have been increased by a nominal 2%. Results are shown in Figure G. 20.

Figure G. 20 - Emissions per km and distance travelled per vehicle (core indicator 2c)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
gCO2/km (manufacturer)	0	0	0.0	185.5	158.2	157.3	131.5	111.2	109.1	104.2	90.9
gCO2/km (actual)	345.78	327.08	334.47	343.4	304.22	291.85	310.66	280.65	270.83	235.90	244.24
km/vehicle	2 334	2 578	2 606	2 561	2 837	2 355	2 391	2 598	2 715	1 910	1 745

In 2021, the theoretical (manufacturer) vehicle emissions decreased by 12.8% with respect to 2020 and by 51% with respect to 2014.This was a consequence of the JRC-Ispra sustainable fleet policy that has EVs replacing old conventional service vehicles.

The actual vehicle fleet emissions[13], accounting for only non-electrical vehicles, has increased by 3.5% with respect to 2020.

On the other hand, the number of total km travelled by all vehicles, including electrical vehicles, has decreased.

The target for 2023 of 50% reduction of the site's vehicle fleet's CO_2 emissions (tonnes) with respect to 2014 was met for the theoretical emissions while it is on track for the actual emissions. In 2022, 8 new EVs will be put into circulation to replace conventional vehicles and this should lead to a further reduction in vehicle emissions.

G4.1.6 Staff commuting (601 tCO_2e in 2021, 2.4% of total carbon footprint)

Commuting staff emissions are mostly related to the use of private car (601 tonnes of CO_2 eq in 2021 considering actual 2021 staff presence). This is explained by the fact that the site is not connected to a widespread public transport system. The emissions deriving from the use of other means do not particularly affect the overall impact (e.g. only 112.9 tonnes of CO_2 eq for the use of JRC buses).

In 2020, a JRC-Ispra Transport Survey in the framework of the Living labs has been performed. This has been used to calculate relative JRC-Ispra commuting mode split (so-called scope 3 emissions). Relevant aspects include that the most commonly used mode of transportation is the car (used by 76% of staff), followed by the bicycle (8%) and the JRC bus (6%).

[13] This indicator excludes EVs given that their CO_2 upstream contribution is already accounted for within the total site's CO_2 direct emissions indicator. The resulting upstream EV charging is 2.03 equivalent tonnes of CO_2 and corresponds to ca. 6% of the total site vehicles' CO_2 direct emissions. This indicator shall be refined in the future by fully monitoring all EVs.

Ispra site management is committed to foster a more sustainable commuting transport, in particular looking into creating synergies with public transport. From June 2021, following an agreement with local public transport agency TPL, the Ispra site has a terminal stop for two main public bus lines, connecting the site with the city of Varese and other transport hubs in the region. The dedicated bus stop is located at the main entrance. The service has been temporarily suspended due to covid-19 and the very limited staff presence on site.
The site has provided a free bus service since the 1980s covering most of the Varese Province, and also reaching out as far as Milan.

G4.1.7 Fixed assets (3398 tCO_2e in 2021, 13.8% of total carbon footprint) MM

Embodied emissions within fixed assets are listed hereunder.

- Buildings (2835 tCO_2e, 11% of the total Ispra site carbon footprint): these depend on building's design life and the type of construction, and are based on an amortisation approach of 50 years. The overall value dropped by 13% compared to 2018, while it is increased by 1.8% with respect to last year due to the opening of the new building 102.
- Commission fleet vehicles (7 tCO_2e, 0.03%): this value accounts for the indirect emissions associated to the manufacturing of the vehicle itself. It is calculated on the basis of a standard distance driven.
- IT office equipment (556 tCO_2e, 2.2%): the amortisation period used for each of the 17 types of IT equipment is 4 years. The overall emission value decreased by 5.1% compared with 2020 and by 56% compared with 2018.

G4.1.8 and services (320 tonnes in 2021, 1.3% of total carbon footprint),

Corresponding to:

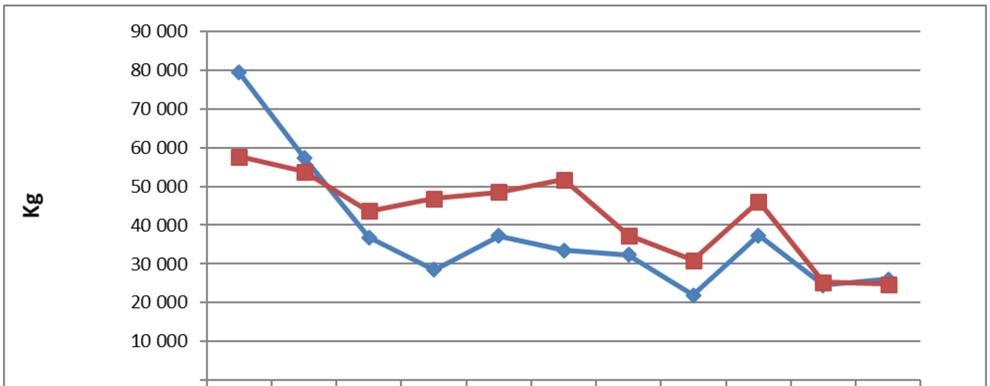
- Service contracts (130 tCO2e, 0.5% of the total Ispra site carbon footprint): based only on the number of Full Time Equivalent staff for the contracts of the cleaning and security services. Relative staffing decreased by 2.3% compared with 2020 and 3% compared with 2018, respectively.
- Paper purchase (11 tCO2e, 0.04%): decreased by 8.3% compared with 2020 and 67.6 compared with 2018.
- Catering (180 tCO2e, 0.7 %): based on consumption of 7 food types, it increased by 35.9% compared with 2020 due to a greater presence of staff on site while it has decreased by 65.2% compared with 2018.

G4.1.9 Own waste treatment emissions (73 tCO_2e in 2021, 0.3% of total carbon footprint)

Ispra-site waste is treated in 11 different ways, including landfill, recycled/reused, methanisation, etc. In 2021, the relative emissions increased by 52.1% (73 tCO_2e) with respect to 2020. The overall waste related emissions decreased since 2018 by 82%.

G4.2 Total air emissions of other air pollutants (CO, NO_x)

Figure G.21 - Evolution of annual air emissions from the tri-generation plant (data 2011-2021)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NOx, (kg)	79 32	57 43	36 80	28 49	37 29	33 50	32 31	21 96	37 32	24 45	26 04
CO, (kg)	57 63	53 81	43 69	46 83	48 48	51 80	37 37	30 88	46 09	25 24	24 80

JRC-Ispra estimates the quantity of air pollutants emitted by the tri-generation engines by means of instrumentation providing continuous analysis of NOx and CO concentrations provided by an analysis device installed on the engine stacks and by the emission flow rates, estimated on the basis of the engine's technical data sheets. As the tri-generation plant consumes natural gas, other air pollutants, such as SO_2 or PM, were not emitted. Other air emission sources (i.e. natural gas boilers in the JRC-Ispra residences, laboratories and facilities using diesel and gasoline) are considered as negligible compared to the tri-generation emissions and are therefore not monitored.

Despite the aging of the tri-generation plant, Figure G.21 shows that the values recorded in 2021 are substantially similar to those of 2020, confirming the reduction compared to previous years. This is accountable thanks to the installation of a new kind of filtration system on all the engines but also to a more careful management and regular maintenance of the tri-generation plant.

The yearly emissions are communicated to Regione Lombardia and other Italian Authorities according to JRC-Ispra's specific legal framework. Further details are provided in § G8.1.

G4.3 Radioactive Emissions

JRC-Ispra, as established in the operational provisions for nuclear installations and under Italian law, has set up a program of environmental monitoring in order to detect and record potential radioactive releases and monitor the level of radioactivity in the environment in its surroundings. This uses a network of fixed instrumentation for sampling and/or direct measurement complemented by environmental sampling made within the site and in the surrounding areas. Main sampling characteristics are shown in following table:

Environment compartment	Type of Samples	Sampling place
Air	Air effluents	JRC nuclear plant chimneys
	Aqueous vapour, Air particulate, Fall out	JRC environmental monitoring stations,
Liquid	Liquid effluents	JRC Liquid Effluent Treatment Station (STEL)
	Surface Water, Groundwater, Drinking water, Sewage sludge	JRC water treatment plant , Rio Novellino, Acquanegra stream, JRC pond, Lake Maggiore (Ispra, Ranco, Cerro) Ticino river
Soil	Soil and sediments	Soils in Ispra, Besozzo and Capronno, Rio Novellino sediments
Feed	Fodder, Vegetables, Fruit	Ispra, Besozzo, Capronno, Angera farms
	Fish	Lake Maggiore
	Honey	Brebbia
	Meat	Cadrezzate
	Milk	Ispra, Besozzo, Capronno farms
Ambient dose	Dosimeter	JRC perimeter stations, City Hall of: Angera, Besozzo, Brebbia, Cadrezzate, Taino, Travedona

Within the framework of operation and pre-decommissioning of its nuclear and radioactive facilities and installations, the site is authorised to discharge low quantities of gaseous and liquid radioactive effluents (**FdS**), through authorised release points, in accordance with the limits set out in operational provisions issued by the Italian Regulatory Authority.

Gaseous radioactive effluents can only be released from the nuclear installations after filtration and continuous radiometric control. The amount of gaseous radioactive releases is shown in the following table. The amount of the JRC-Ispra radioactive releases, together with a summary of the results of the environmental surveillance, are reported on the website[14] of I.S.I.N., the National Competent Body.

Table G.7 - Gaseous radioactive effluents

Year	Gaseous radioactive effluents		Percentage of authorized limit
	type	[Bq]	[%]
2021	Tritium	$7.09*10^{10}$	0.11
2020	Tritium	$7.91*10^{10}$	0.11
2019	Tritium	$9.03*10^{10}$	0.13
	Cs-137	$5.74*10^{2}$	
2018	Tritium	$2.08x10^{11}$	5.7
2017	Tritium	$1.87x10^{11}$	0.25
2016	Tritium	$3.36*10^{11}$	0.45
2015	Tritium	$1.40*10^{11}$	0.19
	Cs-137	$7.03*10^{3}$	
2014	Tritium	$1.34*10^{11}$	0.18

Similarly, the release of radioactive liquid effluents is permitted only after treatment and prior radiometric control. Amount of liquid releases are shown in the following table G.8.

[14] https://www.isinucleare.it/

Table G.8 - Liquid radioactive effluents

Year	Liquid radioactive effluents		Percentage of authorized limit
	type	[Bq]	[%]
2021	α-emitters	$1.11*10^5$	0.891
	β-γ emitters	$5.44*10^5$	
	Sr-90	$5.42*10^6$	
	Tritium	$7.09*10^8$	
2020	α-emitters	$4.63*10^4$	0.615
	β-γ emitters	$7.71*10^5$	
	Sr-90	$3.85*10^5$	
	Tritium	$6.24*10^6$	
2019	α-emitters	$3.89*10^4$	0.024
	β-γ emitters	$9.03*10^5$	
	Sr-90	$8.11*10^5$	
	Tritium	$7.70*10^7$	
2018	α-emitters	$3.80*10^4$	0.012
	β-γ emitters	$5.81*10^5$	
	Sr-90	$3.72*10^5$	
	Tritium	$1.63*10^7$	
2017	α-emitters	$7.75*10^4$	0.019
	β-γ emitters	$1.09*10^6$	
	Sr-90	$5.61*10^5$	
	Tritium	$1.22*10^8$	
2016	α-emitters	$7.16*10^3$	0.011
	β-γ emitters	$4.52*10^5$	
	Sr-90	$3.56*10^5$	
	Tritium	$1.45*10^8$	
2015	Tritium	$2.85*10^7$	0.0017
	β-γ emitters	$1.21*10^6$	
2014	α-emitters	$7*10^4$	0.05
	β-γ emitters	$5.33*10^6$	
	Sr-90	$1.37*10^6$	
	Tritium	$1.67*10^8$	

It should be noted that, since November 2020, the authorised discharge limits have been reduced in accordance with the requirements of the Italian Regulatory Authority. A further reduction will derive from the approval of a new discharge formula, the authorisation process for which is currently underway.

Even though the authorised discharge limits have been reduced, the total activity released in 2021, both liquid and air, remains well below the authorised limits and the overall releases resulted in negligible doses for the population, quantified well under 1 microSv/year[15], even under conservative assumptions.

The 2022 target is to keep discharges well under the authorised limits, in line with the values of the last years and to keep, in any case, the dose values to the population well below the threshold of non-radiological relevance of 10 microSv/year, as defined by Italian legislation and European directives.

JRC-Ispra is committed to keep the effluent treatment systems, the measurement instrumentation and the whole environmental monitoring network updated and efficient both in order to keep emissions as low as reasonably achievable and to be ready for the most challenging decommissioning activities. Furthermore, during the last few years, most of the fixed instrumentation for the environmental monitoring network has been replaced with more modern and efficient instruments.

[15] The Sievert (Sv) is the unit of measure of dose (technically, effective dose) deposited in body tissue, averaged over the body. Such a dose would be caused by an exposure imparted by ionizing x-ray or gamma radiation undergoing an energy deposition of 1 joule per kilogram of body tissue.

G5 Improving waste management and sorting

JRC-Ispra produces many different types of waste that vary according to the site's activities. These are sorted as much as possible. The Logistics Unit manages all the activities of conventional waste collection, handling and disposal by means of external suppliers specialised in waste management.

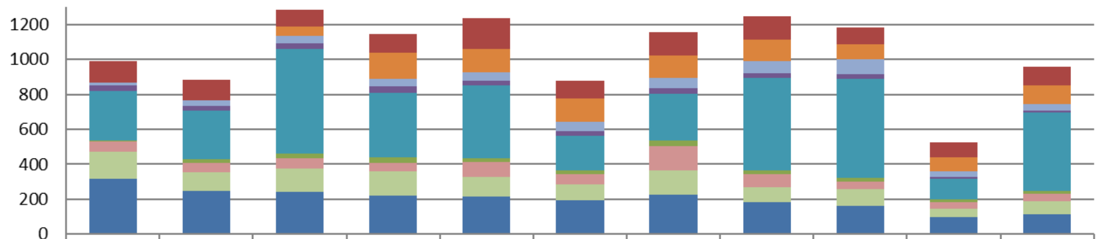
During the covid-19 pandemic, many waste management and sorting actions that had already been implemented on-site had to be reconsidered. For instance, single-use PI sachets of oil and vinegar had to be reintroduced on health grounds. On the other hand, the policy against the use of the Single Use Plastics (SUP) was generally implemented, including that of using biodegradable and compostable SUP where reusable materials could not be used. For example, plastic straws, plastic tableware and cutlery are no longer available, as they have either been substituted by compostable or reusable items.

JRC-Ispra's waste management contractor was asked whether biodegradable and compostable SUP could be digested within its anaerobic organic waste treatment plant. Following a negative reply, he was asked to provide confirmation through testing. The test result showed that indeed the SUP was fully biodegradable and compostable. Hopefully these test results will also have a positive repercussion on all town halls served by this contractor and also their SUP may be sorted with organic waste.

G5.1 Non-hazardous waste

The evolution of non-hazardous waste production is shown below in Figure G.22.

Figure G.22 - Evolution of total non-hazardous waste production in JRC-Ispra (tonnes)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total non hazardous waste, (tonnes)	989.81	883.13	1 285.7	1 147.833	1 235.37	877.769	1 155.357	1 247.262	1 184.966	524.736	957.652
Total non haz.waste (tonnes/person)	0.474	0.419	0.578	0.491	0.538	0.389	0.507	0.546	0.508	0.218	0.387
Other (tonnes)	120.680	116.110	95.420	108.133	172.940	101.929	132.897	133.622	96.656	86.916	105.652
Street cleaning (tonnes)	0.000	0.000	57.800	151.280	137.240	135.170	127.790	124.440	87.600	75.960	105.920
Organic waste (tonnes)	19.470	34.180	37.670	44.080	48.060	51.710	59.020	68.950	87.010	33.440	38.480
Plastic (tonnes)	31.320	27.620	32.980	33.090	27.430	25.810	29.430	26.680	25.740	12.580	11.380
Metal (scrap) (tonnes)	283.300	274.870	601.430	370.790	416.100	196.240	271.240	527.300	567.360	114.100	447.000
Glass (tonnes)	4.900	24.540	24.860	31.070	21.080	23.630	30.670	23.230	21.860	17.200	15.800
Wood (tonnes)	58.730	51.090	62.000	50.270	84.540	57.070	137.970	76.580	39.540	36.840	46.400
Paper and cardboard (tonnes)	153.250	109.040	130.100	137.590	113.600	90.430	138.260	82.960	95.780	50.340	72.040
Mixed urban waste (tonnes)	318.160	245.680	243.440	221.530	214.380	195.780	228.080	183.500	163.420	97.360	114.980

The data shown in Figure G.22 underlines the difficulty of defining trends and setting targets over the years for total non-hazardous waste and individual categories. In fact, this strongly depends both on the number of staff present on site and on certain activities, such as maintenance, construction or demolition of buildings. 2021 waste production increased both due to the resumption of normal activities on site and to a greater presence of staff compared to 2020. There was a 77.9% increase in total non-hazardous waste with respect to 2020 on account of the increase in production of mixed urban waste (+18.1%), metal scrap (+292%) whilst there was a decrease in glass(-8%) and plastic (-10%).

In order to reduce the use of Single Use Plastic (SUP) bottles, an in depth analysis of the use of water dispensers was performed in 2016. This led to the installation of an increasing number of dispensers, first purchased and then on lease. Today the current number of monitored water dispensers around the site is 31, 5 of which installed in 2021. The importance of this proactive initiative was also confirmed by the Commission itself by means of the "European Strategy for Plastics in a Circular Economy". In 2021, 108 854 litres of drinking water were distributed from water dispensers installed in buildings, canteens and the Club House.

This corresponds to avoiding to use 217 708 PET bottles or producing 5 443 kg of plastic waste[16]. However, these figures are not completely reliable because they suffer from a variable amount of water rinses (10-18 litres per day) that affects consumption and cannot be measured precisely.

JRC-Ispra is actively working on maximising the sustainability of its waste streams by adopting circular economy management criteria. During 2021, 5 scientific items were donated and 52% of the office furniture was reused, while there was no donation of IT assets (in contrast to 2020 with the donation of a large batch to the schools in the Province). It is clear that the turnover for IT assets is heavily linked to global supply issues (meaning that the lifecycle/retention of IT equipment is now much longer) and to covid-19 for the disruption, in general, to staff, planning and processes.

In 2021, the JRC-Ispra sold 438.30 tons of mixed wood material (branches, tree trunks, stumps). In particular, 226.7 tons of branches and 211.60 tons of mixed wood/trunks were used to produce energy by means of the tri-generation plant fuelled by biomass.

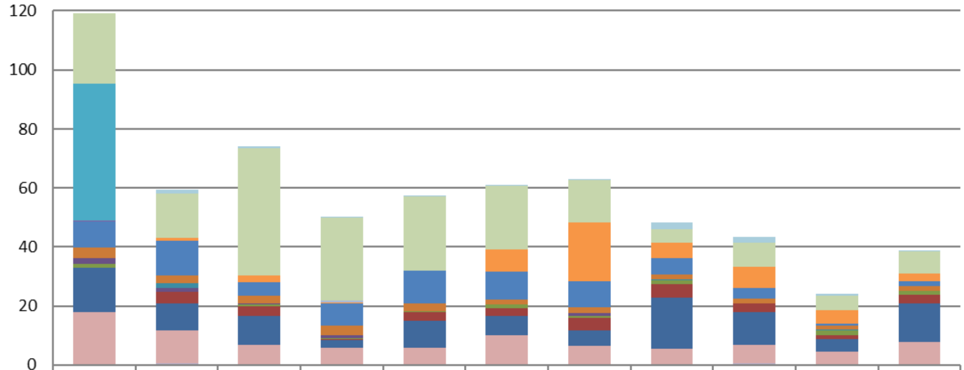
Major actions are ongoing to improve waste management, including:

- Increasing staff awareness with respect to correct waste management by supporting their participation in training;
- Increasing the percentage of recycled office waste. A pilot test with new bins started in 2021 and monitoring will be done in 2022 to eventually further extend the action.

[16] considering a weight of 25g per each 500ml bottle.

G5.2 Hazardous waste

Figure G. 23 - Evolution of total hazardous waste in JRC-Ispra (tonnes)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total hazardous waste, (tonnes/person)	0.057	0.028	0.033	0.021	0.025	0.027	0.027	0.021	0.019	0.010	0.016
Total hazardous waste (tonnes)	119.25	59.33	74.12	50.14	57.19	60.91	62.61	48.27	43.31	24.14	38.92
Other hazardous waste	0.000	1.350	0.720	0.240	0.090	0.209	0.084	2.285	1.920	0.799	0.295
Electrical equipment WEEE	24.020	14.960	43.190	27.958	25.014	21.602	14.190	4.450	7.957	4.695	7.536
Waste containing PCB (tonnes)	0.000	0.080	0.000	0.870	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Waste belonging from buindings and streets maintenance (tonnes)	0.000	0.890	2.040	0.172	0.114	7.389	19.922	5.364	7.240	4.749	2.703
Asbestos material (tonnes)	46.270	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mercury containing objects (tonnes)	0.240	0.000	0.035	0.007	0.000	0.017	0.047	0.000	0.000	0.000	0.003
Lead-acid battery (tonnes)	8.990	11.620	4.710	7.633	11.100	9.580	8.825	5.340	3.778	0.497	1.585
Medical waste (tonnes)	3.641	2.716	2.580	3.020	2.600	1.551	1.974	1.874	1.513	1.495	1.570
Spray cans (tonnes)	0.000	1.490	0.000	0.040	0.000	0.081	0.058	0.259	0.000	0.052	0.071
Solvent (tonnes)	1.740	1.340	0.420	1.185	0.000	0.000	0.879	0.000	0.000	0.000	0.000
Paint (tonnes)	1.410	0.100	0.600	0.314	0.323	1.387	0.540	1.225	0.180	1.749	1.311
Filters (tonnes)	0.000	4.010	3.280	0.239	2.921	2.524	4.203	4.481	2.677	1.326	3.101
Waste oil (tonnes)	14.930	9.100	9.770	2.632	9.282	6.330	5.458	17.626	11.321	4.203	12.956
Laboratory mixed waste (tonnes)	18.010	10.920	6.590	5.829	5.363	10.015	6.002	5.174	5.931	4.466	7.377
Batteries (tonnes)	0.000	0.750	0.180	0.000	0.384	0.224	0.424	0.192	0.792	0.110	0.407

Hazardous waste production depends largely on site-specific research activities carried out in the laboratories, specific maintenance requirements and changes in site use such as removal of laboratories. In 2021, there was an increase in the total quantity of hazardous waste (61%, compared to 2020) due to the resumption of activities on-site after the limitations due to the pandemic. Waste such as oils and lead acid batteries significantly increased by 208% (from 4 to 13 tonnes) and 219% (from 0.497 to 1.585 tonnes), respectively. This was linked to issues related to limited transportation possibilities in 2020.

G5.3 Waste sorting

Table G.9 - Percentage of waste sorted at the Commission in JRC-Ispra

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Percentage of waste not sorted	28.7	26.1	17.9	18.5	16.6	20.9	18.7	14.2	13.3	17.7	11.5
Percentage of sorted waste	71.3	73.9	82.1	81.5	83.4	79.1	81.3	85.8	86.7	82.3	88.5

The above table G.9 demonstrates that, in the last few years, there has been a generally increasing trend in the amount of waste sorted into separate waste streams. In 2021, there was a further increase (8.3%) in percentage of waste sorted. The percentage of waste not sorted decreased by 37.3% compared to 2014. Such notable results are obtained thanks to clear waste sorting campaigns targeting staff and some specific actions, such as introducing trays in the canteens with clear visual indications how to sort the waste.

G5.4 Wastewater discharge

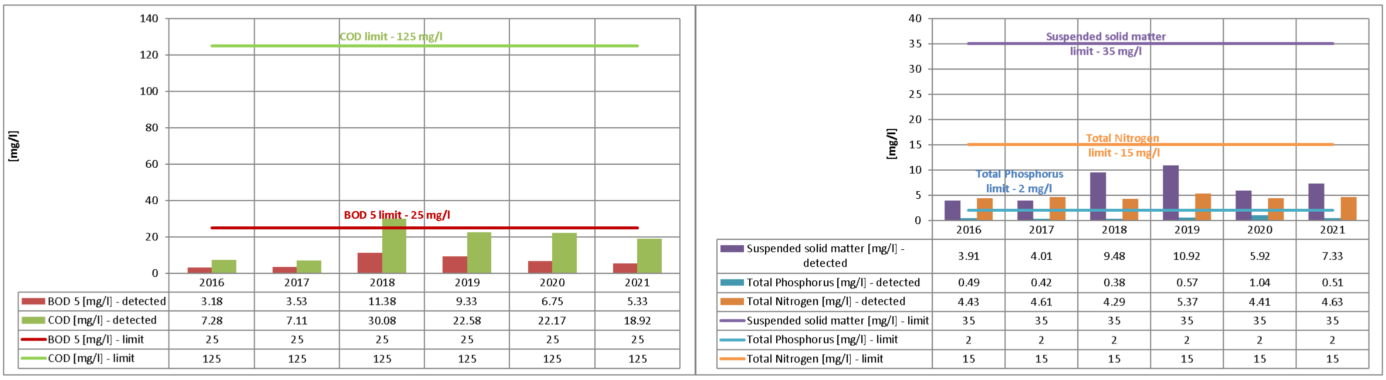
JRC-Ispra site's wastewaters include discharges produced by flush toilets (both from the internal JRC area and the social areas outside the fence) and discharges produced by the canteens, laboratory sinks, etc. as well as part of the urban wastewater from the Municipality of Ispra[17]. These are conveyed by a 26 km sewerage system to the site's urban wastewater treatment plant, which has been operational since 1978.

A secondary wastewater discharging system collects only "white" wastewaters (rainwater and soil drainage) and conveys them to the Acquanegra stream via several discharge points around the site, without need of any preventive treatment processes.

The treatment process used is biological biodisc followed by sedimentation and treatment by Ultra Violet (UV) rays. The maximum treatment capacity, which is limited by the UV treatment equipment, is 870 m^3/h. Excess flow is diverted into two different bypasses located upstream of the wastewater treatment plant.

Treated wastewater is finally discharged in the Novellino stream and monitored to ensure compliance with the Italian threshold limits[18] for water quality. Monthly reports are sent to Italian authorities via the "Sistema Informativo Regionale Acque" database. Figure G. 24 shows the annual average values of some main parameters of the wastewater discharge from JRC-Ispra. Although there is a slight physiological annual variation, all the parameters are always well below the Italian threshold limits.

Figure G.24 - Annual average concentration value of BOD_5 ,COD, Suspended solid matter, total Phosphorus and total Nitrogen at the wastewater treatment plant discharge point with respect to the Italian threshold limits (mg/L).



In addition to these, further analytical checks (which include many more analytical parameters) are performed on a voluntary basis every two months to verify that the wastewater is also below more stringent threshold limits[19]. Also in 2021, the threshold limit values have been respected at all times.

Table G.10 - Total water use and total water discharged (2015-2021)

	2015	2016	2017	2018	2019	2020	2021
Total water withdrawn from Lake Maggiore [mc]	2,201,344	1,875,214	1,768,919	1,827,458	1,434,107	1,183,936	1,238,601
Total water discharged in Rio Novellino] [mc]	5,659,332	3,990,727	3,522,299	2,696,844	3,961,201	3,890,451	3,849,606

The table above (G.10) shows that the volume of water withdrawn from Lake Maggiore is far smaller compared to that treated in the wastewater treatment plant and then discharged in Rio Novellino, which then reaches Lake Maggiore. The overall JRC-Ispra water cycle balance is virtuous, thanks also to rainwater and groundwater contributions.

About 3.9 million cubic metres of wastewater were treated in 2021 of which about 8% comes from the Municipality of Ispra, substantially confirming the values of the previous years.

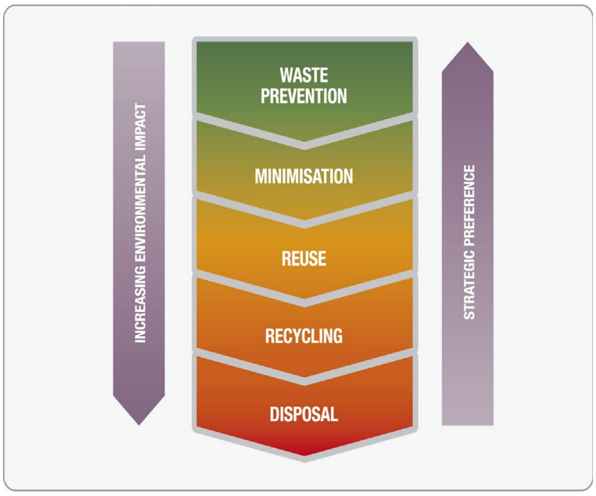
[17] Treatment of the wastewater from the Ispra Municipality is according to a specific Agreement between the two parties stipulated on 30.06.2011 (Ref. Ares(2011)750566) and renewed on 15.06.2016 (Ref. Ares(2016)2775778).

[18] Legislative Decree 152/06, Part 3 of Annex 5, Tables 1 and 2 "Emission limits for urban wastewater disposal plants discharging in surface water bodies and sensitive areas"

[19] Legislative Decree 152/06, Part 3 of Annex 5, Table 3, "Emission limits for industrial wastewater discharging into surface waters".

A multi-stage project to further assure "white" and "black" wastewater separation is ongoing in order to reduce the amount of water to be treated by the wastewater treatment plant, thus improving its performance. During 2021, the project involved lines “via Francia-via Irlanda” and “via Esperia-via Francia”.

G5.5 Radioactive Waste Management System



Significant quantities of radioactive waste from prior on-site activities have accumulated on site. Even greater quantities of waste are expected to be generated by the decommissioning activities in the next few decades. The Ispra Operational Nuclear Decommissioning and Waste Management Unit is developing a management system for radioactive waste ensuring strong internal controls are in place both for historical waste and for new waste originating from operations and (pre)decommissioning activities.

Solid materials are released following a clearance process[20]. A detailed report of the releases by the site and an assessment report of the dose to the human population in the surrounding areas are sent annually to the Italian Control Authority.

The main part of historical solid nuclear waste is stored in "Area 40", either unconditioned or conditioned in bituminised drums, or in concrete blocks or in buried concrete cylinders (the so-called "roman pits").

The radioactive waste management system set up at the site includes clearance materials and radioactive waste in accordance with Italian Law (mainly Legislative Decree 101/2020). It includes elements related to planning, quality assurance and activity recording.

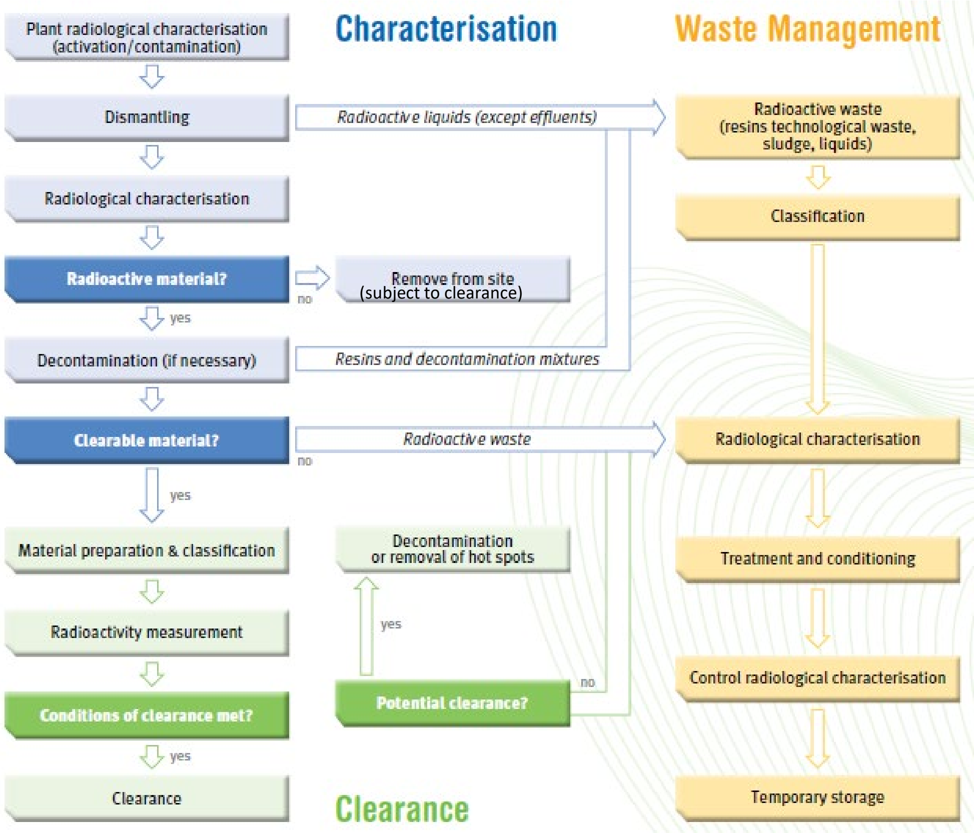
JRC-Ispra's waste management policy is based on three main rules according to Italian law and international guidelines:

1. Minimise the amount of unused nuclear materials by recycling them within industry.
2. Maximise the quantity of clearable waste that can be removed from regulatory control.
3. Reduce the volume of remaining radioactive waste for temporary storage on the Ispra site.

For radioactive waste, the route from bulk waste to an acceptable form for final disposal goes through multiple steps of characterization, pre-treatment, treatment and conditioning. The waste management system thus provides for the flexibility in the waste management strategy to respond to changing external constraints, such as the evolving regulatory framework and the design of the final disposal facility and has included the waste hierarchy, as defined in Directive 2008/98/EC, in its underlying principles.

The radioactive waste management process is summarised in the following schematic diagram:

[20] Clearance: the removal of radioactive materials or radioactive objects within authorized practices from any further regulatory control following verification that the content of radioactivity is below the limits established the regulatory authority.



The Italian regulatory framework allows for the clearance of materials, i.e. its unrestricted use after removal from regulatory control. The procedure for clearance of materials is complex but well defined; the clearance guidelines and procedures are being updated according to the Italian Safety Authority requirements. Currently, limited quantities of material are removed from regulatory control following a strict procedure providing for substantial safety margins to minimise any risk of releasing uncontrolled quantities of radioactivity to the public.
Given the high value of clearance in the Waste Management Strategy Hierarchy and the absolute priority given to safety, the challenge is to increase the efficiency of the process to cope with the increasing flow of material produced by the rising decommissioning activity.
JRC-Ispra's nuclear waste is less than 1% in radiological content and 10% in volume of the radioactive waste produced in Italy. Whereas the implementation of the Decommissioning & Waste Management Programme is under the sole responsibility of the JRC, as stated by the EURATOM Treaty and corresponding national legislation, most of the activities are today carried out by contractors with internationally recognised expertise in the nuclear field to ensure the application of the most exacting technological standards. Provision of complementary on-site/off-site waste management services will integrate and complete the full range of complete activities.

During the radiometric checking process aimed at the disposal of conventional waste (i.e. conventional waste produced within classified areas under Legislative, Decree 101/2020), more than 42.2 tonnes were processed under 42 specific procedures, 38 of them are positively closed (over 39.6 t), 4 negatively closed (2.6 t). Main types of conventional waste disposed are (tons and percentage of total conventional waste):

- Iron and other metallic waste: 14.7 (37.1%);
- Municipal waste: 10.3 (26.0%);
- Demolition/refurbishment: 6.7 (16.9%);
- Asbestos containing materials and MMFV: 3.3 (8.3%);
- Electrical and electronical materials: 2.174 (5.6%);
- Filters (Air Treatment Unit): 2.1 (5.3%);
- Oil and batteries: 0.3 (0.8%).

The 2021 results are 99% of the target (40 t) so the goal can be considered achieved. During 2021 all pending dossiers were closed so the target for 2022 is 20 tons.

G6 Promoting biodiversity

JRC-Ispra has a valuable naturalistic character, counting a nature-oriented area[21] of 949,566 m² over a total of 1,602,965 m², which represents around 59% of the site surface and 385m² per capita. The site hosts many interesting species of wildlife within its boundaries and aspires to protect and enhance biodiversity, i.e. to *promote* biodiversity and possibly be regarded as a hot spot of biodiversity in the regional area. This ambition is based on the fact that within the site there are many natural habitats (i.e. unaltered communities affected only occasionally by human intervention), some of which have remained intact for over 50 years, and semi-natural habitats (i.e., man-made and partially managed, but with an abundance of spontaneous plants). The activities are ongoing on-site to follow the recently updated EU Biodiversity strategy 2030 which are listed hereafter.

Protection of habitats and species

As is seen in the figure below (G.25), JRC-Ispra site features 33 hectares of natural habitats of conservation covered by the Habitats Directive. A three years' monitoring plan of habitat surfaces is in place, the next habitat survey is foreseen in 2022.

Figure G. 25 - Distribution of the naturalistic value in JRC-Ispra site

Habitat	EU Habitat Directive code	2019
Grasslands: high-diversity plant communities Acidophilous meadows, Dry meadows, Wet meadows	6230*: Species-rich Nardus grasslands	3.73 ha
	6150: Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	3.48 ha
	6510: Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	3.02 ha
	Total	10.23 ha
Wetlands Surface waters and swamp	3150: Natural euthrophic lakes with Magnopotamion or Hydrocharition-type vegetation	1.30 ha
Wet woodlands Alder woodland and mixed alder-oak woodland	91E0*: Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	17.11 ha
Dry woodlands Oak woodland	9190: Old acidophilous oak woods with Quercus robur on sandy plains	4.67 ha

JRC-Ispra has established a biodiversity monitoring approach that adopts scores to reflect both the quantity and quality of site biodiversity. This way forward allows defining objectives and evaluating progress in time.

Figure G. 26 - Examples of protected species on site: Rana latastei frog and Eleocharis carniolica plant

[21] Areas dedicated primarily to nature preservation or restoration. At JRC-Ispra, this includes not-sealed areas and green roofs.

A standardised annual programme was established in 2016 for **monitoring the *Rana latastei* population** (Italian agile frog), using a *capture-mark-recapture* methodology, to evaluate if any protective additional actions are needed. The population size was estimated in 2019 of being about 176 breeding frogs, which is a very positive result as it grants a stable *Rana latastei* population, well above the critical level of 50 breeding frogs. The monitoring has currently been suspended due to covid-19 restrictions and will be resumed following the reopening of the Ispra-site. The flowering plant ***Eleocharis carniolica*** (spikerush) is an "endangered" species in Italy. Although extremely rare, it is currently not in danger of extinction. Changes in the habitat conditions (e.g. drainage, water pollution, succession) are its main threats. 14 plants were found in the wetlands of the JRC-Ispra site in 2020 and the data could be confirmed in 2021. On the basis of the data collected, some improvement measures for promoting the spread of the *Eleocharis carniolica* plant, such as turning the soil over, were carried out. Depending on the results of the 2022 habitat survey, it will be decided whether to monitor the *Eleocharis carniolica* plant in terms of its occupied surface area or to keep to the number of plants.

Deadwood (coarse woody debris) is a proxy indicator for biodiversity, since it is a habitat for a wide array of organisms including vertebrates, invertebrates, lichens, bryophytes and fungi. In 2021, a "**dead wood garden**" has been developed along a popular footpath to inform the staff about the biodiversity on site. The installation features:

- An informative communication panel for staff (see Figure G. 27);
- A dying tree provides habitat for birds, such as the woodpecker, or other inhabitants that use the cavities like many insects, fungi, lichens and mosses also settle here;
- A hedge of branches stacked loosely provides shelter for various small animals such as hedgehogs, martens, dormice;
- Soil covered with a thick layer of wood chips provides protection and habitat for fungi, larvae and beetles and keeps the soil moist;
- Wooden wall neatly piled up serves as shelter for insects like various wild bees, and small mammals like mice, also reptiles like lizards or snakes;
- Robinia pillars for insects.

Figure G. 27 - The dead wood garden along the footpath that leads to the JRC-Ispra canteen and the relative informative panel to raise awareness among staff

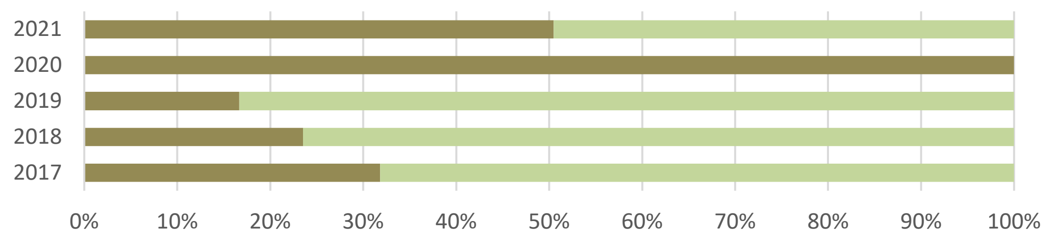
Conservation measures and monitoring

Promoting biodiversity is part of the EMAS policy. JRC-Ispra has established a long-time project to manage the site's naturalistic heritage. A full set of EMAS documentation is supporting this by means of work instructions, guidelines, maps and a multiannual action plan, in accordance with the commitments of the 2030 Biodiversity Strategy. To further improve the status of the Ispra-site ecosystem, compensation schemes and work instructions will be revised in 2022.

Nature restoration: new trees plating on JRC Tree day (21ST November)

As a symbolic gesture to preserve the site's green areas and to engage staff, a yearly JRC Tree day was established as a recurring event on 21st November. Around 431 trees and shrubs have been planted since the first event in 2017, the number varies each year following the space available .

Figure G. 28 - Number or trees and shrubs planted during JRC tree day



	2017	2018	2019	2020	2021
Total trees planted	35	20	25	300	51
Total shrubs planted	75	65	125	0	50

Figure G. 29 - 2021 JRC-Ispra planting day

While in 2020 covid-19 circumstances prevented staff gathering for the annual tree-planting activity, 101 trees and shrubs were planted on site in 2021. JRC Director General Stephen Quest personally committed to this event by planting the first oak tree, as can be seen in Figure G. 29. He was joined by, among others, Ispra Site Manager Marinus Stroosnijder and Green Areas correspondent Elvira Schuller-Huhtiniemi. As usual, these were all native plants:

- 12 *Acer Campestre* (tree) – Field maple;
- 12 *Quercus cerris* (tree) – Turkey oak;
- 12 *Carpinus betulus* (tree) - European or Common Hornbeam;
- 3 *Quercus petraea* (tree) Sessile oak, Cornish oak or Durmast Oak. To be noted that planting Quercus petrae is also considered a contribution to improve the habitat 9190 Quercion Robori-petraeae[22].
- 12 Ulmus minor (tree) – Conutry elm;
- 10 Cornus mas (shrub) – cornelian cherry;
- 10 Cornus sanguinea (shrub) – Common dogwood;
- 10 Corylius avellana (shurb) – Hazelnut;
- 10 Crataegus monogyna (shrub) – Hawthorn;
- 10 Rhamnus cathartica (shrub) – Buckthorn.

Habitat restoration: reforestation of Via Irlanda wood

An action to improve the perimeter of a wooded area of the site has been kicked-off in 2020 by reconciling the safety standards with those for nature conservation. During 2021, exotic forest species have been eliminated to prevent dead branches (or the trees) from falling. 658 native trees and 927 shrubs have been planted with the aim of recovering forest habitats of community interest "Alluvial forests of Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)" (EU habitat 91E0, see Figure G.28). An ecotonal band (hedge) will be added, both as a "buffer strip" and as a physiognomic diversification of the vegetation between the forest itself and the entropized areas. The action will therefore also have positive effects on the local fauna.

Reduction of invasive alien species

The semi-natural or natural habitats that are worthy of protection are native lands for several wild species. Some alien species unfortunately exist on the JRC site and may be invasive and/or harmful. Effects of exotic/alien species include preying on native species, transporting of diseases, out-competing native species for resources, affecting aquatic and terrestrial habitats etc. Such threats can cause fatalities and imbalance an ecosystem by decreasing biodiversity, changing the food chain and altering

[22] Referring to "Technical-scientific support to the activities of the Regional Observatory for Biodiversity of Lombardy" - Resolution No. X / 5739 session of 24/10/2016

ecosystem conditions. The Biodiversity Strategy 2030 states that the implementation of the EU Invasive Alien Species Regulation and other relevant legislation and international agreements will be stepped up.

The effort to control and eradicate alien species, which threaten ecosystems and habitats, is implemented on the Ispra-site by:

- removing Phytolacca americana (american pokeweed) and cutting low Pleioblastus pygmaeus (pygmy bamboo) for a total of approximately 10,000 m2 yearly;
- removing alien invasive species: 9 plants such as Pinus nigra (black pine), Quercus rubra (northern-red oak), Pinus strobus (white pine);
- girdling of Robinia pseudoacacia (black locust) and Prunus serotina (black cherry): 200 plants that will be removed in 2022.

Biodiversity in building sector

On top of the above, JRC-Ispra continuously strives to improve the environmental impact within the building sector. In fact, during works done for refurbishment and new constructions, an internal authorisation process is carried out to implement the EMAS goals and improve the naturalistic quality of the projects. Measures contributing, directly or indirectly, to protect biodiversity include:

1. integrating and managing green areas in the premises of the buildings, e.g. landscaping project for building 102, implementing 13 ecological targets in the frame of its BREEAM certification;
2. introducing infrastructure measures such as green roofs in building projects, recently accomplished in building 102 and Sport Hall;
3. opting for green procurement of goods and services: (e.g. where possible integrating environmental considerations in the selection of construction materials).

G7 Green Public Procurement

G7.1 Incorporating GPP into procurement contracts

JRC-Ispra aims to green its contracts since 2014: EU GPP criteria were taken on board and contracts were checked against these criteria.
EU GPP criteria are subdivided in core and comprehensive criteria, according to the level of environmental performance sought. They cover selection criteria (capacity of the bidder), technical specifications (minimum technical requirements), award criteria (additional quality characteristics) and contract performance clauses (for contract execution).

This is the classifications applied to contracts where EU GPP criteria are available:

- Green by nature: the primary function of goods, services and works to be procured is green ;
- Green: fully or largely compliant with the core criteria and/or partly compliant with the comprehensive criteria. Environmental award criteria add 10% of the total score of tenders ;
- Light green: partly compliant with the core criteria. Environmental award criteria for price and quality for 10% of the total score of tenders.

In order to extend the field of application of the EU GPP criteria, and further increase the green procurement, the contracts that are assessed are those with a value above 15K€, i.e. contracts where competition is foreseen under the Financial Regulation.

In addition, in order to better measure the effort done in greening our contracts, the following classifications to contracts not falling under the EU GPP criteria are applied:

- potential special mention: contracts that could potentially be “greened” further (e.g. requesting to use Euro 6 vehicles for carrying out services performed on-site or requesting additional years of maintenance for the purchased products) ;
- special mention: the contracts that effectively implemented potential special mention aspects ;

- not green: contracts where the application of green aspects was not feasible, either for the nature of the request, for example intellectual services.

The following table accounts for how JRC-Ispra has been greening its contracts.

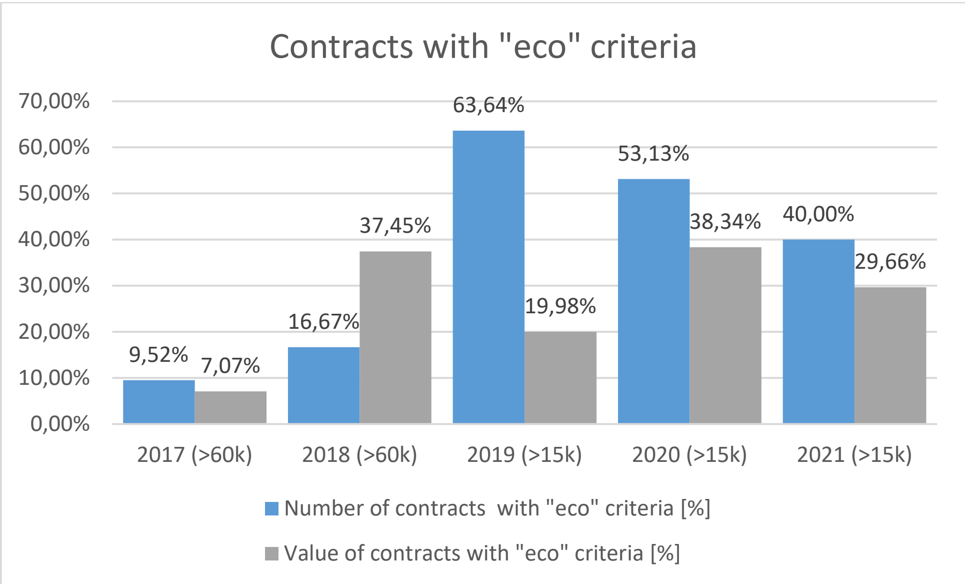
Number of JRC-Ispra contracts	2017 (>60k)	2018 (>60k)	2019 (>15k)	2020 (>15k)	2021 (>15k)
Light green contracts	5	9	5	6	3
Green contracts	0	5	4	4	2
Green by nature contracts	1	1	1	1	0
Total contracts having GPP criteria	**6**	**15**	**10**	**11**	**5**
Contracts having GPP criteria applied [%]	**100%**	**100%**	**100%**	**100%**	**100%**
Special mention contracts			4	6	9
Potential "Special mention" contracts			**12**	**21**	**30**
Special mention/Potential special mention contracts [%]			**33%**	**28%**	**30%**
Not green contracts	**57**	**75**	**94**	**71**	**67**
Total contracts	**63**	**90**	**116**	**103**	**102**

It is to be noted that the results vary each year according to the specific procurement issued (most contracts last for four years).

GPP criteria are applied to the 100% of contracts where GPP criteria are available. With respect to the contracts signed in 2021, it must be underlined that around 10 contracts experienced a delay in the signature and therefore they will be accounted in 2022.

Special mention contracts have extended the possibility to greening more contracts and results are constantly positive since the beginning. The objective for the next years is to further broaden the field of application of special mention contracts, which reflect better the procurement effort to greening the contracts of JRC-Ispra.

This said, having extended further the scope of contracts allows us to address more contracts and thus deliver better results.



To raise awareness among staff drafting contracts and tender specifications, dedicated presentations addressing green public procurement and related implementation aspects were delivered by the Ispra-site GPP correspondent to internal procurement networks, 34 members of staff were reached in 2021.

The above-mentioned framework is complemented by the use of the interinstitutional framework contract of the European Parliament: 'GPP helpdesk for Buying Green'.

A review of the process of greening contracts, including the introduction of new statistics and classification is ongoing, with the purpose to integrate circular economy principles into procurement in "circular procurement". The "circular procurement" aims to streamline a systemic approach to coordinate both processes, managing also the overlapping aspects. This is relevant considering that GPP, which is promoted in the European Green Deal, is mentioned also as a tool within the Circular Economy Action Plan.

G8 Demonstrating legal compliance and emergency preparedness

G8.1 Managing the legal register

According to the Site Agreement, Italian Law 906/1960, JRC-Ispra is:

- fully implementing Italian legislation regarding nuclear activities, including prescriptions relating to requirements laid down in the 19 licences issued by the Italian Nuclear Authorities;
- applying, under a voluntary basis and under its own responsibility, all environmental prescriptions set within both national and regional laws and regulations. Within this framework, JRC-Ispra has developed a dedicated strategy to issue internal environmental authorisations that are technically equivalent to those issued by Italian Authorities. In 2013, the Italian EMAS Competent Body has acknowledged the correctness of this above-mentioned legal environmental framework. This has also been acknowledged by authorities during the EMAS Round Table meetings.

Regarding the internal environmental authorisation applied to the tri-generation plant, JRC-Ispra is maintaining transparent official communication with all relevant stakeholders, including Region Lombardy, ARPA Lombardy[23] and the Province of Varese. Within this framework and according to the Site Agreement, it was decided that the 2021 tri-generation emissions threshold values set by Region Lombardy was to be ensured by means of the overall emission, in terms of mass flow for CO and NOx, assuming the continuous operation of the plant for the entire year. These values were duly respected and will be communicated to the interested parties. On top of this, several actions were carried out to limit the tri-generation plant emissions. For example, new catalysts have been installed for all engines, granting a notable reduction in terms of the concentration of CO and NO_x emissions. A continuous monitoring system has been installed and currently need to be tested.

To be noted that JRC-Ispra has planned to replace the existing tri-generation plant with a new highly efficient tri-generation plant, as of 2024.

Several tools are currently in place to ensure that appropriate legal compliance checks are performed continuously throughout the Ispra-site. These include:

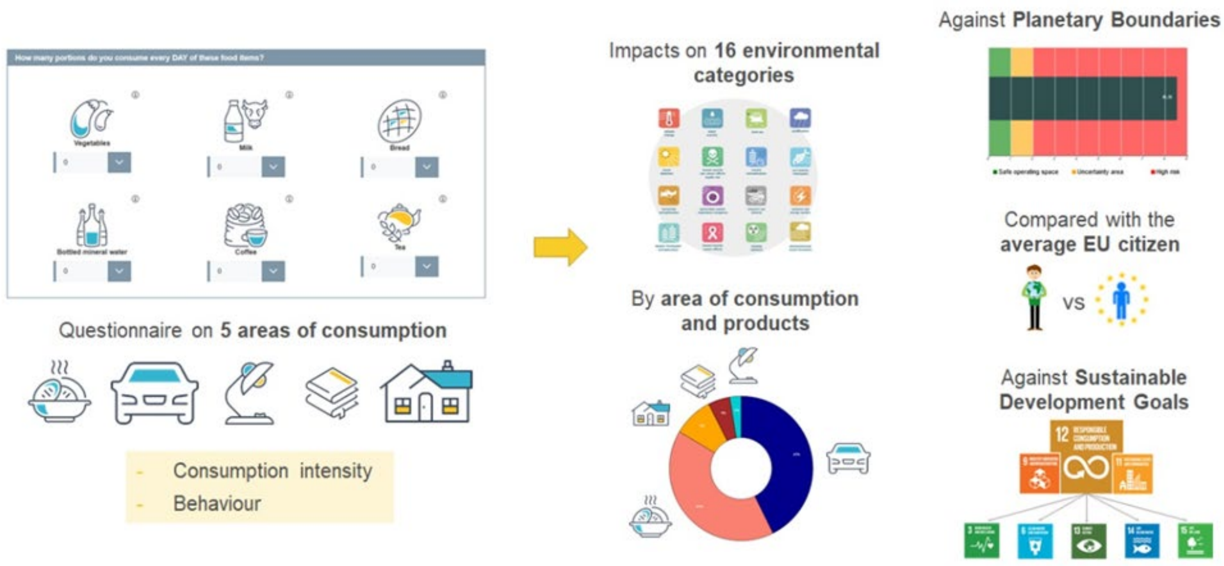
- the register of legal requirements and obligations and voluntary requirements, which is the main document where all applicable environmental legislation is listed and analysed. The EMAS team at JRC-Ispra yearly performs an analysis of the new legislations and highlights its potential impacts, suggesting the course of action necessary to guarantee compliance, thus ensuring the completeness and adequacy of the registers in relation to the Commission's obligations.
- the register for monitoring the legal or voluntary documents keep track of the progress of ongoing actions.
- a recently updated procedure for the management of the legal compliance and environmental requirements applicable to the JRC-Ispra site.
- the Consultation Procedure process, managed by a team of qualified experts in the fields of safety at work, security, environment, etc., to authorise new projects and activities on site;
- an in-house security, safety and environmental inspection service performed by the JRC-Ispra inspectors;
- Internal and external EC EMAS audits and also JRC-Ispra internal safety, environment and quality combined audits;

[23] ARPA Lombardia is the competent Environmental Protection Agency (i.e. "Agenzia Regionale per la Protezione Ambientale").

- an environmental protection service that e.g. supplies information over new environmental legislation to all interested parties.

On top of the above, in 2017 JRC-Ispra signed a Convention with ARPA Lombardia for legal and technical support on environmental matters and, in particular, addressing internal environmental authorisations. Since then, JRC-Ispra has been taking advantage of ARPA's improvement suggestions and collaboration between both parties duly continues.

For instance, the agreement made in 2021 will allow ARPA Lombardia to estimate the impact of its staff by means of the Consumer Footprint Calculator developed by JRC-Ispra. This life cycled-based tool allows to calculate the environmental impacts of the consumption patterns of the consumers and to evaluate how changes in their lifestyle may affect their personal footprint. See this link for more information https://eplca.jrc.ec.europa.eu/ConsumerFootprint.html.



G8.2 Prevention and risk management

During 2018, the emergency procedures were reviewed and the Site's Emergency and Business Continuity Plan and associated procedures and instructions, providing the framework for both nuclear and conventional emergencies, including incidents that could have a negative impact on the environment (site and off site), were approved and finally issued in 2019.

The procedure for the management of emergency exercises and the planning of emergency exercises and drills has been updated to account for all the applicable environmental scenarios, including spillage and release of dangerous substances and finally issued in 2021. These also foresee that in case of effective or risk of pollution of air, soil and/or groundwater JRC Ispra performs activities of securing (with isolation/removal of pollution sources), soil/groundwater characterization (only for site surveillance caused by JRC itself), risk analysis and, where needed, site remediation. Authorities and interested parties are informed according to the host country's legislation.

In 2013, JRC Ispra detected the presence of fuel oil in the ground close to Via Esperia during one of its periodical checks. This derived from a leak from two old underground storage tanks that had been used to stock fuel oil for heating the residences within the JRC social area. The tanks and surrounding layers of the soil were removed. However, minor presence of fuel oil was detected in the neighbouring areas both under Via Esperia, and in the premise of a JRC Ispra parking area. Italian authorities were informed about this old heritage and were timely kept up to date, including by means of the JRC Ispra EMAS Round Table meetings

Despite the fact that the risk analysis performed by JRC Ispra stated that the residual presence of fuel oil is under the mandatory intervention threshold, JRC Ispra opted for the best environmental way forward, and has requested to start the relative soil removal procedure in 2022, including supplying preliminary information to the competent authorities. The intervention will take place as soon as they will give a green light.

G8.3 Emergency preparedness

In 2021, mandatory nuclear emergency exercises and building evacuation tests were carried out. Additionally, a drill for the scenarios of both forest fire and spillage of liquid acids were carried out in the wooded area of the JRC-Ispra site and in Building 16b (Special waste deposit), respectively.
In order to test the preparedness of the JRC and the Italian authorities to respond to nuclear emergencies, the annual nuclear full-scale emergency exercise was held in February 2021 in the presence of local and national authorities. In parallel, an emergency exercise was held to test the emergency preparedness in Area 40. There was a positive outcome of both exercises.

G9 Communication and training

G9.1 Internal and external communication

An Environmental Communication Action Plan was established in 2014 and revised annually in coordination with the EMAS Commission's corporate team. The corporate programme is adopted by JRC-Ispra according to feasibility of implementation and with the addition of specific site-level initiatives. The Ispra-site EMAS team is supported in the execution of its environmental communication campaigns by the Ispra Green team, namely colleagues that voluntarily engage in supporting environmental-raising actions.

In 2021, the Ispra-site focus for internal communication was on:

1. Raising staff awareness by organising specific events to further improve the environmental performance of the Ispra-site;
2. Engaging staff to participate in these events, even if remotely or via a hybrid participation, and to support them.

This was mostly achieved communicating the below-listed awareness-raising campaigns to staff via 'Connected', our intranet. Limited ad hoc tools were used due to covid-19 limitations.

Event	Description/Purpose	Achievements
Sustainable meetings and events (competition) 31 May 2021 for submission	The second edition of the sustainable conferences and events competition focuses on: virtual events and conferences organised in 2020 and lessons-learnt from the pandemic situation. **Communication Action:** Connected blog to inform staff about the event.	JRC's 'Square series' won the first prize for EC internal events. The Square series is a unique virtual space with a human touch to meet and talk with the Director-General, Stephen Quest, and inter-connect with the more than 3,000 JRC staff spread over various sites in a dynamic and very participatory format.
M'illumino di meno 26 March 2021	The annual day of energy-saving and sustainable lifestyles launched by Caterpillar and Radio 2 in 2005. In 2021, M'illumino di meno was dedicated to the "Leap of Species", the ecological evolution in our way of life that we absolutely must do to get out of the pandemic better **Communication action**: Connected blog to encourage the participation by switching off lights, heating, computer and monitor before leaving the office in the evening even while teleworking.	The environmental awareness of staff was targeted thanks to the Ispra-site's participation in the event. This was done mostly by involving staff in switching off light. The lights at the main entrance were also switched off, compatibly with security requirements, as a symbolic gesture.
Earth Hour 27 March 2021	Worldwide movement organized by the World Wide Fund for Nature (WWF), encouraging individuals, communities and organisations to turn off non-essential lights for one hour. This year taking part in the first-ever Earth Hour Virtual Spotlight **Communication Action:** Connected blog referencing Ispra site environmental achievements	The environmental awareness of staff was targeted thanks to the Ispra-site's participation in the event. This was done mostly by involving staff in switching off light. The lights at the main entrance were also switched off, compatibly with security requirements, as a symbolic gesture.

Event	Description/Purpose	Achievements
VéloMai and Velowalk April and May 2021	VeloWalk - the new inter-institutional campaign - combines the Walking challenge and Velomai. The Walking Challenge is from 1st-30th April and Velomai from 1st-31st May. **Communication Action:** Connected blog by fit@work. Staff can take part in both events or just join one by simply downloading the apps and counting your steps or rides. Related blogs: Plogging is to pick up litter whilst out jogging, walking or cycling and Virtual Run@walk challenge from Ispra to Lisbon in collaboration with Portuguese semester	Several staff joined the run&walk challenge. The overall distance covered was the same as travelling from Ispra to Lisbon. This was a fun way to involve staff, raising awareness over both environmental and health aspects.
EU Green Week 31 May-4 June 2021	This year the EU green week will be dedicated to 'zero pollution ambition'. **Communication Action:** Blog on My IntraComm and Connected page	The JRC's contribution to this year's EU Green Week was the presentation of a Consumer Footprint Calculator (see chapter 8.1 for further details). This tool allows anyone to calculate their environmental impact on the basis of their consumption patterns and to evaluate how changes in their lifestyle may affect their personal environmental footprint.
JRC-Ispra Tree Day 26 November 2021	The event is organised annually in November (to celebrate the national tree day in Italy) using only native trees and shrubs provided by the site management services. **Communication Action:** Connected blog	JRC Director-General Stephen Quest planted an oak tree, the first of 100 trees and shrubs, specifically purchased for this occasion. Unfortunately, covid-19 circumstances prevented staff gathering for our annual tree-planting activity, but they could still participate planting trees on their premises and posting pictures in the Connected blog.
Green Public Procurement: Info session by GPP Helpdesk 23 March 2021, 06 May 2021, 12 October 2021 and 24 November 2021	Arguments treated: a) GPP Helpdesk Webinar on Green Public Procurement of imaging equipment, consumables and print services; b) GPP Helpdesk Webinar - Computers, Monitors, Tablets and Smartphones **Communication Action:** Connected blog to promote VC to Brussels	The aim is to achieve environmental policy goals greening our procurement. This enables us to address climate change, resource use and sustainable consumption and production.
European Week for Waste Reduction 20-28 November 2021	An EC initiative aiming to increase awareness about how we can change habits and "3Rs": Reduce waste, Reuse products, Recycle material. **Communication Action:** Blog on My IntraComm and Connected page	To promote circular economy among staff.
Ispra and EMAS-related environmental news and achievements Throughout 2021	Regular updates of environmental news, initiatives and achievements to Ispra site staff to help keep sustainability at the forefront **Communication Action:** Connected blog	To draft the annual EMAS Environmental Statement; to promote various webinars, presentations, green tips; to draft the yearly EMAS management review report.

On top of the above events and campaigns, an important hybrid event took place in Ispra in November 2021, the "**Annual staff meeting of the Ispra Site Management Department", hosted by the Ispra Site Manager and in the presence of the Resources Director, focusing on sustainability.**

The Green Deal and environmental improvements on the Ispra-site was one of the main topics presented to 100+ Site Management staff and Resources Director in the annual department meeting. The Ispra EMAS site coordinator and several team leaders talked about renewable energy, circular economy, green buildings and biodiversity projects and initiatives that progressed on the Ispra-site, despite the covid-19 pandemic.

The goals and way ahead for the future were presented, with a clear link to further engaging staff, taking into account the 'new normal' following the post-pandemic era.

JRC-Ispra organises an annual EMAS Round Table, covid-19 permitting, in order to:

- enhance the dialogue with key local, regional and national stakeholders over JRC-Ispra's environmental performance and to follow-up over stakeholder's expectations;
- promote JRC-Ispra's ambitions to promote a more sustainable environment and lead by example;
- demonstrate the transparency that is required under the EMAS umbrella;
- grant to all stakeholders that there are no impediments towards JRC-Ispra's EMAS registration.

The last EMAS Round Table was held on the 17th January 2020, when the Protocol for Sustainable Development of the Lombardy region was adopted by JRC-Ispra. This Protocol promotes the implementation, in particular, of the core of the United Nations' 2030 Agenda for Sustainable Development. Companies, associations and representatives of local authorities adhering to this Protocol are committed to establishing their own programme of measures or initiatives, centred on topics ranging from the conservation of biodiversity and the improvement of air quality to the circular economy, from the energy transition to the development of renewable sources to the development of sustainable mobility. The progress of the actions is discussed annually within the Forum for Sustainable Development organised by Lombardy Region.

JRC-Ispra shared this programme within the framework of the Protocol for Sustainable Development. The target of this contribution is to share how the European Commission and, in particular, JRC-Ispra shall achieve climate neutrality within its premises by 2030.

Figure G. 30 - The JRC-Ispra signing of the Protocol for Sustainable Development of Region Lombardy received notable mass media coverage. Here is the handshake following the signature by Rien Stroosnijder, Ispra Site Manager and Raffaele Cattaneo, Environmental Councillor of Regione Lombardia


ISPRA

Patto tra Regione e JRC per lo sviluppo attento all'ambiente

Sottoscritto un accorso che recepisce i 17 obiettivi per lo sviluppo sostenibile definiti dall'ONU

jrc ispra   regione lombardia   ispra

Questa mattina, **nella sede del JRC, Rien Stroosnij** e l'assessore all'Ambiente e Clima di Regione Lombardia **Raffaele Cattaneo** in occasione dell'**annuale Tavolo di confronto EMAS**, hanno sottoscritto il nuovo protocollo.

The particular focus is on the following Sustainable Development Goals – SDGs:

- goal 13, climate action;
- goal 12, responsible consumption and production;
- goal 7, affordable and clean energy.

Figure G. 31 - Photo from the VI EMAS Round Table

Details of external participation in the recent EMAS Round Tables are summarised in the table below.

	Invited	Participants	National	Regional	Provincial	Municipal
2014 EMAS Round Table	48	25	2	6	2	15 (12 VA[24]; 3 NO)
2015 EMAS Round Table	59	23	2	3	8	10 (7 VA; 3 NO)

[24] "VA" stands for the Varese Province, where JRC Ispra is located and "NO" stands for the Novara Province, on the opposite side of Lake Maggiore.

	Invited	Participants	National	Regional	Provincial	Municipal
2016 EMAS Round Table	75	28	2	2	9	15 (12 VA; 3 NO)
2017 EMAS Round Table	84	33	1	4	17	11 (8 VA; 3 NO)
2018 EMAS Round Table	89	35	5	6	11	13 (10 VA, 3 NO)
2020 EMAS Round Table	73	43	4	13	11	15 (12 VA, 3 NO)

Unfortunately, the pandemic has temporarily stopped this key communication event with external EMAS stakeholders. JRC-Ispra is looking forward to resume this as soon as possible in compliance with pandemic restrictions.

G9.2 Internal and external training

In 2021, the following environmental training courses were held:

- five environmental training courses (totalling 39 participants) were delivered to technical staff in 2021 focussed on waste management;
- within the training for procurement and contract management (34 members of staff for Ispra), GPP was also addressed. For further detail see G7.1;
- an environmental training for the Safety, Security and Environmental inspectors was held. The inspectors are a key figure in the JRC-Ispra Environmental Organisation.

Therefore, in 2021 there were overall 76 participants attending environmental trainings courses.

JRC-Ispra does not provide environmental training for contractor staff as specific contract requirements address this.

G10 EMAS Costs and savings, conversion factors

G10.1 Costs and savings

The following table shows the running EMAS costs and the costs for energy, water and waste disposal.

Table G. 11 - EMAS costs and virtual savings in JRC-Ispra

	2013	2014	2015	2016	2017	2018	2019	2020	2021	Change in last year
Total Direct EMAS Cost (Eur)	486 799	383 760	368 168	446 200	486 945	491 928	473 595	476 515	475 175	- 1 340
Total Direct Cost per employee	219	164	160	198	214	215	203	198	192	-6
Total buildings energy cost (Eur)	4 643 900	4 140 299	3 359 556	2 416 599	2 941 221	3 418 162	2 533 956	2 069 208	5 365 774	3 296 567
Total buildings energy cost (Eur/person)	2 089	1 772	1 464	1 070	1 292	1 496	1 087	858	2 168	1 310
Total fuel costs (vehicles) (Eur)	24 854	20 049	19 777	11 180	11 286	9 443	10 220	4 851	6 147	1 296
Total energy costs (Eur/person)	11	9	9	5	5	4	4	2	2	0
Total water costs (Eur)	58 993	64 431	65 084	67 997	47 971	44 783	31 361	34 478	36 921	2 443
Water (Eur/person)	27	28	28	30	21	20	13	14	15	1
Total paper cost (Eur)	n.a.	50 197	45 619	40 082	39 156	36 645	34 079	13 562	13 304	- 258
Total paper cost (Eur/person)	n.a.	21,48	19,87	17,75	17,20	16,04	14,61	5,63	5,38	
Waste disposal (non hazardous) - unit cost/tonne	176	233	251	341	293	218	223	397	240	-157
Waste disposal (non hazardous) - Eur/person	102	115	135	133	149	119	113	86	93	7
Waste disposal (non hazardous) - net* unit cost/tonne	0	0	239	331	260	137	158	351	139	-212
Waste disposal (non hazardous) - net* Eur/person	0	0	129	129	132	75	80	76	54	-23

Savings in resource expenditure, particularly in relation to energy and fuel costs, are substantial. However, in 2021, building energy costs have significantly increased in gas and electricity: +196% (from 17.17 to 50.84 EUR/MWh) and +53% (from 137.04 to 210.17), respectively. This situation has led to an increase in total building energy costs by 20% since 2013 and an increase of 908 EUR/person from 2013 to 2021. This is clearly accountable for gas costs in running a tri-generation plant.

In 2021, total fuel costs have decreased (-75%) compared to 2013. However, there has been a 26.7% increase compared to 2020, mostly on account of the rise of the costs of fuel.

The total cost related to paper consumption still decreased by 1,9% between 2020 and 2021 and also the cost of paper per kg has decreased (-4.4%). A virtual saving of 36,893 EUR (or 73%) compared to 2014 was achieved.

The overall total cost of non-hazardous waste (including also waste sent for recovery and sold as recyclable material) decreased in 2021. However, it should be noted that the new contract in place since the end of 2018 foresees far higher costs, both in terms of waste disposal and in terms of rentals of roll-off containers. Thanks to an accurate management of the roll-off containers, the rental cost decreased in 2021. The so-called "ferrous materials"[1] represent about 360,000 EUR in total revenue during the period 2015-2021 (almost 97,000 EUR in 2021).

Finally, it should be noted that the direct EMAS costs account for internal staff and also for a consultancy contract which includes the application of Internal Control Standards, such as the respect of environmental legislation, GPP criteria assessment and also include specific projects. It therefore goes well beyond the scope of the EMAS registration itself.

G10.2 Conversion factors

Conversion factors (most of which apply to all the sites) are shown in an Appendix X of the Corporate Summary.

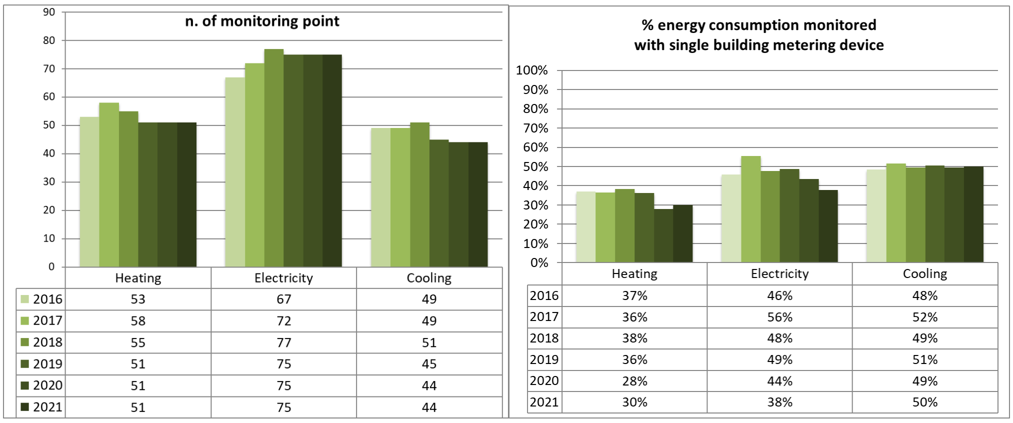
[1] Aluminium; iron and steel; copper; cables, which are respectively accounted for by the following CER codes: 17.04.02, 17.04.05, 17.04.01 and 17.04.11.

G11 Site breakdown: Buildings' characteristics and performance (selected parameters, indicative data)

JRC-Ispra is continuing the implementation of an automatic energy management system to monitor energy consumption of single buildings. This currently allows monitoring end-user buildings/facilities energy consumption (see Figure G. 32):

a) 30% of global site heat consumption (corresponding to 51 monitoring points[25]);
b) 38% of global site electric energy consumption (corresponding to 75 monitoring points);
c) 50% of site global cooling energy consumption (corresponding to 44 monitoring points).

Figure G. 32 – Monitoring of energy consumption progress



	Heating	Electricity	Cooling
2016	53	67	49
2017	58	72	49
2018	55	77	51
2019	51	75	45
2020	51	75	44
2021	51	75	44

	Heating	Electricity	Cooling
2016	37%	46%	48%
2017	36%	56%	52%
2018	38%	48%	49%
2019	36%	49%	51%
2020	28%	44%	49%
2021	30%	38%	50%

It should be noted that the energy consumption values measured at the monitored buildings is lower than the theoretical one due to the grid losses.

Furthermore, reduction of the monitored energy consumption in 2021 with respect to the previous years is accounted by:

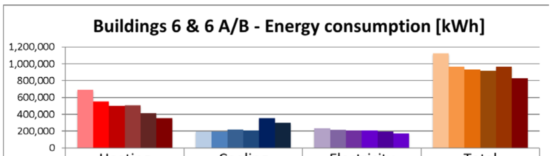
- Some metering devices temporarily not working;
- Different consumption trends with respect to the total site energy consumption.

What follows are some examples of ongoing monitoring for heating, cooling and electrical energy for sample buildings hosting mainly offices over the last five years. Data will be further analysed and actions will be decided in due course, considering the scope, the data reliability and the available manpower.

In 2021, the total monitored energy consumption has decreased compared to the previous year in almost every case, when a relevant increase in cooling energy was registered. Covid-19 dispositions, particularly the request to have air ventilation 24 hours a day and during weekends too, were in force also during 2021 but some expedients (such as reducing the air flow of the AHU - Air Treatment Units- systems) helped to reduce energy consumption at least in office buildings. In buildings used as laboratories, energy consumption has increased compared to 2020 due to the reopening of scientific research activities. This demonstrates once again to the difficulty to implement policies to reduce energy consumption where energy is used for scientific activities.

[25] For technical reasons, monitoring points at end user do not always correspond to readings of single buildings.

Buildings 6, 6a and 6b, administrative offices

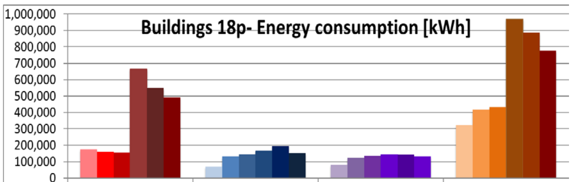


	Heating	Cooling	Electricity	Total
2016	690,186	197,235	236,328	1,123,749
2017	553,260	199,683	217,301	970,244
2018	500,230	221,741	208,576	930,547
2019	506,716	205,195	207,314	919,225
2020	413,265	355,595	199,372	968,232
2021	355,212	300,298	176,269	831,779

Type energy	2021 vs 2020
Heating	-14%
Cooling	-16%
Electricity	-12%
Total	-14%

This building hosts administrative staff including from the Site Management Ispra. There is a strong commitment to lead by example.
A gradual and steady decrease in all the energy rates has been registered since 2016, except for the increase of cooling energy registered in 2020 (but down again in 2021).

Buildings 18p, central library

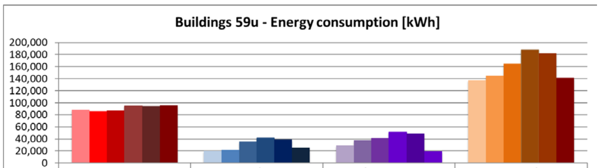


	Heating	Cooling	Electricity	Total
2016	174,233	68,055	81,078	323,366
2017	161,882	130,661	123,990	416,533
2018	155,089	144,242	134,257	433,588
2019	664,414	162,075	142,052	968,541
2020	549,279	196,674	142,426	888,379
2021	491,887	152,599	131,880	776,366

Type energy	2021 vs 2020
Heating	-10%
Cooling	-12%
Electricity	-7%
Total	-13%

This building hosts the central library and staff from the Directorate E, Space, Security and Migration. Also in this case all the figures decreased compared to 2020.

Buildings 59u, offices



	Heating	Cooling	Electricity	Total
2016	88,307	20,059	28,773	137,139
2017	86,126	21,566	37,403	145,095
2018	87,310	35,979	41,559	164,848
2019	94,925	41,918	51,162	188,005
2020	94,673	38,843	48,934	182,450
2021	96,045	25,712	19,522	141,279

Type energy	2021 vs 2020
Heating	1%
Cooling	-34%
Electricity	-60%
Total	-23%

The building hosts JRC.R.I.4 Infrastructure Unit offices. Values show that there were notable improvements with respect to 2020, mainly in the cooling and electric energy consumption.

G12 Tables

G12.1 Indicative climate conditions

Indicative climate conditions [1]	2014	2015	2016	2017	2018	2019	2020	2021
Heating degree days, heating required	2 346	2 568	2 611	2 934	2 655	2 617	2 681	2 806
Cooling degree days, cooling required	24	106	48	81	69	72	55	47
Total degree days	2 370	2 674	2 659	3 015	2 724	2 689	2 736	2 853
kWh/person/degree day [2]	**18. 7**	**16. 8**	**16. 29**	**14. 21**	**15. 9**	**15. 55**	**13. 38**	**13. 72**

(1) Local meteorological data (source: JRC - Ispra Atmosphere – Biosphere – Climate Integrated monitoring Station). Annual winter degree days (Jan-Feb-Mar-Apr-Oct-Nov-Dec), calculated as the difference between the hourly daily average temperature and the base temperature (20°C) taking into account only results >0. Annual summer cooling degree days (May-Jun-Jul-Aug-Sep), calculated as the difference between the hourly daily average temperature and the base temperature (26°C) taking into account only results >0.

(2) Using buildings energy consumption data for the Ispra site.

G12.2 Summary of main stakeholders' requirements to be addressed in the management system as obligations

Interested parties	Interested parties' Needs and expectations	EMS Obligation
- Competent bodies - Ecolabel-Ecoaudit Committee - National, regional, local authorities, environmental associations	- Legal compliance - Absence of significant environmental impacts related to JRC activities - Receive information on activities carried out by JRC and any potential environmental impact related to the territory. - Support and collaborations in various forms.	A. - Maintain EMAS registration, high commitment to respect legal aspects and possibly to go beyond (collaboration with ARPA) B. - Organise EMAS Round Table and bilateral meetings C. - Lead by example D. - Responsible management of the covid-19 crisis, thus ensuring non- critical workers at home E. - Subscription to the Sustainable Development Protocol of Region Lombardy including Yearly contribution to the Open Innovation forum of Region Lombardy. Keep updating EMS
Staff, Local staff committee (staff representatives)	- Continuity of the Organisation's activities - To have an environmental friendly and attractive site - Agreements - Scientific collaboration - Maintenance of adequate capacity for the remuneration of employees - Working in an organisation committed directly to reducing the environmental impact - To receive information over environmental management - Scientific and other site-related collaboration	Maintain EMAS registration, environmental awareness-raising and relative communication campaigns, training
DG (BXL) Head of Department I - Site Management Ispra	- Implementation of Environmental Policy and requirements as defined; - Legal compliance; - Minimising and management of environmental risks and impacts; - To maintain the EMAS registration; - Lead by example - To implement European Green Deal	Analysis and implementation of changes defined by ESC Apply Greening the Commission Communication
Other DGs	- Support research activities	Core business

Interested parties	Interested parties' Needs and expectations	EMS Obligation
	- Support policies, - Receive help in the development of Regulations and Directives related to environmental sustainability and environmental protection - Collaboration towards the implementation of the Green Deal	Communication to be implemented
EC Steering Committee (ESC) (BXL) EMAS Coordination Team (BXL)	- Implementation of Environmental Policy - Legal compliance; - Complete application of EMAS requirements - To maintain the EC EMAS registration; - implement decision taken within the EMAS SC and the EMAS Coordinators workshops - To implement European Green Deal	- EMAS Registration Analysis and implementation of changes defined by the ESC and EMAS Coordinators workshops - Analysis of DG CLIMA Study Communication to be implemented
Media	- Involvement, participation in environmental events organised by the JRC-Ispra - information on good practices - information about environmental objectives	Invitations to yearly EMAS Round Table Information on sustainable meetings and campaigns promoted by JRC Ispra.
Internal preparedness emergency bodies (ERSS)	- Share procedures that are well known and tested (drills) - Quick activation of established communication channels described in procedures	- Site Emergency Plan - Meetings with involved stakeholders - Drills
External preparedness emergency bodies (VVF, Prefettura, Questura, etc.)	- Share procedures that are well known and tested (drills) - Quick activation of established communication channels described in procedures	- Site Emergency Plan - Meetings with involved stakeholders - Drills - Agreement for mutual cooperation particularly in fire safety activities (VVF- JRC Ispra)
EMAS Round Table	- Legal compliance - Absence of significant environmental impacts related to JRC activities - Receive information on activities carried out by JRC that can support their needs. - - Support and collaborations in various forms.	- Signing agreements with environmental relevance with interested parties -Assessment of the needs and expectations of the stakeholder

G12.3 Summary of significant environmental aspects for the JRC-ISPRA site

Aspect group	Environmental aspect	Environmental impact	Activity, product or service	Indicator
1) Resources	Energy production	Energy sources consumption; Electric, thermal and cooling energy consumption	Heating, cooling, ventilation, electrical equipment and transport, tri-generation plant; non-nuclear scientific laboratories; site maintenance and infrastructures development; nuclear controlled areas	(1a) Total energy buildings (1a i) supplied (1a ii) mains supplied gas 1a vii) site generated renewable - PV, (1b) Total energy used by service vehicles (1c) Total non-renewable energy use
	Site activities		Electricity for lighting, IT devices, air conditioning units Electricity for yards	
	Buildings heating and cooling		Natural gas consumption for tri-generation, local heating and cooling	

Aspect group	Environmental aspect	Environmental impact	Activity, product or service	Indicator
2) Air	Air emissions (e.g. CO_2, NO_x, CO)	Air pollution, climate change	Buildings: HVAC and equipment maintenance Transport: work-related travel and commuting to work Site activity: tri-generation plant; non-nuclear laboratories; site maintenance and infrastructure development; nuclear controlled areas	(2a) Total office building emissions from energy (2c) Site vehicle CO_2 emissions (2d) Total air emissions for buildings (CO, NOx)
	HCFC and GHG gas emissions	Green House effect	Used in refrigerators and cooling systems	(2b) Refrigerant gases
3) Waste	Hazardous and non-hazardous waste production	Environmental impacts on soil, water, air, and use of natural resources connected to waste final management	Medical laboratories, sanitary installations, cleaning, maintenance, office activities, IT and catering,	(3a) Total non-hazardous waste (3b) Total hazardous waste (3c) Percentage of waste sorted
	Spills of hazardous substances from underground storage tanks, waste production	Soil and groundwater pollution, environmental impact related to final waste management	Presence of diesel tanks, generator sets in some buildings (above ground, or double-walled underground), spillage of chemicals / hydrocarbons during transport on the roads / yards of the site	Not applicable
	Spills of hazardous substances from waste storages	Soil and groundwater pollution		Not applicable
4) Water	Radioactive release in wastewater[26] following radiometric control (see paragraph G.4.3)	Water and soil pollution	Generated by nuclear controlled areas	Liquid radioactive effluents
5) Bio-diversity	Protection of flora, fauna e site natural environment	Impact on flora, fauna e site natural environment	In the context of the Commission's buildings policy (Life cycle approach) Variation of permeable/impermeable surfaces, felling of trees, damage to green areas	4a) Total use of land Total sealed area Total nature-oriented area on site Total nature-oriented area off site
6) Local aspects	Noise	Noise pollution	Generated by building renovation/repairs, staff travel and Commission car fleet, tri-generation engines	Indicator 2c / mobility plan
7) Other acrtivities on site	Construction and mainteinance activities (external operators))	Legal and internal environmental requirements	Construction and mainteinance activities on site	Not applicable

[26] See note 8 on page G15.

The analysis of significant environmental aspects identifies risks, opportunities and actions to be implemented, as listed hereunder.

Main risks:

- increasing cost of energy purchase or waste management;
- not complying with the Ispra-site's Environmental Policy;
- possible JRC-Ispra reputation loss.

Main opportunities:

- renovation of buildings with high energy consumption installations;
- reduction of costs for waste management;
- reduction of costs for procurement of goods, by implementing full circular economy principles.

Main actions to manage risks and opportunities:

- implementation of the Ispra Site Development Plan;
- increase communication to staff of energy saving behaviours;
- promote waste reduction activities, as well as those of waste separation.

G12.4 Carbon footprint elements (tonnes CO_2e/person)

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Scope 1: Fuel consumption and fugitive emissions									
Fuel for bldgs: mains gas	9.08	8.38	8.34	8.03	7.86	7.70	7.78	5.99	6.33
Fuel for bldgs: tanked gas (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel for bldgs: diesel	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Biomass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commission vehicle fleet	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01
Refrigerants	0.07	0.04	0.22	0.62	0.07	0.02	0.09	0.22	0.13
Scope 2: Purchased energy									
External electricity supply (grey),	0.53	0.19	0.23	0.35	0.44	0.39	0.00	0.00	0.00
External electricity supply contract (renewables), combustion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
District heating (combustion) (2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scope 3: Other indirect sources									
Fuel for bldgs: mains gas (upstream)	1.81	1.67	1.66	1.60	1.56	1.53	1.51	1.26	1.33
Fuel for bldgs: tanked gas (upstream) (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel for bldgs: diesel (upstream)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commission vehicle fleet (upstream)	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Site generated renewables (upstream) (3)	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03
External grey electricity supply, line losses	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00
External 'renewables' electricity contract (upstream with line loss	0.00	0.00	0.00	0.00	0.00	0.01	0.05	0.01	0.04
District heating (upstream) (2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Business travel: air (combustion) and JRC Navette	0.02	0.12	0.99	0.85	0.86	0.92	1.58	0.22	0.04
Business travel: rail (combustion)	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Business travel: hire car (combustion)	0.00	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00
Business travel: private car (combustion)	0.00	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.01
Experts' travel: air emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Experts' travel: rail emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commuting (combustion) (4)	0.00	1.38	0.62	0.62	0.62	0.62	0.60	0.17	0.24
Fixed assets - buildings	0.00	0.00	0.00	0.00	0.00	1.43	1.39	1.16	1.15
Fixed assets - IT	0.00	0.00	0.00	0.00	0.00	0.55	0.36	0.24	0.22
Fixed assests - Commission vehicles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paper supply	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
Service contracts	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.05	0.05
Catering	0.00	0.00	0.00	0.00	0.00	0.23	0.17	0.05	0.07
Own waste	0.00	0.00	0.00	0.00	0.00	0.18	0.17	0.02	0.03
Teleworking emissions (equipment electricity use)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
Teleworking emissions (fixed assets, equipment)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Teleworking emissions (space heating)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
Other upstream emissions (JRC Ispra)						0.07	0.06	0.06	0.06
Sum	**11.6**	**11.9**	**12.2**	**12.2**	**11.5**	**13.8**	**14.0**	**9.6**	**9.9**

EUROPEAN COMMISSION

Environmental Management System

EMAS
VERIFIED ENVIRONMENTAL MANAGEMENT
BE-BXL-000003

Environmental Statement 2022
2021 results
Annex H: DG SANTE at Grange

For further information on environmental performance in Grange please contact:

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Or visit EMAS page on My Intracomm EMAS system (europa.eu)

Foreword

2021 was the seventh year in which the Grange site was part of the European Commission's Eco-management and audit system (EMAS). Each year of the project, we have put in place measures to deliver on the Commission's targets but also to exploit the unique location of the Grange site.

We are located in the lush, green farmland of County Meath, Ireland where cattle farming is the main activity although sheep are not an uncommon sight in the fields around us.

We are particularly conscious of the agricultural setting of our site and take steps to ensure that our activities do not have a negative impact on our neighbours and the local environment. We include EMAS compliance as a feature of all contracts and look at how services to the 178 or so staff can be delivered in an eco-friendly way.

2021 has seen the arrival of twelve colleagues of the Irish Language Department of the Translation Directorate General and are now based permanently in Grange.

As in 2020, the pandemic situation has had a significant impact on last year’s performance. The decisions taken by the Commission, such as teleworking for non-critical staff and the application of measures to ensure a safer working environment, showed how quickly the Commission, as well as its staff, could adapt to extraordinary circumstances.

The different lockdowns imposed by the Irish Government (due to the Covid-19 pandemic), with as direct consequence the closure of the site, once again have disrupted our plans and therefore we played more a role of caretaker (ensuring that the building was maintained and kept in good order, ready to re-open when necessary).

Having said that, during the year 2021 we delivered a number of projects. In particular:

- Replacement of old watt high consumption lights with new LED low watt consumption lights on different places in our site (crèche; courtyard; reception hall; external bulkheads & emergency lighting).
- Once again big sections of our grassland (±3.75 ha) were left to grow into meadows, in order to allow plants and flowers to grow and provide nectar for insects such as bees, butterflies and hoverflies.

Not only have these initiatives had a positive impact for the Grange site but they have also raised the profile of the EMAS project with everyone in Grange and contributed to spreading the EMAS message further afield. For the EMAS team that is the best of outcomes.

(e-signed)
Maria Pilar Aguar Fernandez
Director
DG SANTE - Dir. F – Health and food audits and analysis

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ANNEX H: SANTE Grange

The European Commission's Health and Food Safety Directorate General (DG SANTE), has offices located at Grange (Dunsany) in County Meath in Ireland, some 45 kilometres north-west of Dublin, and approximately 10 kilometres south-east of Trim as shown in Figure H1.

Figure H1: DG SANTE at Grange, 45km NW of Dublin

There are approximately 178 staff, covering a range of administrative and technical activities. The working environment is typical of an administrative office.

The site is home of SANTE Directorate F – Health and food audits and analysis. A large proportion of staff conduct audits within Europe and beyond and therefore at any time many staff are on mission. Since 2021, twelve colleagues of the Irish Language Department of the Translation Directorate General have joined us and are now based in Ireland. The site is currently certified EMAS compliant and was included in the Commission's EMAS registration in 2015, 2016, 2017, 2018, 2019 & 2020. SANTE is responsible for overseeing facilities management and the implementation of EMAS on site.

In this document, the European Commission site will be referred to as SANTE Grange or simply Grange.

H1 Overview of core indicators at Grange

Grange has been collecting data on core indicators (mostly utilities) since it opened as a purpose built facility in April 2002. A summary of some of the main parameters from 2005 is presented below in Table H1, which focuses on data expressed per square metre, as staff numbers prior to 2014 are estimated.

Table H1 - Historical data, performance and targets for core indicators for Commission level reporting[1]

Physical indicators	Historic data values						Performance since:		Future targets		Future targets	
(Number, desciption and unit)	2005 (1)	**2014**	2018	2019	2020	2021	2005	2014	2014-23	2014-30	2023	2030
							Δ %	Δ %	Δ % (2)	Δ % (2)	value(2)	value (2)
1a) Energy bldgs (MWh/p)	10,21	12,69	10,75	11,27	9,88	8,57	-16,1	-32,5	-19,0	-34,0	10,28	8,38
1a) Energy bldgs (KWh/m^2)	199	227	192	198	171	152	-23,4	-32,8	-22,0	-39,0	177	138
1c) Non ren. energy use (bldgs) %	0,0	92,5	82,3	82,2	84,3	85,9		-7,1	-25,0	-36,0	69,4	59,2
1d) Water (m^3/p)	30,66	27,69	18,11	16,31	11,50	12,90	-57,9	-53,4	-45,0	-50,0	15,23	13,84
1d) Water (L/m^2)	597	495	324	287	199	229	-61,6	-53,7	-45,0	-50,0	272	248
1e) Office paper (Tonnes/p)	0,000	0,010	0,018	0,016	0,007	0,006		-42,0	-25,0	-30,0	0,008	0,007
1e) Office paper (Sheets/p/day)	0,0	9,9	18,7	16,5	6,8	6,0		-39,2	-25,0	-30,0	7,4	7,0
2a) CO_2 buildings (Tonnes/p)	4,18	4,91	3,69	3,58	3,20	2,78	-33,4	-43,3	0,0	0,0	4,91	4,91
2b) CO_2 buildings (kg/m^2)	81,4	87,8	66,0	63,0	55,2	49,5	-39,2	-43,6	-41,0	-74,0	51,8	22,8
2c) CO_2 vehicles (g/km, manu.) (3)	0	174	174	0	0	0		-100	0,0	0,0	0,0	0,0
2c) CO_2 vehicles (g/km, actual) (3)	0	174	174	0	0	0		-100				
3a) Non haz. waste (Tonnes/p)	0,000	0,251	0,253	0,230	0,088	0,085		-66,1	-10,0	-12,0	0,2	0,2
3b) Hazardous waste (Tonnes/p)	0,000	0,000	0,050	0,052	0,002	0,068						
3c) Unseparated waste (%)	0,0	0,0	5,2	7,4	4,2	5,6			-46,0	-82,0	0,0	0,0
3c) Unseparated waste (T/p)	0,0	0,0	0,0	0,0	0,0	0,0		-33,4	0,0	0,0	0,0	0,0
Economic indicators (Eur/p)												
Energy consumption (bldgs)	0	931	829	864	734	629		-32,4				
Water consumption	0,00	34,06	22,27	20,06	14,14	15,87		-53,4				
Non haz. waste disposal	0,00	0,00	0,00	0,00	0,00	0,00						
Note: (1) Earliest reported data, for a reduced scope of buildings (and not directly comparable with current scope)												
(2) Draft figures from the Global Anual Action Plan 2022												
(3) DG SANTE at Grange no longer has a site vehicle												

The site increased water consumption (per m^2 and per person) in 2021 compared with 2020 by an average 15% due to measures put in place (daily purges of the water pipework), in order to keep at bay legionella risks as a result of the building being closed for long periods. Instead, energy consumption for buildings and CO_2 emissions per square metre have continued to decrease. Energy and water consumption have fluctuated since the site opened. Poor roof insulation and window draughts were identified in an energy survey as primary causes contributing to our energy consumption. Major roof insulation works took place and were successfully finished at the end of 2017 and another large-scale joinery project of replacing all problematic windows started in 2018 and was finished in 2021.

The evolution of basic parameters of the EMAS system at Grange is shown below:

Table H2 - EMAS baseline parameters

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Population: total staff	188	186	189	182	179	180	190	188	179	176	173	178
Total no. operational buildings					3	3	3	3	3	3	3	3
Useful surface area for all buildings, (m^2)	10 010	10 010	10 010	10 010	10 010	10 010	10 010	10 010	10 010	10 010	10 010	10 010

H2 Brussels activities, context and key stakeholders, environmental aspects

H2.1 Activities

Most of the activities in Grange are classic administrative tasks. Other services, include cafeteria, restaurant, archives, a crèche and after school day care centre.

H2.2 Context – risks, and opportunities

Opportunities for improvement of the Environmental Management System and its effectiveness are identified in the same way as the identification of hazard and risk. Many of the internal and external factors which have the potential to harm the EMS may also have the potential to improve the system. We consider the risks and opportunities related to aspects and impacts on the environment, potential emergency situations, impacts on the organization from the environmental conditions, and business issues such as reputation, competitiveness and cost, both positive and negative. We also consider the risk that the EMS is not effective in achieving intended outcomes. Because of the serious threat that Covid-19, it was felt important to add its risk assessment to the list.

Table H3: Assessment of Environmental Risks

Assessment of Environmental Risks to European Commission Grange								
Scope of Risk Assessment: European Commission Grange Environmental Management System								
Legend:P * I = RR P = Probability (1-5)		**I = Impact (1-5)**			**RR = Risk Rating (1-25)**			
Risk Category	**Detail**	**P**	**I**	**RR**	**Actions to address Risk/Opportunities**	**P**	**I**	**RR**
Pandemic of class 3 or 4 biological agent	Covid 19 is a viral disease with the potential to spread widely in the community, cause serious illness or fatality and has no vaccine or cure.	3	5	15	Work from home from initial phase to at least 10th August 2020. Covid management plan, full compliance with legal requirements and government and HSE guidance (including Health Preservation and Protection and other Emergency Measures in the Public Interest Act 2020, Emergency Measures in the Public Interest (Covid-19) Act 2020) risk assessment, social distancing, severe restriction on numbers coming to site (employees and others), PPE, cleaning and disinfection, minimising touch points, personal hygiene, signs and posters, contact logging.	2	5	10
Risk of legal restrictions and/or the	Legal requirements changes, impacting on compliance or ability to conduct business (Risk)	2	4	8	The Commission monitors legal requirements and ensures compliance. Pegasus legal register is used to identify	2	3	6

H2.3 Stakeholders (interested parties), compliance obligations risks and opportunities

Grange is located in a rural setting in County Meath and is bounded by the local Gaelic Athletic Association (G.A.A.) grounds and club house, a research farm and centre which belongs to Teagasc (the National Agriculture and Food Development Authority) and other farm land. Teagasc is responsible for coordinating national research and development on cattle. According to its mandate, it seeks to ensure that production of Irish Beef is world class and therefore environmentally aware, safe for consumers while meeting best practice of animal health and welfare.

Additional local stakeholders include the Office of Public Works (OPW) which currently owns the site under a lease-purchase scheme and is located in the nearby town of Trim; the operator of the local water supply scheme, Kiltale Water Scheme, which supplies water to the site; Irish Water, which removes wastewater from the site; as well as the local authority, neighbours and local towns.

Contractors and employees are in continual communication with SANTE Grange. Employees also make suggestions through the suggestion scheme and other communication streams. On site contractors meet with the Commission regularly. The Facilities Management and Cleaning contractors have weekly meetings with the Commission. Other on-site contractors also meet regularly with the Commission.

In addition to local external stakeholders, SANTE Grange has a number of national and international stakeholders, including the Commission itself, the Member States of the EU, Irish national regulatory bodies such as the Environmental Protection Agency, the Health and Safety Authority and the Department of the Environment.

Figures H2.3a and H2.3b below show the main outcomes of the stakeholder analysis

Figures H2: Relative importance of issues for the Commission and for Stakeholders

Stakeholder Analysis

Importance to External Stakeholders		Important (Importance to the European Commission)	Very Important (Importance to the European Commission)
	Very Important	• Commission image • Economic contribution • Diversity • Local employment • Economic climate	• Infrastructure developed to meet current and future needs • Directorate Image • Competence, engagement and focus on staff • Sustainability impact in the local area • Recruitment and retention of key staff • Healthy and Safe Environment for employee well-being • Service value and innovation • Reliability of service • Impact of our services on health and food safety in the EU • Compliance with legislation • Impact of our business to local community, suppliers and contractors • Business ethics and values
	Important	• Excellence in implementing audit function • Greenhouse gas emissions • Waste management • Use of natural resources • Climate change	• Safe and healthy work environment and processes • Reputation • Ecological footprint • Maintaining standards • Risk Management

Figure H3: Importance of different issues by stakeholder

	Sustainable develop.	Business Continuity	Reputation	CSR	Infra-structure	Staff competence & engagement	Recruitment & retention key staff	Safe and healthy environment for staff & contractors	Service Value & Reliability	Legal compliance	Impact of business to local community, suppliers and contractors	Business ethics and values
European Commission, Brussels	Important	Very important	Very important	Very important	Important	Important	Important	Very important	Very important	Legal requirement	Important	Very important
Regulatory authorities - Operations	Important	Not important	Not important	Very important	Very important	Very important	Not important	Legal requirement	Not important	Legal requirement	Not important	Very important
Local community neighbours	Very important	Very important	Not important	Very important	Important	Very important	Very important	Very important	Not important	Very important	Very important	Very important
EU member states	Important	Very important	Important	Not important	Very important	Very important	Very important	Very important	Very important	Legal requirement	Not important	Very important
Employees	Very important	Very important	Very important	Very important	Very important	Very important	Very important	Legal requirement	Very important	Legal requirement	Very important	Very important
Suppliers /Contractors/Hauliers	Not important	Very important	Not important	Important	Not important	Not important	Not important	Legal requirement	Not important	Legal requirement	Very important	Very important
Insurers (EL/PL/ Property)	Important	Important	Not important	Not important	Important	Important	Important	Very important	Important	Important	Not important	Important
Utilities Suppliers	Not important	Important	Not important	Not important	Important	Important	Not important	Important	Not important	Legal requirement	Not important	Not important
Management System cert bodies	Important	Not important	Not important	Important	Important	Very important	Important	Very important	Important	Very important	Important	Very important

Red	Legal requirement
Orange	Very important
Green	Important
White	Not important

Figure H4: Aerial view of SANTE Grange

As shown in Figure H2.3, the site consists of one main rectangular building and several outbuildings set in a rural location. It includes a restaurant, café and crèche. There is a large conference facility which can accommodate major events, and which is in use most weeks of the year.

Notable features in the vicinity include a surface watercourse along the Teagasc boundary, which discharges into the River Boyne.

The Commission site also includes an old wastewater treatment plant, disused since October 2010, that still awaits decommissioning. The Commission has a lease/purchase arrangement with the OPW ending in April 2022 by which time the Commission will own the premises outright. Since October 2010 site wastewater discharges into the new mains sewer, part of the Kiltale sewage scheme, following the construction of a link from the Grange site.

H2.4 Environmental aspects

Examination and evaluation of Grange's environmental aspects and impacts, both direct and indirect under normal, abnormal and emergency conditions was developed in 2017. The identification of environmental impacts takes account of the organisation's current and past activities, products and/or services.

A summary of the preliminary analysis of aspects and impacts is presented below in Table H2.4, which also shows the related indicators and actions identified in the Commission's 2019 EMAS annual action plan that was adopted by the EMAS Steering Committee.

A study of the Grange environmental aspects was undertaken for the first time in 2014. This table is reviewed and updated every year, the results of which are summarised in the table H2.4.

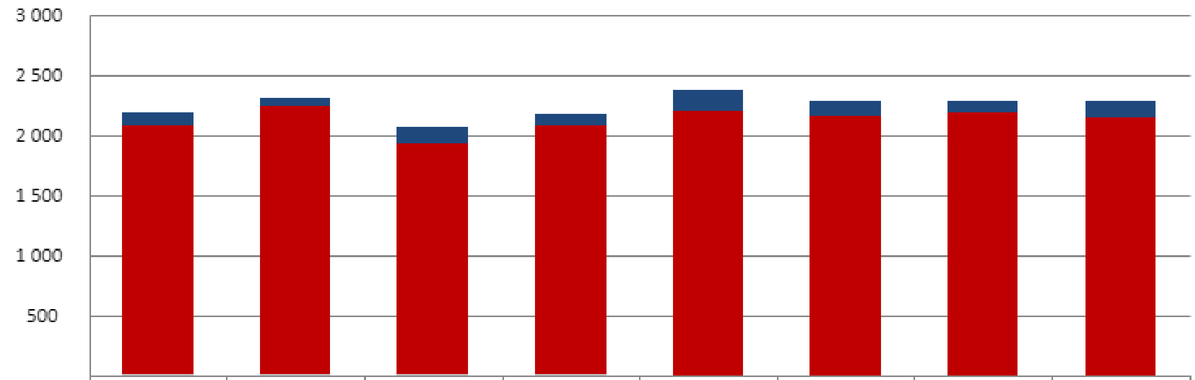
Table H4 – Summary of significant environmental aspects for the Grange site

Environmental aspect	Environmental impact	Activity, product or services	Indicator/Action plan	Significance Rating
Resource consumption (Energy – Electricity)	Energy production and usage has impacts on air and water quality as well as depletion of natural resources.	For office activities; facilities and all parts of the site	Electricity kWh. The site is monitoring and comparing electricity use from month to month and year to year to identify possible issues and opportunities. Electricity use for 2021 was 12% lower than 2020, continuing the improvement trend from previous years. The reduction in 2021 is due to a full 12-month period of Covid restrictions, whereas 2020 was restricted for 9 months. The lower occupancy levels on site wre partially responsible for the reductions in both 2020 and 2021. Solar tubes generate some electricity for hot water, particularly in summer months when they combine with Biogas boiler to provide hot water for the site, and avoid using the diesel boilers when possible.	**42**
Resource consumption (Energy – Oil)	Energy production and usage has impacts on air and water quality as well as depletion of natural resources.	Diesel is used for heating and hot water outside of the summer months.	Commission has installed gas oil burners which generates GHG. The burners are well maintained and serviced as required. Gas is also used on site. Gas oil use for 2021 was 8% lower than 2020, and 90% lower than the baseline figure in 2015. The overall pattern of use was similar with the expected dip in the summer months. Very low occupancy levels for 2020 and 2021 partially account for this reduction, but insulation projects have also made a contribution. Lifecycle considerations for fuels include sourcing of fuels and impacts on environment, depletion of resources, transport of fuel. Burning of fossil fuels creating CO2 emissions and other pollutants. Storage of fuel and risk of spillage or leak to ground water, soil or waterways. Reduction of fuel use will have an impact on the environment at each stage of the lifecycle and reduce the overall environmental load and risk.	**42**
Non-hazardous waste	Impacts are resource depletion in the re-use, recycling and recovery activities, and use of landfill. Impact on landfill is minimised by re-use, recycling and recovery.	Packaging materials, timber, metals, non-hazardous WEEE, food waste, paper	Impacts are resource depletion in the re-use, recycling and recovery activities, and use of landfill. Impact on landfill is minimised by re-use, recycling and recovery. The site has worked to reduce the impact of non-hazardous waste by improving segregation and recycling. Total non-hazardous waste levels for 2021 were up against 2020 by 15% (due to increased number of staff retiring and disposing of large numbers of old paper files/documents and disposal of large amounts of cardboard packaging following the installation of new VC material).	**42**
Water use	Upstream impact on treatment and delivery to site, including energy, land use, materials and chemicals. Downstream impacts include requirements related to water treatment and potential effects on the receiving environment.	Water is used for sanitary and kitchen requirements. Water is also used in utilities such as the boilers.	During its lifecycle water use has an upstream impact on treatment and delivery to site, including energy, land use, materials and chemicals. Downstream impacts include requirements related to water treatment and potential effects on the receiving environment. Water use during 2021 was 15% higher than 2020, but is still around 60% below the baseline figure for 2015. The increase was due to the additional full building flushing in order to keep legionella under control.	**24**

H3 More efficient use of natural resources

Buildings energy consumption data should be considered in the context of climatic conditions. Analysis of degree data suggests that climatic conditions were slightly less harsh in 2021 than in 2020.

Figure H5: Indicative climate conditions

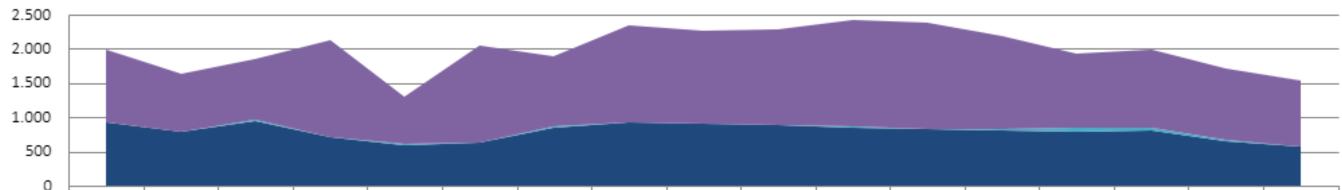


	2014	2015	2016	2017	2018	2019	2020	2021
Total degree days	2 179	2 297	2 056	2 173	2 376	2 276	2 278	2 279
Cold degree days (CDD)	110	63	128	105	185	115	102	140
Hot degree days (HDD)	2 069	2 234	1 928	2 068	2 191	2 161	2 176	2 139
kWh/person/degree day	5,82	5,86	6,09	5,33	4,53	4,95	4,34	3,76

H3.1.1 Energy consumption of buildings

Most of the energy requirements for the buildings are met from the electricity grid and from heating oil supplied on average three times per year and stored in an 85,000 litres bunded storage tank. There is no mains connection for gas on site because there is no such facility in the area. Bio-LPG is provided by two propane storage tanks and is used for cooking in the canteen and restaurant, and to heat the water on site during the period spanning from May to September when oil boilers are shut down. Heating oil has in recent years provided a larger share of the site's energy use than electricity.

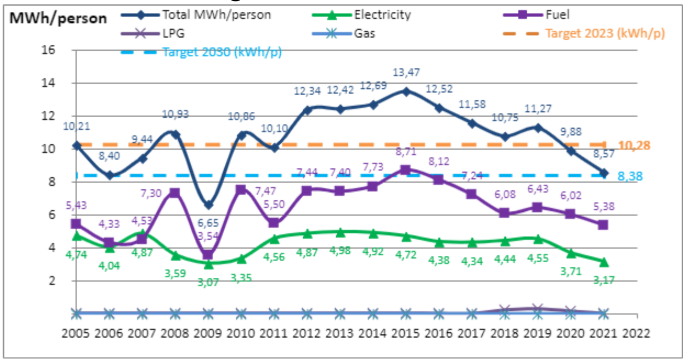
Figure H6: Annual buildings energy consumption (MWh) in the EMAS perimeter (indicator 1a)

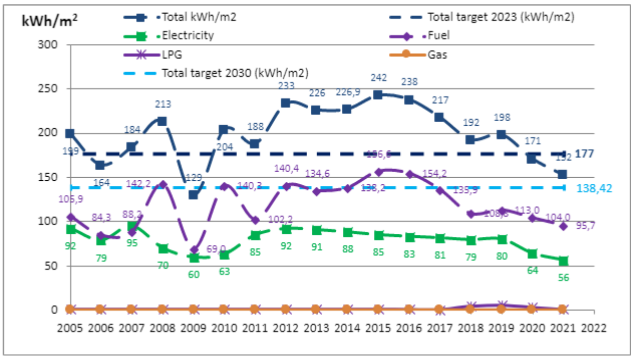


	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	1 991	1 639	1 841	2 131	1 296	2 041	1 878	2 333	2 260	2 271	2 425	2 378	2 177	1 925	1 983	1 709	1 525
Diesel	1 060	844	883	1 424	691	1 405	1 023	1 406	1 347	1 383	1 568	1 543	1 360	1 089	1 131	1 041	958
Mains supplied gas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Tank supplied gas	6,87	6,87	6,87	6,87	6,87	6,87	6,87	6,87	6,87	6,87	6,53	2,68	1,68	40,55	51,20	26,80	2,28
Electricity	924	788	951	700	598	630	848	920	906	881	850	832	815	795	801	641	565

Per capita and consumption per square metre are presented here below:

Figure 7 and 8: Evolution of total annual energy consumption for Grange EMAS buildings





In 2021 due to the covid-19 pandemic and the different lockdowns, few minor electrical projects took place and all involved the replacement of old lamp fittings with new LED ones.

The trends in energy consumption are largely related to external causes such as climate, seasons (natural light levels) and to office occupancy rates.

In 2021, COVID-19 continued to have a significant impact on the implementation of SANTE programme of audits and similar controls. Most of the on-the-spot activities continued to be done remotely; however, some of the controls were carried out on-the-spot. In 2021, the Directorate introduced a new category of controls - partially remote controls. These consist of remote assessment (office based) and an on-the-spot part in the country audited. (Unfortunately, the system now does not allow us for this type of controls to differentiate between the number of remote and on-the-spot audit days.)

Of the 217 audits and similar controls initially planned, 155 were carried out. These included 18 on-the-spot controls amounting to a total of 239 person-days of staff absence and 13 partially remote controls, resulting in 155 “audit days”.

Under those circumstances and the fact that although a low presence of staff on site, the office did remain open and fully functioning in order to facilitate the work of the daily present staff, the ±13% decrease in energy consumption for 2021 compared with 2020 is a positive outcome.

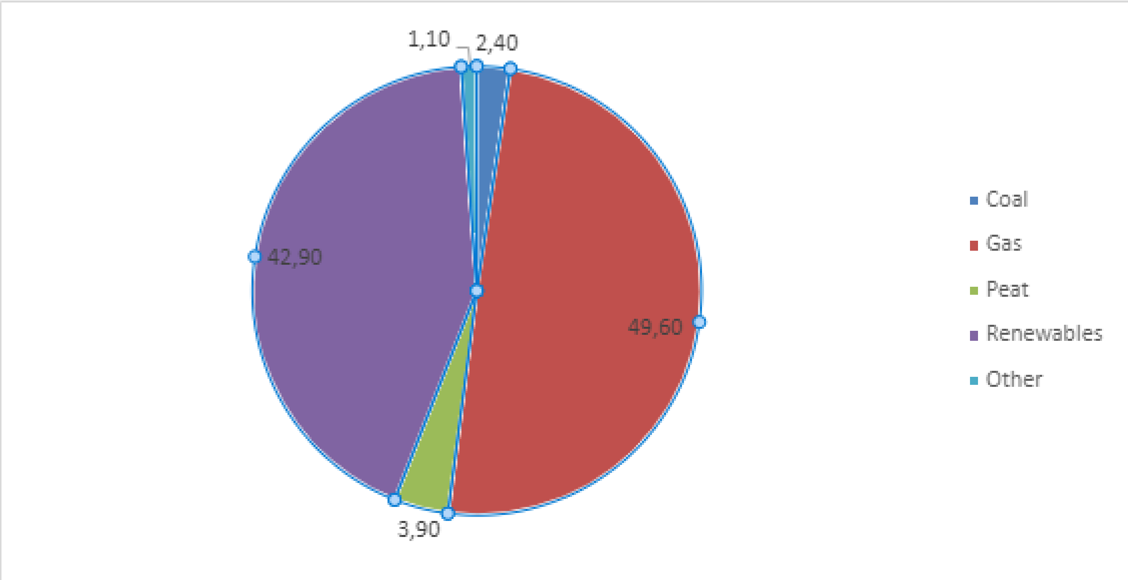
Indeed, when one examines our main type of energy (oil & electricity) separately, one realises that the single performances are encouraging even in a Covid-19 context:

- Electricity ± 11% reduction
- Fuel ± 8% reduction

H3.1.2 Renewable energy use in buildings

The composition of the grid electricity supply is shown in figure H9. Gas is still the most important component and renewables account for 42.90%.

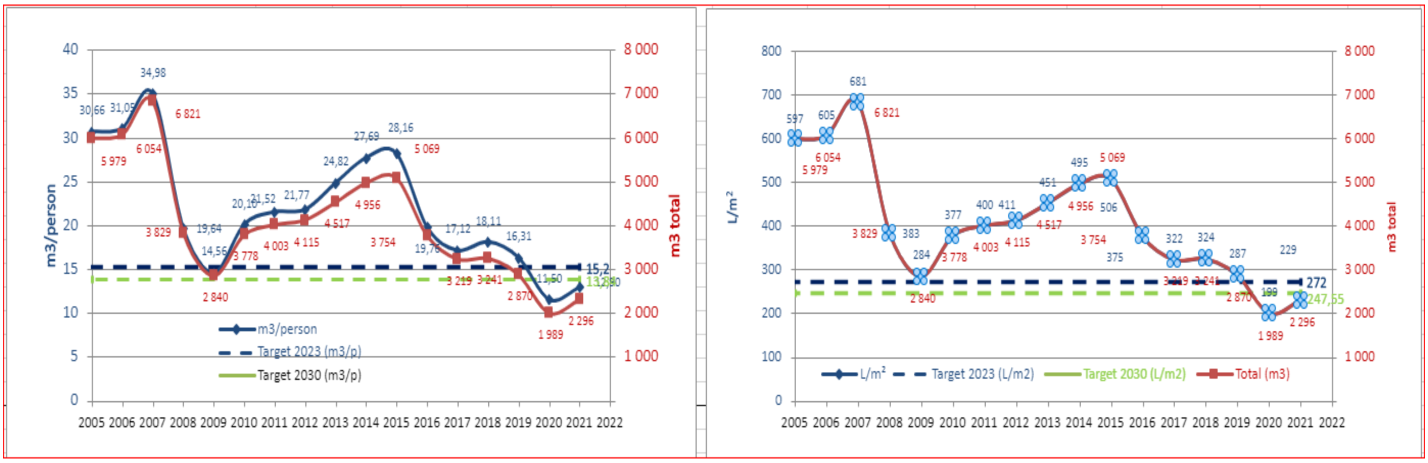
Figure H9: Renewable and non-renewable energy use in buildings (MWh and percentage of total)



H3.2 Water consumption of Commission buildings

The figures presented in this section are for Commission buildings only and do not include domestic water consumption due to homeworking under the COVID pandemic.

Figures H10 and H10a: Evolution of total annual water consumption for Grange EMAS buildings



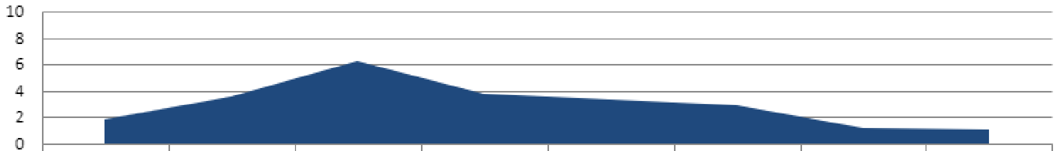
Figures H10 and H10a, show water consumption as a total and per square metre since 2005. 2021 has seen an increase in consumption of around 15% when compared with the previous year.

Indeed, in 2021 the building remained closed for long periods, as a consequence of Covid-19 lockdowns, and despite a stringent program of controlled flushing of the internal waterpipe system, legionella was detected and this brought as consequence additional full building flushing in order to keep it under control.

H3.3 Office paper consumption

The figures presented in this section are for Commission buildings only and do not include domestic paper consumption due to homeworking under the COVID pandemic.

Figure H11: Evolution in paper consumption at Grange



	2014	2015	2016	2017	2018	2019	2020	2021
Office (A4 sheet equivalent) x 1 Mil	0,38	0,76	1,34	0,80	0,71	0,61	0,25	0,23
Total paper consumption	1,839	3,54	6,254	3,74	3,3	2,87	1,16	1,06
Offset paper consumption (tonnes)	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Office paper consumption, (tonnes)	1,84	3,54	6,25	3,74	3,30	2,87	1,16	1,06

Paper usage in 2021 was 222,500 sheets, an average of 1,250 sheets/person, equivalent to 5.85 sheets per working day (± 220 working days/year), compared with the 2020 figures of 1,392.6 sheets/person = 6.33 sheets per working day. This is one of the positive effects of the Covid-19 situation. Indeed, as a direct consequence of staff not being on site, because the majority has been working from home, the printing of paper in 2021 has seen a decrease of ± 9.18% compared to 2020.

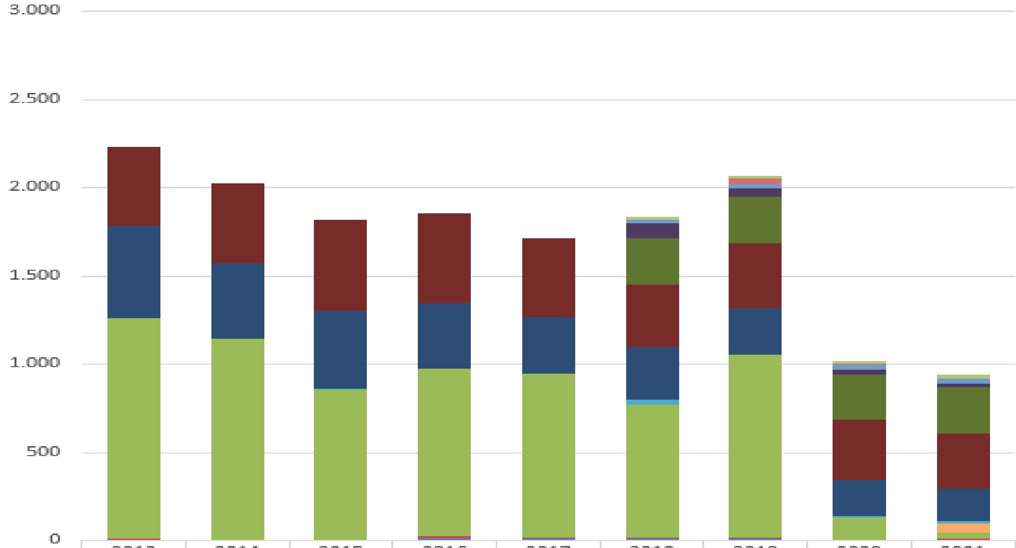
Since 2015 all printers and photocopiers have the option to print double sided set as a default. Since 2015, Grange followed other Commission sites in using $75g/m^2$ office paper instead of $80g/m^2$. In 2019 Grange moved to “paperless” signataires, better exploiting the possibilities of Ares.

H4 Reducing carbon footprint and air emissions

H4.1 Overall Carbon footprint

Emissions associated with energy supply for the buildings still account for virtually half of all the CO_2 emissions evaluated for the site. Business air travel emissions have substantially decreased when compared with previous year 2020, due to the fact that only a limited number of missions took place in 2021 due to the different travel bans, restrictions and lockdowns imposed by the Covid-19 situation.

Figure H12: Grange carbon footprint 2013-21 (tonnes CO2e)



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	2.229	2.027	1.823	1.856	1.717	1.834	2.073	1.020	941
Own waste	0	0	0	0	0	13	17	17	17
Catering	0	0	0	0	0	0	34	4	4
Service contracts	0	0	0	0	0	21	23	29	29
Paper supply	0	0	0	0	0	3	3	1	1
Fixed assets - Commission vehicles	0	0	0	0	0	0	0	0	0
Fixed assets - IT	0	0	0	0	0	83	50	24	23
Fixed assets -buildlings	0	0	0	0	0	258	258	258	258
Buildings - fuel for heating	445	456	519	510	449	359	366	337	310
Buildings - electricity	526	421	439	367	319	293	264	209	186
Buildings - district heating/cooling	0	0	0	0	0	0	0	0	0
Buildings coolant losses	0	0	5	0	0	34	0	8	12
Teleworking emissions						0	0	0	51
Vehicle fleet fuel consumption	0	0	0	0	0	0	0	0	0
Missions air (RFI=2)	1.248	1.142	853	953	927	747	1.035	128	37
Missions excluding air	10	7	7	12	7	7	7	0	9
Experts' travel	0	0	0	0	0	0	0	0	0
Staff commuting	0	0	0	14	14	14	14	4	4

Table H5: Per capita CO2 or equivalent (CO2e) emissions 2013 to 2021 by scope (tonnes)

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Scope 1: Fuel consumption and fugitive emissions									
Fuel for bldgs: mains gas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: tanked gas (1)	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel	2,00	2,09	2,35	2,19	1,95	1,64	1,71	1,60	1,43
Biomass	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Commission vehicle fleet	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Refrigerants	0,00	0,00	0,03	0,00	0,00	0,19	0,00	0,05	0,07
Scope 2: Purchased energy									
External electricity supply (grey),	2,66	2,17	2,25	1,78	1,56	1,51	1,37	1,11	0,95
External electricity supply contract (renewables), combustion	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
District heating (combustion) (2)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Scope 3: Other indirect sources									
Fuel for bldgs: mains gas (upstream)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: tanked gas (upstream) (1)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel (upstream)	0,44	0,46	0,52	0,49	0,43	0,37	0,37	0,35	0,31
Commission vehicle fleet (upstream)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Site generated renewables (upstream) (3)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
External grey electricity supply, line losses	0,23	0,18	0,19	0,15	0,13	0,13	0,14	0,10	0,08
External 'renewables' electricity contract (upstream with line loss)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
District heating (upstream) (2)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Business travel: air (combustion)	6,86	6,38	4,74	5,01	4,93	4,17	5,88	0,74	0,21
Business travel: rail (combustion)	0,01	0,00	0,01	0,01	0,00	0,00	0,00	0,00	0,01
Business travel: hire car (combustion)	0,05	0,04	0,03	0,06	0,04	0,04	0,04	0,00	0,01
Business travel: private car (combustion)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,04
Experts' travel: air emissions	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Experts' travel: rail emissions	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Commuting (combustion) (4)	0,00	0,00	0,00	0,07	0,08	0,08	0,08	0,02	0,02
Fixed assets - buildings	0,00	0,00	0,00	0,00	0,00	1,44	1,47	1,49	1,45
Fixed assets - IT	0,00	0,00	0,00	0,00	0,00	0,47	0,28	0,14	0,13
Fixed assets - Commission vehicles	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Paper supply	0,00	0,00	0,00	0,00	0,00	0,02	0,02	0,01	0,01
Service contracts	0,00	0,00	0,00	0,00	0,00	0,12	0,13	0,16	0,16
Catering	0,00	0,00	0,00	0,00	0,00	0,00	0,19	0,02	0,02
Own waste	0,00	0,00	0,00	0,00	0,00	0,07	0,09	0,10	0,09
Teleworking emissions (equipment electricity use)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,12
Teleworking emissions (fixed assets, equipment)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Teleworking emissions (space heating)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,16
Sum	**12,2**	**11,3**	**10,1**	**9,8**	**9,1**	**10,2**	**11,8**	**5,9**	**5,3**

Notes

(1) Grange is the only site with tanked gas rather than mains gas

(2) Not all Commission sites

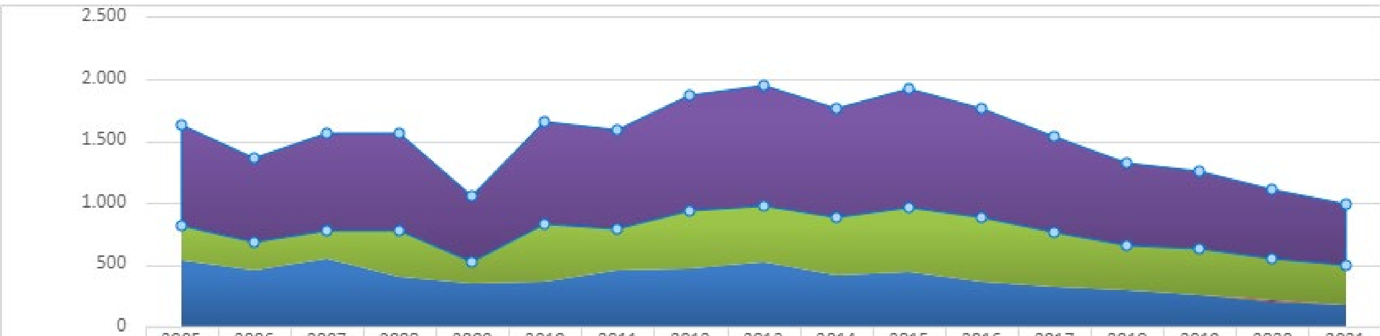
(3) Can include Commission bus service when appropriate

(4) Geothermal, biomass, PVs

Buildings' emissions from energy use

Most of the energy requirements for the buildings are met from the electricity grid and from heating oil supplied on average three times per year and stored in an 85,000 litres bunded storage tank. There is no mains connection for gas on site because there is no such facility in the area. Bio-LPG is provided by a propane storage tank and is used for cooking in the canteen and restaurant, and to heat the water on site during the period spanning from May to September when oil boilers are shut down. Heating oil has in recent years provided a larger share of the site's energy use than electricity.

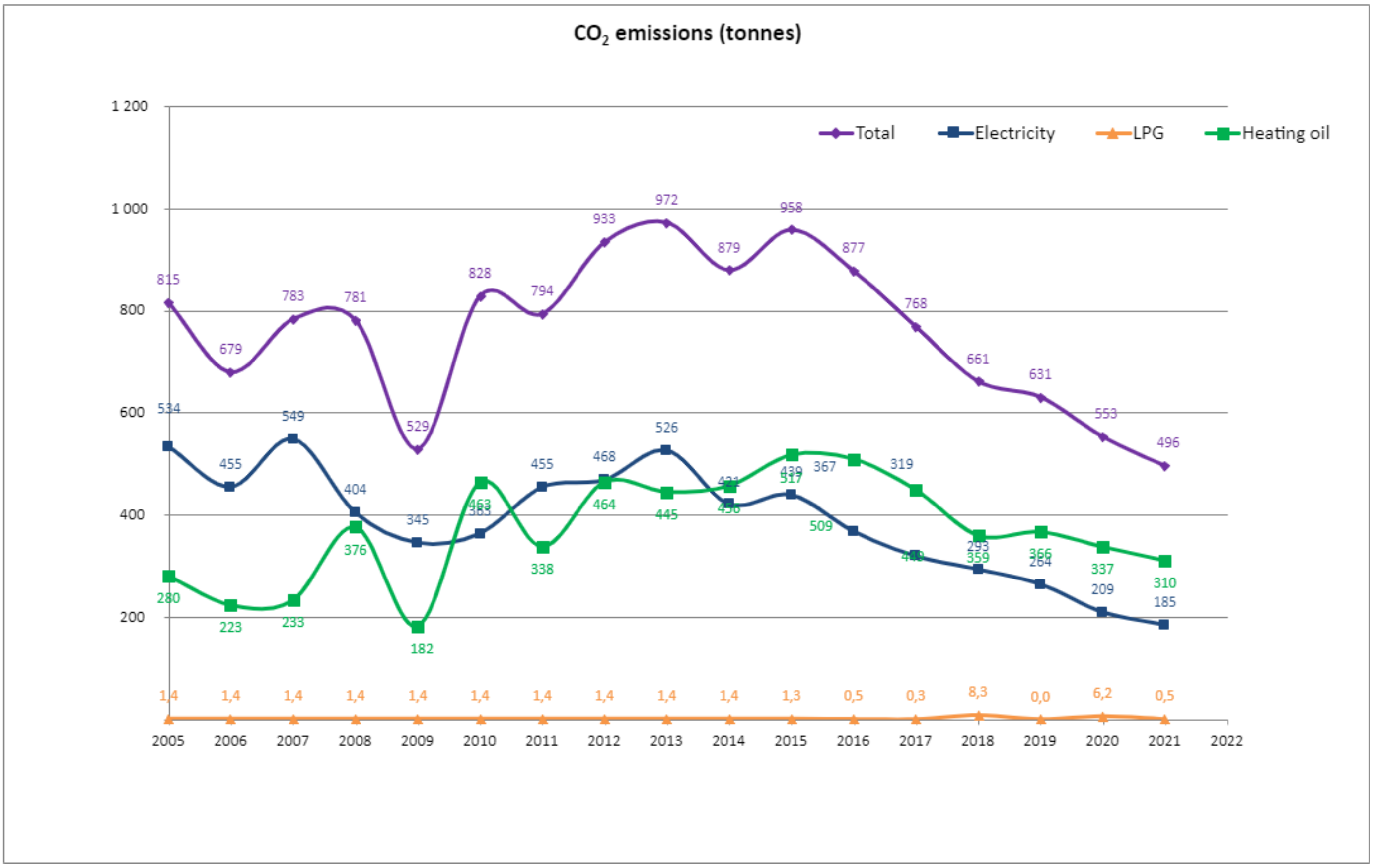
Figure H13: CO2 emissions from buildings energy consumption at Grange, 2005-2021

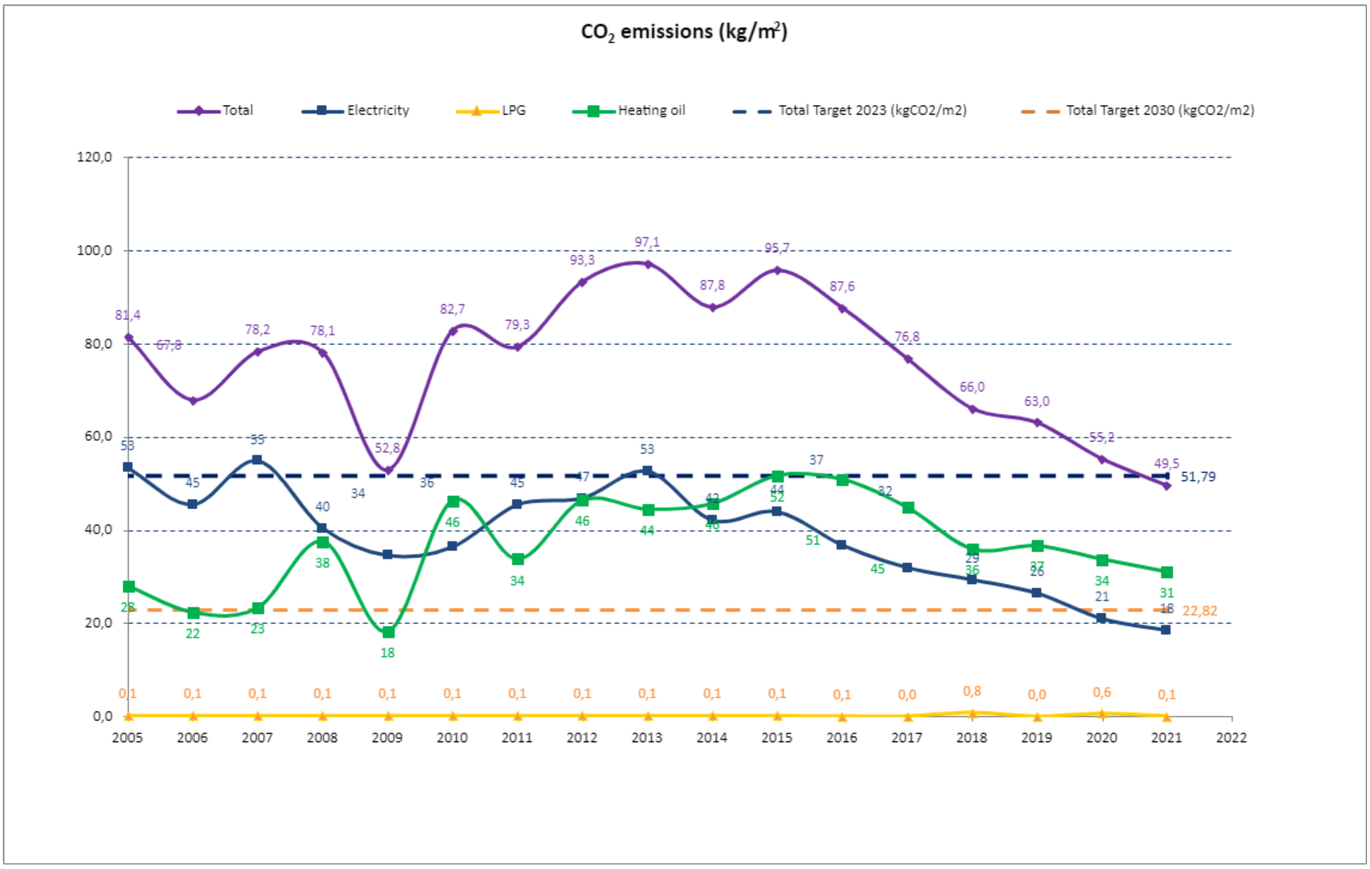


	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	815	679	783	781	529	828	794	933	972	879	958	877	768	661	631	553	496
Diesel	280	223	233	376	182	463	338	464	445	456	517	509	449	359	366	337	310
Tanked gas	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,33	0,55	0,34	8,27	0,00	6,16	0,52
Electricity	534	455	549	404	345	363	455	468	526	421	439	367	319	293	264	209	185

Per capita and consumption per square metre are presented in figures H13 and H14.

Figure H14 and H14a: C02 emissions from buildings energy consumption





2021 has seen a decrease of 14% in CO2 emissions compare 2020. Heating oil and electricity still account for the majority of the CO2 production of the site. CO_2 emissions Kg/M² in 2021 went down by 6 Kg because of the electricity performances (3 Kg) and 3 Kg from oil.

H4.1.1 Fugitive emissions from Commission buildings (refrigerant/coolants)

A loss of 4.36 tonnes CO_2 of refrigerants R449A (freezer room main kitchen – 3.91 tCO_2e) and R32 (cassette pre-school room – 0.45 tCO_2e) were recorded in 2021, following the F-gases maintenance schedule:

1. air conditioning units (quarterly/six-monthly and annually depending on capacity);
2. main kitchen freezers and fridges (six-monthly and annually); and
3. the two main Hitachi chillers for the air-conditioning system in the main conference rooms (monthly and annually) and, although they are rarely used, they are maintained in operational condition.

H4.1.2 Staff travel for missions

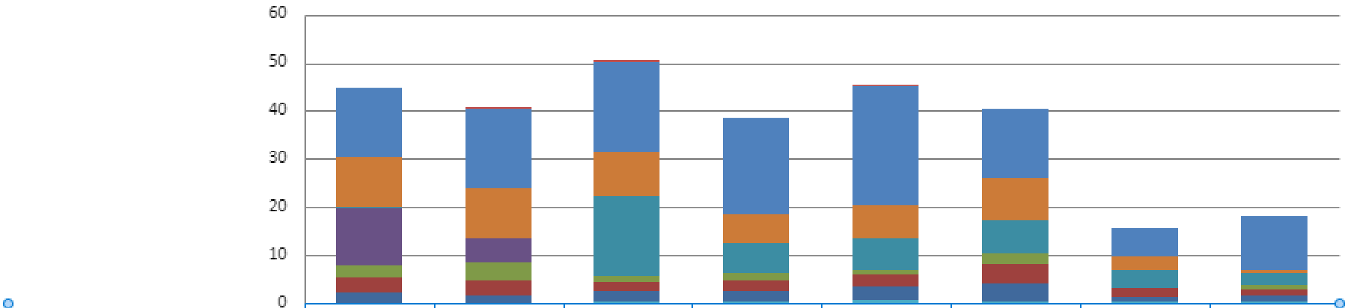
Missions within the EU and to third countries are part of SANTE Grange's core business. All missions carried out are part of an approved work programme of official controls and, in setting priorities; every effort is made to ensure that the missions carried out are essential. At the same time SANTE has invested in improvements to its video conference (VC) facilities to allow meeting take place without the need to travel, particularly between colleagues in SANTE's three locations (Brussels, Luxembourg and Grange).

H5 Improving waste management and sorting

H5.1 Non hazardous waste

Waste generation is an environmental aspect with significant impact, and the evolution of waste generation since 2014 is shown below.

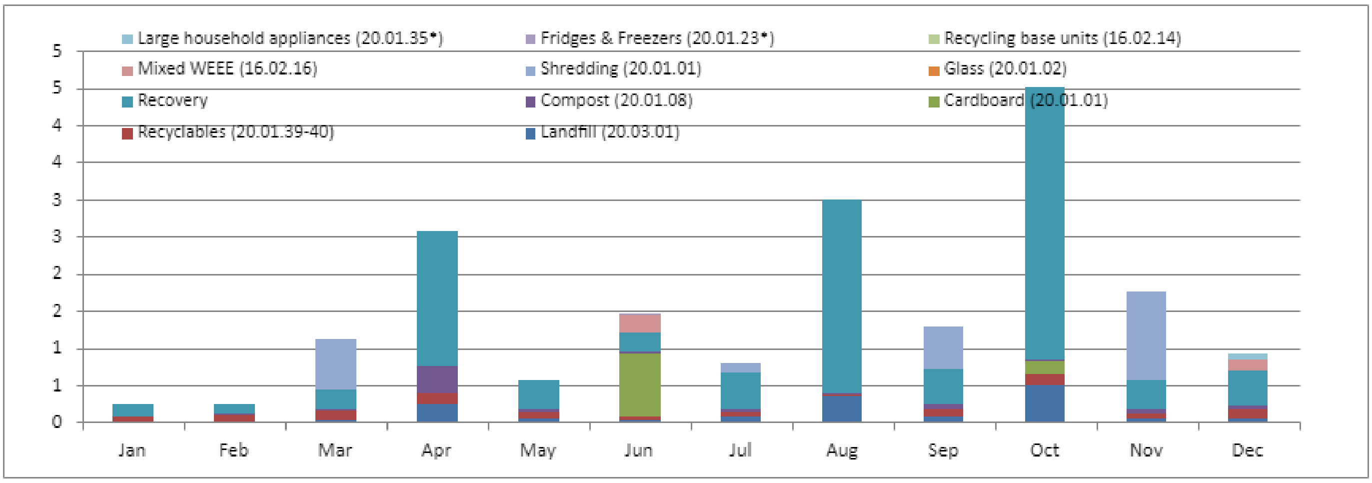
Figure H15: Evolution of total non-hazardous waste generation at Grange (tonnes)



	2014	2015	2016	2017	2018	2019	2020	2021
Total non hazardous waste, (tonnes)	45,00	40,50	50,22	38,67	45,22	40,42	15,15	18,17
Total non haz.waste (tonnes/person)	0,251	0,225	0,264	0,206	0,253	0,230	0,088	0,102
Glass (20.01.02)		0,065	0,130	0,000	0,070	0,000	0,000	0,000
Recovery*	14,57	16,62	18,79	20,08	24,66	14,22	5,92	11,10
Compost (20.01.08)	10,30	10,31	8,96	5,96	7,08	8,91	2,87	0,73
Shredding (20.01.01)	0,33	0,00	16,66	6,47	6,37	6,79	3,54	2,56
Paper (20.01.01)	11,95	5,08	0,00	0,00	0,00	0,00	0,00	0,00
Cardboard (20.01.01)	2,44	3,75	1,29	1,36	1,03	2,36	0,00	1,04
Recyclables (20.01.39-40)	3,10	3,17	1,95	2,32	2,61	4,03	2,17	1,01
Household waste, landfill (20.03.01)	2,31	1,51	2,01	2,25	2,84	3,65	0,65	1,53
Mixed WEEE (16.02.16)			0,428	0,188	0,520	0,354	0,504	0,200
Recycling base units (16.02.14)				0,042	0,042	0,042	0,000	0,000

As direct consequence of the 2021 Covid-19 lockdowns, restrictions and very low numbers of people present on site, the trend of decrease of non-hazardous waste generation compared to 2019 has continued, but registered a 23% increase when compared with 2020 results.

Figure H16: Monthly breakdown of waste in 2021 (tonnes)



H5.2 Hazardous waste

In 2021 12 tonnes of hazardous waste were collected. There was 11,860 kg of oily water from oil/water separators, 20 kg of fluorescent tubes, 8 kg of batteries, 12 kg of toner and 222 kg of other discarded containing hazardous products.

H6 Protecting biodiversity

The dimensions of the Grange site are shown in the plate to the left, from which the footprint is calculated at approximately 8,5 ha within which the constructed area is about 0, 55ha. Owing to its rural location, preserving and promoting biodiversity is very important. The site is sparsely populated, a staff member occupies on average 477 m² of the site or 56,7m^2 of the built up area.

The main action regarding the protection and enhancement of our bio-diversity, after the signature of a contract for submission of a multi-annual plan, was to let a big sections of our grassland (±3.75 ha) grow into a meadow, in order to allow plants and flowers to grow and provide nectar for insects such as bees, butterflies and hoverflies. Unfortunately, due to the prolonged Covid-19 lockdowns it was not possible to put in place other parts of the plan (e.g. creation of two pollinators sections). Having said that, our meadows have grown and their harvesting has been quite successful and productive (see picture below).

H7 Green Public Procurement

H7.1 Incorporating GPP into procurement contracts

Action 54 of the Commission's Global Annual Action Plan has, since 2012, sought to integrate systematically GPP or environmental criteria in calls for tender's terms of reference and technical specifications.

All tenders for the Grange site incorporate GPP. In 2021 a tender for Supply of 100% Green electricity was launched and contains reference in the technical specification to EMAS. SANTE envisages using a three level classification of the tenders (green, not green and green by nature), which should give sufficient detail in the analysis of the environmental criteria

H8 Demonstrating legal compliance and emergency preparedness

H8.1 Managing the legal register

A procedure for maintaining the legal register has been in place since late 2014. The Register of Environmental Legislation is reviewed and updated continually by an external consultancy[2]. The responsible SANTE personnel receive automatic email updates relating to new or changing legislation and ensure that there is appropriate follow up.

For each piece of legislation, the Legal Register provides:

1. Full title of legislation;
2. Reference number;
3. Purpose of the Act/Regulation/Directive; and
4. Summary of the Act/Regulation/Directive.

The Register of Environmental Legislation is divided into the following sections:

1 - General Environmental Legislation
2 - Water
3 - Waste
4 - Air Pollution
5 - Physical Planning
6 - Noise
7 - Energy
8 - Dangerous Substances
9 - Emergency Preparedness
10 - Habitats and Eco systems
11 - Existing Licences, Planning Permissions and EMS Policy

Unlike most other Commission EMAS sites, Grange does not require a permit to operate. It does require a fire safety certificate and a planning permit. Legal compliance is demonstrated through the responses the site provides to legislation specific questionnaires which generate scores. The Grange site is compliant with all relevant legislation. SANTE Grange monitors the findings of EMAS internal and verification audits and, in co-operation with DG HR's EMAS coordination unit, ensures that all non-conformities and scopes for improvement are monitored and that remedial actions are taken to close them.

H8.2 Prevention and risk management

The site implements a programme of environmental incident prevention based on its evaluation of environmental aspects and impacts, and on the identification of potential emergency conditions or abnormal incidents related to each aspect. The main aspects likely to give rise to an accident or incident are:

1. Waste management on site and off site: Waste management procedures have been implemented and authorised and approved waste management contractors identified and employed through the Facility Management contractor. Dedicated storage areas for specific wastes are maintained, including a fluorescent tubes “coffin”, food waste containers, recyclable waste containers, general waste containers.
2. Hazardous materials: Diesel is stored in a bunded overground 85 000 litre tank. The bund is subject to three yearly hydrostatic testing, in accordance with Environmental Protection Agency guidelines, by a competent engineering contractor. Paints, water treatment and cleaning materials are stored in small quantities and provided with secondary containment. A liquid propane gas (Bio-LPG) tank on site is subject to maintenance and periodic testing by the supplier, who also own the tank.

[2] www.pegasuslegalregister.com.

3. Air emissions: Regular maintenance and annual emissions testing of the boilers ensures that emissions remain as low as possible.
4. Discharges to water: Polluted discharge to ground and surface water is prevented by primary and secondary containment of all hazardous wastes and hazardous materials and substances on site. Discharges to sewer are from sanitary and cooking facilities. The kitchen sinks drain through a grease trap which is regularly serviced and emptied. Cleaning chemicals are low or non-hazardous and are diluted in use.
5. Use of resources: Utilities and waste consumption are monitored each month and variances from expected levels are investigated.
6. Contractors: All contractors used by the site are subject to approval based on competence and environmental probity. Contractors are also regularly audited and operational audits include environmental requirements and considerations. Key on site Facilities Management and security contractors are certified to ISO 14001.

The preventive measures outlined above protect the local ecosystems and habitats. Furthermore, measures to encourage wild life and bees on site and to prevent damage to healthy trees and wildlife have been also implemented.

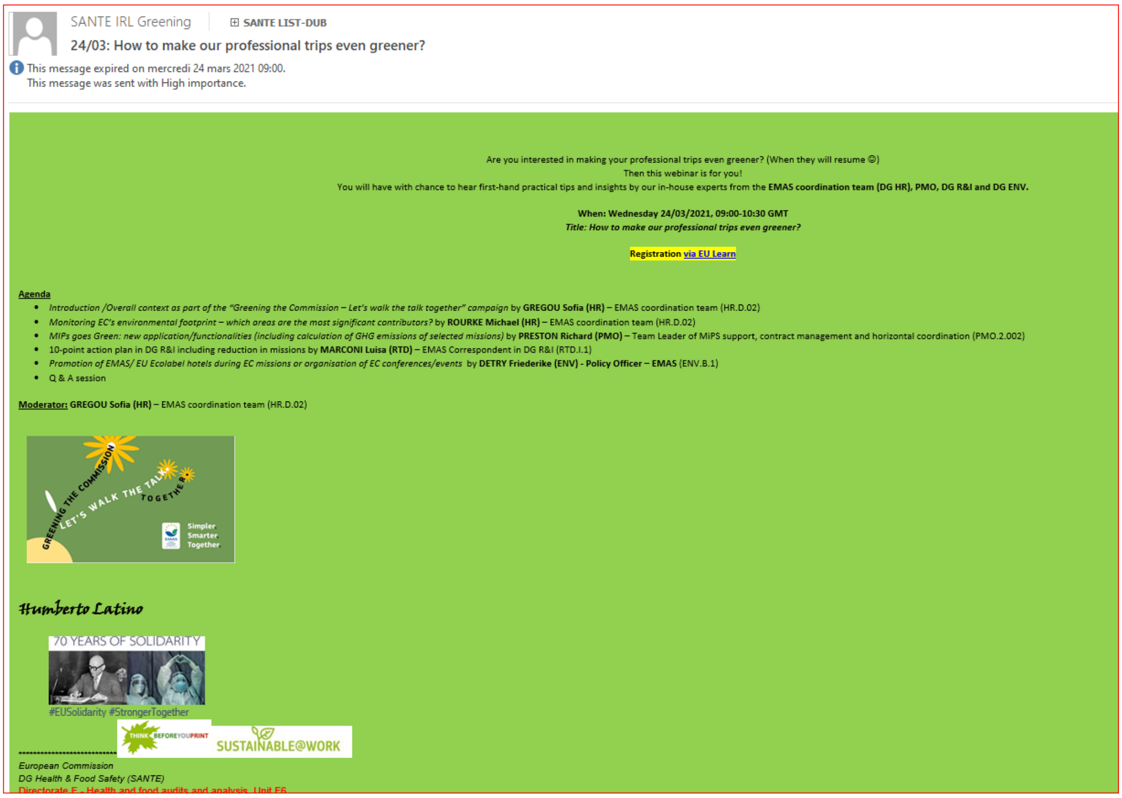
H8.3 Emergency preparedness

The Emergency Plan was updated in 2021. Last update was done on the 17/02/2021.

H9 Communication and training

H9.1 Internal and external communication

Staff was invited to participate to the webinar organised by DG HR "*Are you interested in making your professional trips even greener?*" that took place on the 24/03/2021 (see copy of invitation here below).



SANTE IRL Greening | SANTE LIST-DUB

24/03: How to make our professional trips even greener?

This message expired on mercredi 24 mars 2021 09:00.
This message was sent with High importance.

Are you interested in making your professional trips even greener? (When they will resume ☺)
Then this webinar is for you!
You will have with chance to hear first-hand practical tips and insights by our in-house experts from the **EMAS coordination team (DG HR), PMO, DG R&I and DG ENV.**

When: Wednesday 24/03/2021, 09:00-10:30 GMT
Title: How to make our professional trips even greener?

Registration via EU Learn

Agenda

- *Introduction /Overall context as part of the "Greening the Commission – Let's walk the talk together" campaign* by **GREGOU Sofia (HR) –** EMAS coordination team (HR.D.02)
- *Monitoring EC's environmental footprint – which areas are the most significant contributors?* by **ROURKE Michael (HR) –** EMAS coordination team (HR.D.02)
- *MIPs goes Green: new application/functionalities (including calculation of GHG emissions of selected missions)* by **PRESTON Richard (PMO) –** Team Leader of MiPS support, contract management and horizontal coordination (PMO.2.002)
- 10-point action plan in DG R&I including reduction in missions by **MARCONI Luisa (RTD) –** EMAS Correspondent in DG R&I (RTD.I.1)
- *Promotion of EMAS/ EU Ecolabel hotels during EC missions or organisation of EC conferences/events* by **DETRY Friederike (ENV) - Policy Officer – EMAS** (ENV.B.1)
- Q & A session

Moderator: **GREGOU Sofia (HR)** – EMAS coordination team (HR.D.02)

Humberto Latino

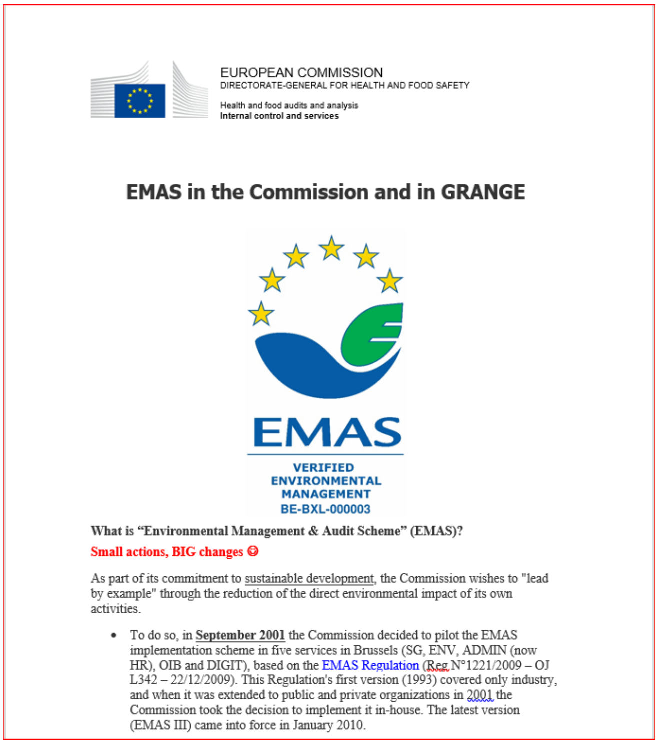
#EUSolidarity #StrongerTogether

****

European Commission
DG Health & Food Safety (SANTE)
Directorate F - Health and food audits and analysis, Unit F6

H9.2 Internal and external training

An introductory EMAS training course is provided for newcomers. The objective is to raise awarness and knowledge of EMAS in Grange among our staff and to ensure that EMAS is taken into account in all aspects of our day to day life on site.


EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR HEALTH AND FOOD SAFETY
Health and food audits and analysis
Internal control and services

EMAS in the Commission and in GRANGE

What is "Environmental Management & Audit Scheme" (EMAS)?

Small actions, BIG changes ☺

As part of its commitment to sustainable development, the Commission wishes to "lead by example" through the reduction of the direct environmental impact of its own activities.

- To do so, in **September 2001** the Commission decided to pilot the EMAS implementation scheme in five services in Brussels (SG, ENV, ADMIN (now HR), OIB and DIGIT), based on the EMAS Regulation (Reg N°1221/2009 – OJ L342 – 22/12/2009). This Regulation's first version (1993) covered only industry, and when it was extended to public and private organizations in 2001 the Commission took the decision to implement it in-house. The latest version (EMAS III) came into force in January 2010.

H10 EMAS Costs and savings, conversion factors

H10.1 Costs and savings

For several years we have monitored the costs associated with running EMAS in terms of staff time, and the cost of supporting contracts and savings. We have also estimated costs associated with parameters such as energy and water consumption. Costs and energy savings are presented below.

Table H6: EMAS costs and savings (EUR)

Parameter	Costs												Change in
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	last year
Total Direct EMAS Cost (EUR)	0	0	0	0	47.400	47.900	48.356	49.356	51.856	56.100	56.600	57.850	1.250
Total Direct Cost per employee	0	0	0	0	265	266	255	263	290	319	327	325	-2
Total buildings energy cost (Eur)	0	0	0	0	166.604	174.867	171.230	160.324	148.396	152.066	126.979	111.970	-15.009
Total buildings energy cost (Eur/person)	0	0	0	0	931	971	901	853	829	864	734	629	-105
Total water costs (Eur)	0	0	0	0	6.096	6.235	4.617	3.959	3.986	3.530	2.446	2.824	378
Water (Eur/person)	0	0	0	0	34	35	24	21	22	20	14	16	-6

H10.2 Conversion factors

Table H7: Conversion factors used in producing data for the Grange site

Parameter and units	2005	2014	2015	2016	2017	2018	2019	2020	2021
kWh of energy provided by one litre diesel (1)		10,89	10,89	10,89	10,89	10,89	10,62	10,58	10,58
Paper Density (g/m2)		78,63	75	75	75	75	75	75	75
Kgs CO2 from 1 kWh of electricity (2)	0,532	0,44	0,476	0,407	0,361	0,34	0,3	0,3	0,3
Kgs CO2 from 1 kWh tanked gas (3)	0,20	0,20	0,20	0,20	0,20	0,20	0,21	0,21	0,21
Kgs CO2 from 1 kWh diesel (1)	0,27	0,27	0,27	0,27	0,27	0,27	0,266	0,266	0,266
Kgs CO2 from one litre of diesel (3)		2,50	2,50	2,50	2,50	2,50	2,50	2,50	2,50
Kgs CO2 from one litre of petrol (3)		2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28
Annual cost of one FTE (EUR) (4)		132 000	134 000	134 000	138 000	148 000	150 000	152 000	157 000
Conversion 1 Litre heating oil = x kwh	10,169	10,169	10,169	10,169	10,169	10,169	10,169	10,169	10,169
Notes									
1) Neil Packer, Staffordshire University UK - 2011									
2) Electricity bills (2010-2017)									
3) Base ADEME 2017									
4) Value from DG BUDG Finance Unit Network for beginning of year									

H11 Site breakdown: Buildings' characteristics and performance (selected parameters, indicative data)

Building	Address	Occupant	Construction Yr	EMAS registration	Useful surface area (m2)	Staff	Office	Café	Self rest	Creche/ child care	Printing and mail sorting	Medical service	Depot, large storage	Workshop	Sports/ recreation centre	IT Server centre	Power generation	Water treatment plant	Lab/experimental (non nuclear)	Nuclear lab/experimental	Electricity	Mains gas	Other gas	Diesel	District heating	District cooling	Site renewable solar	Site renewable biomass	Water (m3)	Non hazardous waste (tonnes)	Hazardous waste (tonnes)	Wastewater discharge (industrial)
1) Building essential details 2021:							2) Building use 2021														3) Energy sources and amount (MWh for 2021								4) Water and waste consumption			
GRANGE																																
GRAN	Grange, Kiltale, Dunsany, Co Meath, Ireland	DG SANTE/Dir F	2 002	BXL -000003	10 010	178	X	X	X	X	X			X	X	X	X				565		2.28	958					2 296	17,97	12,10	

EUROPEAN COMMISSION

Environmental Management System

European Parliament

EMAS
VERIFIED ENVIRONMENTAL MANAGEMENT
BE-BXL-000003

Environmental Statement 2022

2021 results

Annex I: Houses of Europe Valletta, Vienna

Revision after verification

ANNEX I: HOUSES OF EUROPE

Foreword

With the European Green Deal, the European Union placed the fight against climate change and environmental degradation at the core of its political agenda, setting Europe on course to become climate-neutral by 2050 through a mix of transformative policies and measures. To put actions behind words and lead by example, the European Commission has set itself, through the Communication on Greening the Commission, the ambitious target of becoming climate-neutral already by 2030. The European Parliament, in the context of its Environmental Management System, also set itself ambitious environmental performance targets in 11 areas for the end of its current legislative term, in 2024. These targets include, among others, reduction in carbon emissions, resource consumption, and waste.

It was an obvious conclusion then, that the EU institutions' outposts in the Member States – the Commission Representations and the European Parliament Liaison Offices – should join the process, even though they represent only a small fraction of the respective institution's environmental impacts, including carbon footprint. They are the institutions' public face at local level, with the overarching mission to engage with all segments of society. As such, the Representations and Liaison Offices are in the prime position to demonstrate first-hand, to the 450 million citizens of the Member States in which they are located, the European institutions' firm commitment to the protection of the environment.

As a first step, the Commission and the Parliament joined forces to implement EMAS, the well-established framework which underpins the greening process in the European institutions, in the pilot cities Valletta (Malta) and Vienna (Austria). This is done in the context of the so-called Houses of Europe, physical premises hosting the Commission Representations and the Parliament's Liaison Offices in Member States.

The two-fold aim of the project is to reduce the environmental impact of the Houses of Europe and in doing so, also add credibility to the efforts of the European Union to lead change across Europe at large. The initiative is also the first known example of two European institutions implementing EMAS together, developing additional synergies and efficiencies, as well as a possible blueprint for others to follow.

This Environmental Statement appears for the first time, as a new annex (I) to the Commission's 2022 Environmental Statement and to the Parliament's Environmental Statement 2022 for 2021, and provides an account of EMAS implementation in the Houses of Europe in Valletta and Vienna in 2021.

Signed

For the Commission Representations	For the European Parliament
Pia Arenkilde-Hansen	Susanne ALTENBERG
Director-General, DG Communication	Director of Office of the Secretary-General

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ANNEX I: HOUSES OF EUROPE – Administrative activities

General context and key milestones

*"Through the **European Commission Representations** (hereafter Representations) in the Member States (in 27 capitals and six regional offices), the European Commission, notably the Directorate-General for Communication, engages with citizens, national authorities, media and stakeholders on the ground and supports the President and the College with political and economic reporting, informing policy and communication as two sides of the same coin".*

*"**European Parliament Liaison Offices** (hereafter EPLOs) are responsible for the local implementation of institutional communication activities, with the ultimate goal of ensuring that people understand the importance of the European Parliament well enough to engage in the European democratic process."*

Representations and EPLOs ensure a strong engagement on the ground via the Houses of Europe (HoE) hosted in buildings or parts of buildings which are, in the majority of the cases, jointly occupied by the two institutions. There are twenty-eight Houses of Europe[1]. The management of the infrastructure and security of these buildings is ensured by the European Parliament Directorate-General for Infrastructure and Logistics (DG INLO) and European commission Directorate-General for Communication (DG COMM).

In 2020 and 2021, respectively, the European Commission and the European Parliament decided[2] to gradually extend the scope of their EMAS (EU Eco-Management and Audit Scheme) registrations and agreed to jointly pursue the establishment of an Environmental Management System of the Houses of Europe, based on the requirements set out in the EMAS Regulation[3], and starting with the premises they co-own. The first two Houses of Europe to aim for EMAS registration are Vienna and Valletta which completed the required internal audits at the end of 2021 and will undergo external verification in the autumn of 2022. On the strength of the positive results in the two pilot locations, preparations for eventual EMAS registration started in spring 2022 for the next two Houses of Europe, Budapest and Nicosia, aiming to complete registration of all 8 owned buildings[4] by 2025.

Approach to EMAS registration and the project governance

The local elements of the environmental management system in each House of Europe are developed and implemented jointly, in cooperation between the Parliament and the Commission. The local systems are founded on the individual corporate environmental policies of the two participating institutions, which are entirely compatible and consistent with each other. The Commission's and the Parliament's environmental policies can be consulted in section I11.

As required by the EMAS Regulation and applied at corporate level by the Parliament and the Commission, the local systems in the Houses of Europe too take into account the EMAS Sector Reference Document (with Best

[1] With the exception of Athens, Brussels and Luxemburg where, for historical reasons, Representations and EPLOs are housed on different premises, Houses of Europe can be found in all capital cities as well as in Barcelona, Milan, Munich and Wrocław.

[2] EC: EMAS Steering Committee Oct 2020; EP: Strategic Execution Framework 2022-2024 and Management Review 2021 for 2020

[3] Regulation (EC) 1221/2009 amended by Regulation (EU) 2017/1505 and Regulation (EU) 2018/2026

[4] In Budapest, Copenhagen, Lisbon, Nicosia, Sofia, Valletta and Vienna

Environmental Practices) for Public Administrations[5], reflected in the environmental objectives and performance indicators.

All local elements of EMAS in Houses of Europe, including but not limited to calculating and reporting environmental performance, implementing actions in annual action plans, ensuring legal compliance, and conducting and following up internal and external audits, are implemented jointly by the Commission and Parliament. However, in order to include the Representations and EPLOs under their respective institution's EMAS registration, the final EMAS verification of the House of Europe will result in two separate certificates, one for the Representation and one for the EPLO, which is required for their separate EMAS registrations.

All Representations will eventually be reported and registered as one site under EC's corporate EMAS structure, in addition to the already existing 8 sites covered by the corporate registration. The EP does not have a single corporate EMAS registration. Instead, each of its three main sites – Brussels, Luxembourg, and Strasbourg – is registered under a separate EMAS registration in its respective Member State. All EPLOs included in Parliament's environmental management system would therefore be registered as a single site under an additional separate EMAS registration.

EMAS implementation in the Houses of Europe rests on the established cooperation between the Commission and the Parliament, formalised in the form of an administrative agreement which details the mutual rights and obligations, including budgetary aspects, in the context of the shared management of the premises.

The coordination of the EMAS implementation is ensured for the Commission by DG Communication (DG COMM)[6], in charge of the European Commission's Representations in Member States, supported by the EMAS Central Coordination Team in DG HR which ensures alignment with the corporate EMAS process and provides the contractual framework for the internal and verification audits. The EMAS Unit, a Central Service attached to the Secretary-General of the European Parliament, coordinates the project implementation for the Parliament side, in cooperation with other service responsible for the management of EPLOs, notably DG COMM and DG INLO. EMAS Representations site coordinators in DG COMM (EC) and EPLO project coordinators in the EMAS Unit (EP) ensure day to day coordination in liaison with EMAS coordinators in the Houses of Europe, composed of representatives from the Representation and EPLO. The governance structure is illustrated in section I.11.

I1. Activities and scope, context and key stakeholders, environmental aspects

I1.1 Activities and scope

The activities of the Houses of Europe are typically administrative, communication and public outreach activities, augmented by additional functions such as conference and meeting organisation, supporting the local activities of

[5] Commission Decision (EU) 2019/61 of 19 December 2018 on the sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the public administration sector under Regulation (EC) No 1221/2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)Text with EEA relevance

[6] DG COMM acts under the authority of the President to communicate the President's Political Guidelines and the priorities decided by the Commission as well as on the role of the Commission as the executive of the European Union. DG COMM thereby also ensures corporate Communication.

EP Members (in the case of EPLOs), and similar. Applicable NACE codes are: 84.1 General Administration, and 99 Activities of extraterritorial organisations and bodies.

The activities under the scope of EMAS include the day-to-day operations of the Houses of Europe on or linked to their premises, including the activities performed on their behalf by third parties, such as contractors.

The two Houses of Europe included in the scope of EMAS for 2021 are located at the following addresses:

- Vienna: Haus der Europäischen Union, Wipplingerstraße 35, A-1010 Wien, Austria
- Valletta: Dar l-Ewropa, 254 Triq San Pawul, Valletta VLT 1215, Malta

I1.2 Context – risks, and opportunities

Under the EMAS regulation, the Commission and the Parliament define their operational context, their legal obligations and determine which environmental aspects related to their activities, products and services have (or may have) a significant impact on the environment and on the environmental management system (EMAS). They also consider the needs and expectations of interested parties and decide which of these should be addressed through the environmental management system. While these analyses are broadly similar at corporate level for the two institutions, they can differ slightly based on the specific role of each institution under the Treaties, and the resulting scope of their activities. When it comes to Houses of Europe, the identical roles, activities, and shared premises of the Representations and EPLOs mean that for each House of Europe, only a single, joint analysis is required.

Political, Economic, Social, Technological, Environmental and Legal aspects in the Member States present their specificities differently from one context to another. However, several external issues and circumstances that influence the outcomes of the management system are similar. These risks and opportunities are described below.

I1.2.1 External issues and circumstances affecting the environmental performance of the Houses of Europe

Political The European Green Deal and the increasing demand for more sustainable national and local environmental policies are adding political pressure on the Houses of Europe to embrace the transition rapidly. Houses of Europe play a key role in the European Institutions' two-way communication in the Member States. Due to their high visibility, Houses of Europe have the opportunity to become sustainability institutional ambassadors.

Economic The volatility of the external economic environment with impact on internal budgets could potentially affect available resources for EMAS processes. However, upfront investment to conduct environmental studies and cost/benefit analyses is an opportunity to identify future savings, prioritise actions with high environmental positive local impacts and long-term benefits.

Social In the context of increasing environmental consciousness among citizens and interested parties, non-alignment of Houses of Europe' day-by-day operations to the policies promoted by the EU could affect citizen's trust. Conversely, EMAS environmental results can be transformed into broader outcomes such as developing good communication, stirring citizens' involvement, and strengthening the EU institutional reputation.

Technological. Technological advances, further accelerated in response to the COVID crises, proved their potential to reduce environmental footprint. However, keeping pace with all the innovative technological breakthroughs might be challenging, especially when it comes to rapid implementation and updates at the buildings level. Nonetheless, embracing digitalisation, combining face-to-face and hybrid working environments could lead to efficient use of space, energy consumption and CO_2 equivalent emission reduction.

Environmental: Houses of Europe are situated in urban dense historical centres, more and more affected by urban development, mobility challenges, pollution, and climate change impacts such as heat islands or other extreme events. Green Deal vision policies provide a clear framework for stakeholders' involvement and development of holistic solutions for energy efficiency, renewable energy supply and production, CO_2 reduction, water, biodiversity, waste management, sustainable mobility, social inclusion, etc.

Legal Transition towards Green Deal regulation, new legislation (e.g., FIT for 55) and plans (e.g. RePowerEU) to be translated at the national level in each country provide complexity and the risk of potential non-compliance in the short-term. The opportunity exists in the future harmonisation of EU policies at the national level, legitimating more actions supporting EMAS continuous improvement processes.

I1.3 Internal issues and circumstances affecting the environmental performance of the Houses of Europe

Activities: COVID crisis severely affected the HoE's activities. The shift towards a stronger online presence had tremendous impact on the reduction of activities, and use of space in the representations. In 2020, the Valletta and Vienna HoE started EMAS certification process, approval of an action plan, implementation of several sustainable measures and technical solutions, green public procurement, etc.

Strategic direction. In 2022, the European Commission revealed its strategy: "Greening the European Commission". The institution has set a clear target to reduce its CO_2 emissions by 60% compared with 2005 figures and to become climate neutral by 2030. In 2019, the Bureau of the European Parliament set out its comprehensive environmental performance targets for the current legislative term, with a unified target date of 2024. Furthermore, ecological transformation has been included as one of five basic pillars for Parliament's administrative activities set out in the Strategic Execution Framework of the EP for the 2022-2024 period. However, within a context of decreasing resources, the Houses of Europe will need to find synergies and innovative solution to keep up quality and achieve targets.

Culture and employees: Environmental awareness of staff rises once they are involved in the activities mentioned above and trained to act in accordance with the strategic direction. Identifying priorities, considering employees' expectations and providing appropriate incentives are essential aspects of keeping staff involved and motivated within a complex system, where several themes must be tackled simultaneously.

Process and systems: Technological ageing, operational maintenance organisation, the complexity of internal decisional processes and the differences between the Commission and Parliament's governance systems are potential risks to be mitigated by enhancing training and capacity building, reviewing procedures, more decentralisation and lean operational processes, enhancing dialogue, and revising contractual aspects when appropriate.

I1.4 Stakeholders (interested parties), compliance obligations risks and opportunities

The HoE identified the most relevant interested parties, together with their needs and expectations to be addressed through the environmental management system. Amongst them are the European institutions, public bodies (incl. regulatory authorities), suppliers/contractors, building management/condominium, as well as staff. The public, be it as visitors at the HoE premises or as recipients of external communication activities of the Representation and EPLO, have a prominent role, in accordance with the outreach prerogative of the HoE. The identified needs for transparent communication, accountability and access to appropriate information by the public are addressed through local communication plans (see section I8.1). These focus on the promotion of the

European Green Deal as overarching policy, adapted to national and sometimes regional or sectorial needs, depending on the target group.

A summary of the stakeholder analysis is provided in table I12.1.

I1.5 Environmental aspects

The Houses of Europe performed an analysis of environmental aspects following the EC corporate methodology, the results of which are summarised in section I12.2.

I2. Overview of core indicators since 2019

Tableau 1 - Historical data, performance and targets for core Commission level reporting indicators, combined Valletta and Vienna

Physical indicators: (Number, description and unit)	Historic data values 2019 (baseline)	2020	2021	Performance since: 2019 Δ %	Future targets (tentative) 2019-23 Δ %	2019-30 Δ %	Future targets (tentative) 2023 value	2030 value
1a) Energy bldgs (MWh/p)	9.1	8.4	9.1	0.0	-3.0	-5.0	8.87	8.69
1a) Energy bldgs (KWh/m^2)	166.7	143.9	138.0	-17.2	-3.0	-5.0	161.66	158.32
1c) Non ren. energy use (bldgs) %	68.3	68.4	68.2	-0.1	n/a	n/a	n/a	n/a
1d) Water (m^3/p)	17.6	11.9	14.5	-17.7	0.0	-5.0	17.56	16.68
1d) Water (L/m^2)	320.1	203.9	218.1	-31.9	0.0	-5.0	320.13	304.12
1e) Office paper (Tonnes/p)	0.012	0.006	0.007	-39.7	-40.0	-60.0	0.01	0.00
1e) Office paper (Sheets/p/day)	11.4	5.4	6.9	-39.7	-40.0	-60.0	6.86	4.57
2a) CO_2 buildings (Tonnes/p)	1.8	1.6	1.8	-1.1	-3.0	-5.0	1.73	1.69
2b) CO_2 buildings (kg/m^2)	32.4	27.6	26.6	-18.1	-3.0	-5.0	31.45	30.80
2c) CO_2 vehicles (g/km, manufacturer)	154	154	122	-20.6	-42.0	-90.0	89.13	15.37
2c) CO_2 vehicles (g/km, actual)	111	63	63	-43.1	n/a	n/a	n/a	n/a
3a) Non haz. waste (Tonnes/p)	0.03	0.01	0.05	64.7	-20.0	-25.0	0.02	0.02
3c) Unseparated waste (%)	58.7	68.3	41.2	-29.8	n/a	n/a	n/a	n/a
3c) Unseparated waste (T/p)	0.018	0.005	0.021	13.7	n/a	n/a	n/a	n/a
Economic indicators (Eur/p)								
Energy consumption (bldgs)	194.5	79.4	166.8	-14.2				
Water consumption	45.7	32.0	39.0	-14.6				
Non haz. waste disposal	0.0	0.0	0.0					

Waste and district cooling and heating have not been included under economic indicators because related financial data was not available at the time of reporting.

I2.1.1 Targets and action plan

DG COMM of the Commission was invited to introduce targets on core corporate indicators at the time of contributing to the Commission's 2022 Global Annual Action Plan (GAAP). On Parliament's side, targets at EPLO/HoE level with respect to EP's global key environmental performance indicators are not required, but they could be helpful in order to manage those impacts at local level and contribute to the overall performance. Parliament has 11 global key environmental performance indicator targets for the entire institution, which are set by the EP Bureau for the duration of a particular legislative term (5 years). EP does not have sub-targets at the level of individual sites, DGs, etc.

Given the early stage of EMAS implementation and the lack of reliable historic data, it was premature to define targets for all indicators at the level of Houses of Europe. As a first step, tentative targets were proposed for a limited number of indicators over which the Houses of Europe have greater operational control. These are included in the above table and are the basis for underlying calculations in this environmental statement. The intention is to define targets for all required indicators in time for inclusion in the 2023 GAAP, taking into account the targets published in the meanwhile adopted Communication Greening of the Commission. The future targets will apply to all Houses of Europe, including those outside of the scope of EMAS, where environmental actions, inspired by the lessons learnt with EMAS and aligned with the corporate environmental objectives, are implemented. In order to achieve these targets, a set of cross-cutting actions, applicable to all Houses of Europe, was developed and included in the Commission's 2022 GAAP, as complement to local action plans developed specifically in Valletta and Vienna. These actions address the identified significant environmental aspects (see section I12.2), legal obligations, stakeholder expectations and relevant risks and opportunities managed within the system. The distribution of the actions according to policy objective can be found in table I12.15 whereas individual actions are mentioned in the chapter they relate to.

The cross-cutting action plan encompasses measures aiming to directly address the environmental policy objectives as well as to develop the necessary framework for measuring progress. Parliament has signalled its intention to cooperate in the pursuit of the to-be agreed targets and implementation of related joint actions at the level of the Houses of Europe, pending agreement between the two institutions on the specific details.

I2.1.2 Impact of the COVID-19 pandemic: reporting and teleworking

The health crisis had a significant impact on daily operations of the Houses of Europe, including at the start of preparations for EMAS implementation in 2020. The spread of the pandemic itself as well as the timing and type of national measures in response to it differed between Member States. This is reflected in the indicator 'office presence for the year' which, in 2021, was 31,7% and 55,5% respectively for Valletta and Vienna. This is another variable to consider, in addition to climate, when comparing the environmental performance.

The year 2019 was thus chosen as a baseline for the reporting on environmental indicators, in order to afford a comparison with pre-pandemic performance and a fair basis for measuring progress. In light of this retroactive reporting, estimates had to be used for some indicators (eg. paper consumption, waste management), whereas some others remained unaccounted for whilst the processes necessary to measure them are being set up (eg. refrigerant losses in Valletta, further categories of waste).

I2.1.3 Baseline parameters

Tableau 2 - EMAS baseline parameters

HoE	Useful surface (m2)				Staff			Buildings for registration
	Total	EC	EP	Shared	Total	EC	EP	
Vienna	2.455	785	603	1.067	32	22	10	1
Valletta	1.056	322	206	528	21	14	7	3
Total	**3.511**	**1.107**	**809**	**1.595**	**53**	**36**	**17**	**4**

Surface measured according to DIN 277 standard

In order to make an informed analysis of the trends in the various indicators, it is useful to consider the downward trend in staff numbers: -11,7% between 2020 and 2021, rising to -17,2% between 2019 and 2021.

Further details about the buildings can be found under section I10 Site breakdown: Buildings' characteristics and performance.

I2.1.4 Approach to presentation of results and attribution to EC and EP corporate calculations

Except for the number of staff and the useful surface, indicated in Table 2, the values on all indicators appearing in this environmental statement are presented holistically for the Houses of Europe, without distinction between the two institutions. This approach reflects the shared management of the premises, governed by an administrative agreement. The latter foresees a cost-sharing ratio of 60% for the Commission and 40% for the

Parliament, applicable to all Houses of Europe, which approximates the share of surfaces occupied by each institution as well as the share of staff.

The 60/40 ratio will therefore be applied for the corporate level data aggregation into respective environmental statements of the Commission and the Parliament, save where an accurate attribution can be established, such as on vehicles and missions. In the future, a precise attribution may be possible for more categories, including paper consumption and fixed IT assets emissions. Table I12.9 provides the split values for the key resource parameters and the carbon footprint, applying the above-mentioned approach.

I3. More efficient use of natural resources

The figures presented in this section are for HoE premises only and do not include domestic energy consumption due to teleworking under the COVID pandemic, which is estimated to be 9,8 MWh/yr or 2% of the buildings energy consumption.

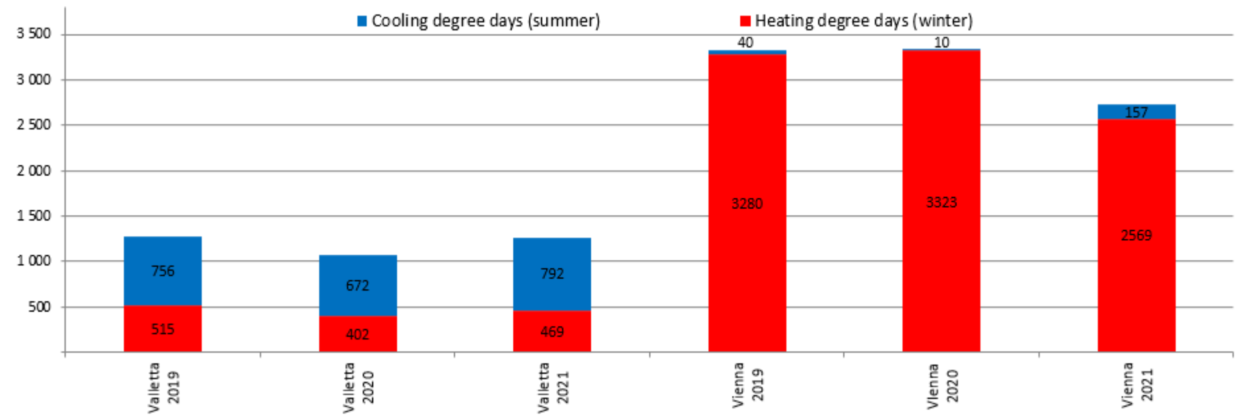
Consumption values for the two HoE have been aggregated in order to show results for the HoE EMAS site as a whole. Detailed results for each HoE are provided in table 12.8.

I3.1.1 Climatic conditions

Buildings energy consumption data should take in consideration the context of climatic conditions. Analysis of degree data for 2021 suggests that climatic conditions for the two locations were warmer over the summer (more cooling required) and winter (less heating required) than both preceding years.

Figure 1 Total cooling and heating degree days in Valletta and Vienna

1

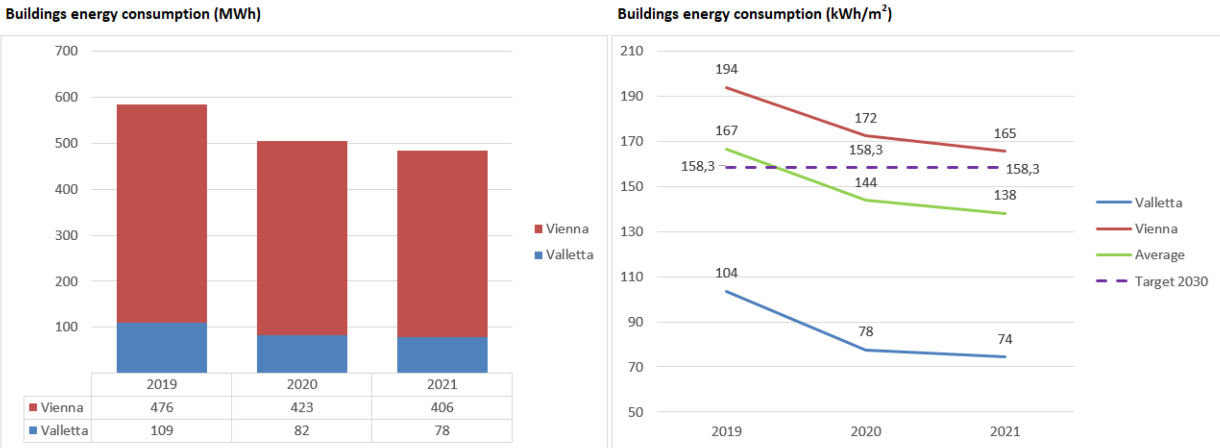


I3.1.2 Energy consumption of buildings

Figure 2 below shows the evolution of total annual final energy consumption in the buildings of the two HoE. Electricity represented 65% of the total in 2021, followed by district heating and cooling (used exclusively in Vienna).

It is worth mentioning that energy consumption has not dropped as one might expect in buildings that have remained mostly empty, or with low occupancy, during the pandemic period. The Commission and the Parliament have decided to increase ventilation as well as to use strictly 100% fresh air, where possible, in order to guarantee the safest work environment to the colleagues on premises. In addition, in Vienna, most of the energy consumption (with the exception of the separate, 100% green electricity contract used exclusively by the HoE) is derived through surface-share calculation from the shared consumption of the Condominium, in which the other building occupants did not follow the same office-presence patterns as the House of Europe, rather than through precise and HoE-specific metering . This means that energy savings in the House of Europe Vienna are not fully accounted for in the data (this applies also to water consumption). The installation of smart meters as part of the future building management system will remedy this shortcoming.

Figure 2 - Evolution of annual buildings energy consumption in Valletta and Vienna



Total buildings energy consumption, mirrored by consumption per square metre, decreased by 16,8 % since 2019 (baseline), owing to reduced office presence due to the COVID pandemic and favourable climatic conditions.

Ongoing active measures to reduce energy consumption:
Comfort and lighting schedule optimization;
Closure of buildings during the End of Year holiday period;
Installation of smart energy meters (VIE);
Installation of led lighting (VIE);
Communicating with landlord on energy saving measures (VIE);
Inspection of buildings, outside the occupancy hours, to detect any lighting or HVAC equipment working which should normally be idle. (VIE)
Energy audits (VAL)

I3.1.3 Energy consumption of fleet vehicles

Tableau 3 - Summary vehicle energy consumption for the two HoE

	2019	2020	2021
Total (MWh/yr)	17,62	10,09	17,20
Total as % of tot. building energy consumption	3,01	2,00	3,55
MWh/person	0,28	0,17	0,32
kWh/km (per 1000 kms)	0,976	0,90	0,83
Diesel used (m^3)	0,63	0,22	0,36
Petrol used (m^3)	1,16	0,82	1,42

Houses of Europe have on average 2 vehicles (Valletta has exceptionally only one), belonging to the Representation: an official car (executive class) and a service car (usually an MPV). Besides local needs, both are frequently used for the transportation of Commissioners and other high-ranking officials on work visits throughout the entire country. This is reflected in the vehicles' total energy consumption as % of total building energy consumption, which is higher than at other Commission sites.

Total vehicle energy consumption increased in 2021 compared to 2019 on account of higher use of the official car in Vienna. This is attributed to the fact that, in 2019, the car was used less than usual for official meetings given that the Head of Representation post was vacant for part of the year. The increase in energy efficiency in 2021 results from the switch to a plug-in hybrid car in Valletta. The breakdown of vehicle energy consumption by HoE is provided in section I12.4.

I3.1.4 Renewable energy use in buildings and vehicles

The following table shows the evolution in non-renewable energy use. The break-down by HoE, provided in table I12.5, allows a better appreciation of the difference in the share of renewables between Valletta and Vienna, which is conditioned by the offer on the national energy market. Vienna was amongst the first Houses of Europe to switch to a 100% green electricity contract in 2016 (contract 1 in the table), after the liberalisation of the Austrian energy market. Electricity contract 2 in Vienna is shared amongst the condominium and the usage is currently calculated according to surface area share, not actual consumption. The planned introduction of a building management system with smart meters will allow more accurate monitoring and reporting.

Tableau 4 - Renewable and non-renewable energy use in buildings (MWh and percentage of total)

Contributions to renewable energy	2019	2020	2021
i a) electricity contract 1 (% renewables)	51,6	52,7	52,2
electricity contract 1 (MWh renewable)	107,9	84,4	79,0
i b) electricity contract 2 (% renewables)	56,2	49,1	55,4
electricity contract 2 (MWh renewable)	35,7	33,8	30,1
v) district heating and cooling (% renewable)	22,8	24,0	23,6
district heating and cooling (MWh renewable)	41,9	41,6	44,9
viii) (PV) (% renewable)	n/a	n/a	n/a
(MWh renewable)	n/a	n/a	n/a
Total renewables (MWh)	185,6	159,8	154,1
Total renewables (%)	31,7	31,6	31,8
Total non ren. energy use, (MWh/yr)	**399,6**	**345,4**	**330,7**
Non ren. energy as part of total, (%)	**68,3**	**68,4**	**68,2**

Planned energy audits in Valetta and Vienna will determine possible actions to increase energy efficiency of the buildings, including the possibility of site-generation of renewable energy through photovoltaic systems. All Houses of Europe are to switch to green energy contracts whenever this is feasible[7].

I3.2 Water consumption of House of Europe buildings

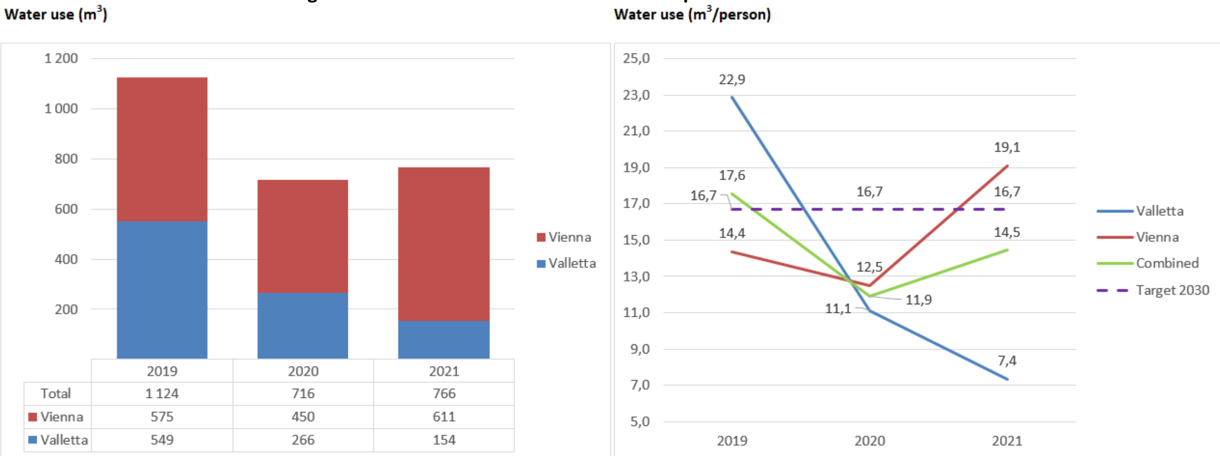
The figures presented in this section are for Houses of Europe buildings only and do not include domestic water consumption due to homeworking under the COVID pandemic, and which is estimated to be 179,5 m3/yr or 21,8% of that for House of Europe buildings.

Water consumption in 2020 and 2021 shows a significant decrease due to the low occupancy of the buildings linked to the pandemics. As for other indicators, the per capita consumption is negatively influenced by the decrease in staff working in the Houses of Europe. A water leak in Valletta was detected and addressed in 2020, affecting the

[7] The change of energy contracts may be delayed for economic reasons due to the currently unfavourable energy market conditions. In addition, in condominiums, the change of contract may depend on the agreement of other occupants.

2019 and 2020 consumption values. As remedial action, counters will be checked more frequently during periods when no water is used, in order to detect possible abnormalities as early as possible.

Figure 3 - Evolution of annual water consumption in Valletta and Vienna



Additional measure to reduce water consumption:
In view of the scarcity of water in Malta, the HoE is assessing the possibility to introduce rain and storm water collection. Notices in the kitchen remind staff in Valletta to minimise the use of the reverse osmosis units for drinking water.
Flow control systems are installed on all taps in Valletta and dual-flush systems in toilets in both HoE.
Notices in the kitchen remind staff in Valletta to minimise the use of the reverse osmosis units for drinking water.

I3.3 Office and printshop paper use in Houses of Europe

The figures presented in this section are for House of Europe buildings only and do not include domestic printing due to homeworking under the COVID pandemic, and which is estimated to be 0,6 sheets/person/day or 8,3% of that for Houses of Europe premises.

Figure 4 - Evolution of annual office paper consumption in Valletta and Vienna

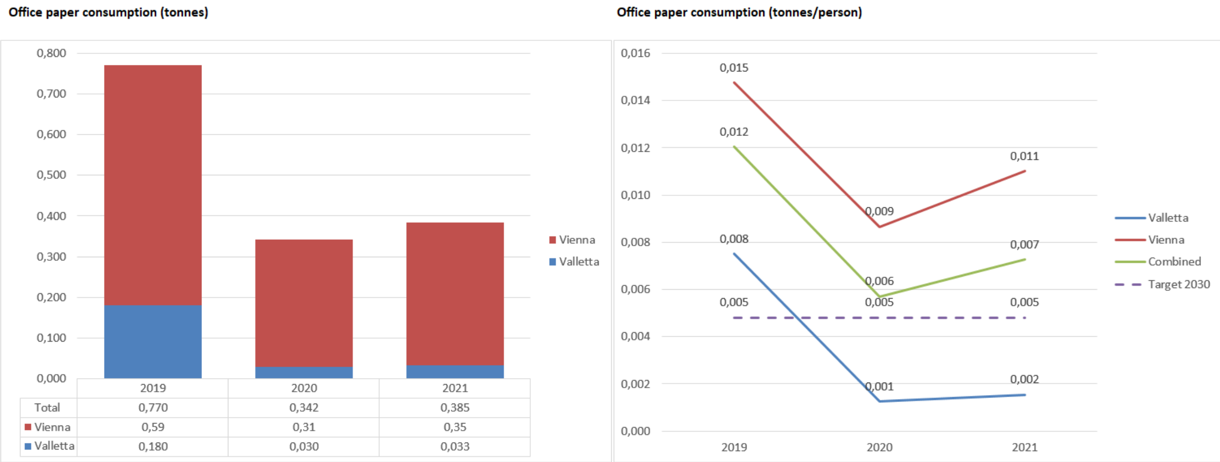
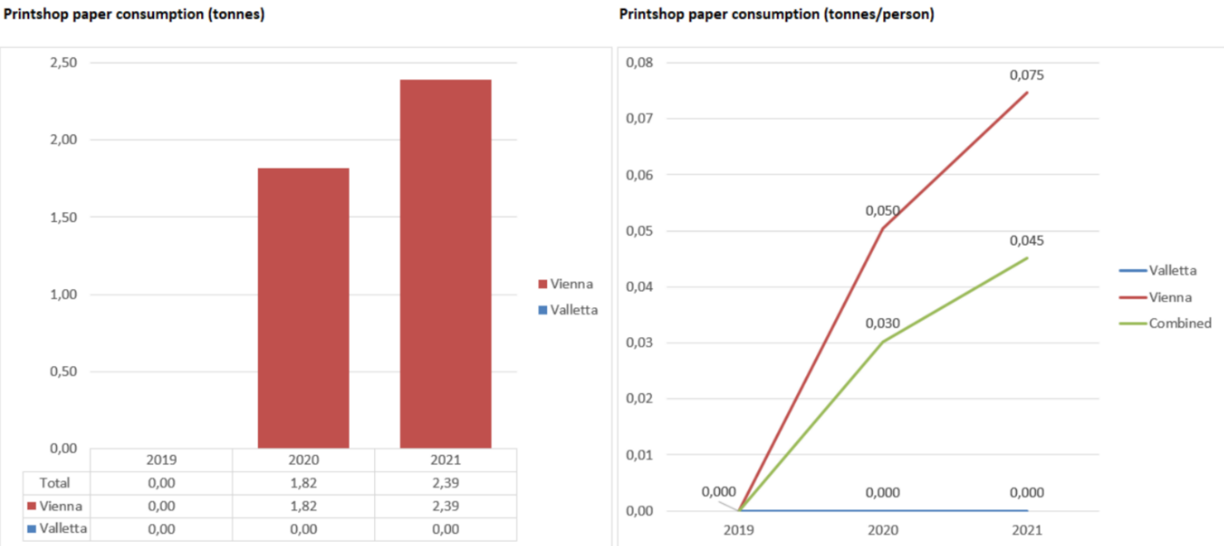


Figure 5 - Evolution of annual printshop paper consumption in Valletta and Vienna



Figures above show an increase in total paper consumption (office and printshop paper combined). This is linked to external printing of certain publications in Vienna in 2020 and 2021. If we exclude external printing, we see that office paper use increased slightly in 2021 as result of increased office presence, but remains below 2019 levels: -39,7% in per capita terms and -50,1% in tonnes.

Due to the communication prerogative of the Houses of Europe, there will always be a certain need for printed publications for external stakeholders, keeping in mind also accessibility aspects, which can nevertheless be optimised by carefully estimating the demand and offering digital alternatives, whenever possible. Use of office paper on the other hand is expected to reduce further with the continued digitalisation, including of procurement.

Actions to reduce paper consumption include:

Replacement of personal with network printers, configured for recto-verso and black-and-white printing as default;

Close monitoring of paper consumption for printing by analysing counters of installed network printers;

Continued implementation of paperless strategy, including development of electronic processes, promotion of digital signature, training and staff awareness raising actions;

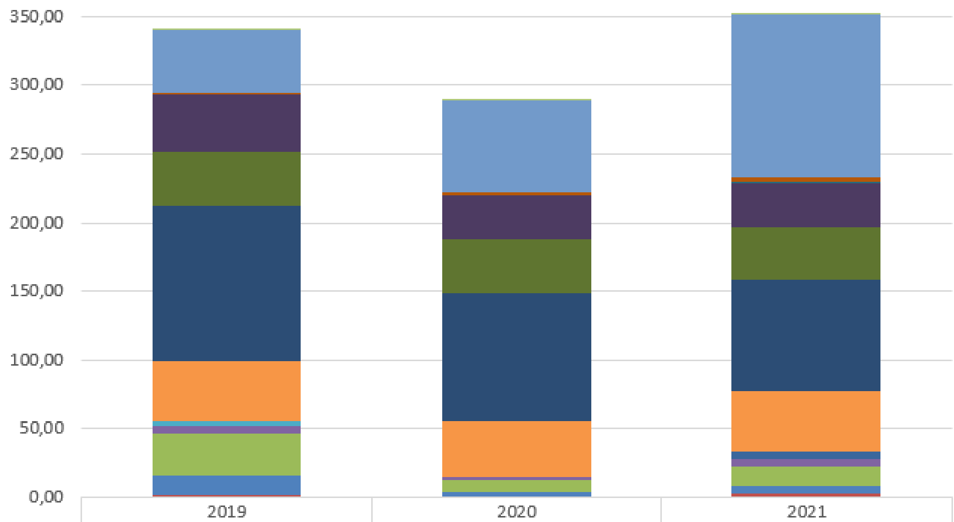
Purchase of eco-friendly and FSC-certified paper.

I4. Reducing carbon footprint

I4.1 Overall carbon footprint

Figure 6 shows the distribution of components of the carbon footprint measured as equivalent tonnes of CO_2 emissions (T CO_2e) for Valletta and Vienna combined, including teleworking emissions.

Figure 1 - Annual CO_2 (and equivalent) emissions (Tonnes CO_2e) for the two HoE



	2019	2020	2021
Total	340,35	289,48	352,18
Own waste	0,42	0,10	0,40
Catering	0,00	0,00	0,00
Service contracts	45,53	66,89	119,11
Paper supply	0,77	2,16	2,77
Fixed assets - Commission vehicles	0,90	0,56	1,03
Fixed assets - IT	41,22	32,23	31,71
Fixed assets -buildings	38,89	38,89	38,89
Buildings - fuel for heating	0,00	0,00	0,09
Buildings - electricity	113,37	93,13	80,63
Buildings - district heating/cooling	43,38	40,24	44,42
Buildings coolant losses	3,87	0,00	0,00
Teleworking emissions	0,00	0,00	5,19
Vehicle fleet fuel consumption	5,25	3,00	5,11
Missions air (RFI=2) and air taxi	30,49	8,19	14,59
Experts' travel	0,00	0,00	0,00
Staff commuting	14,11	3,53	5,63
Missions excluding air	2,14	0,55	2,60

The largest single contributor to the carbon footprint in 2021 were building energy emissions (electricity, district heating/cooling and fuel for heating combined), and this is consistent with most other EMAS sites in 2020 and 2021. What sets the Houses of Europe apart is the high weight of the service contracts category. Besides logistic functions (facility management, cleaning, security), this category also includes various communication services contracts, in line with the outreach prerogative of the Houses of Europe. Given the trend in reduction of staff imposed by budgetary cuts, there is a growing need for outsourcing support to communication activities in order to meet the ambitious political objectives. Communication contracts have, in proportion, a higher value than administrative contracts and thus significantly add to the overall figures, almost equalling building energy, when applying the common corporate factors. If the trend persists, it is possible that the contracts category will take the lead as building energy-efficiency measures implemented to reach the greening objectives deliver results in the coming years.

Emissions from fixed assets follow in magnitude, whereby the IT component is decreasing thanks to an active policy of equipment replacement with environmentally friendlier models. Buildings' fixed emissions are, on the other hand, set to remain constant given that the institutions own the premises. Commission vehicles have a marginal impact, yet this might increase with an accelerated pace of electrification of the fleet (partly offset by lower emissions from use, depending on the intensity of use and time they will remain in service).

A further significant source of emissions for the Houses of Europe is mobility (missions, staff commuting and vehicle fleet). Given the new policy on teleworking and the lack of an established baseline for operations under a 'new-normal' scenario, it is difficult to predict future trends for this category, beyond the likely marginal increase compared to 2021 levels.

Teleworking emissions, included for the first time in the calculation for 2021. Despite adding 5,19 tCO_2e to the overall carbon footprint, if we combine them with the 2021 staff commuting emissions (5,63 tCO_2e), there is still a net overall reduction of 23% in comparison with the 2019 staff commuting emissions (14,11 tCO_2e, before teleworking).

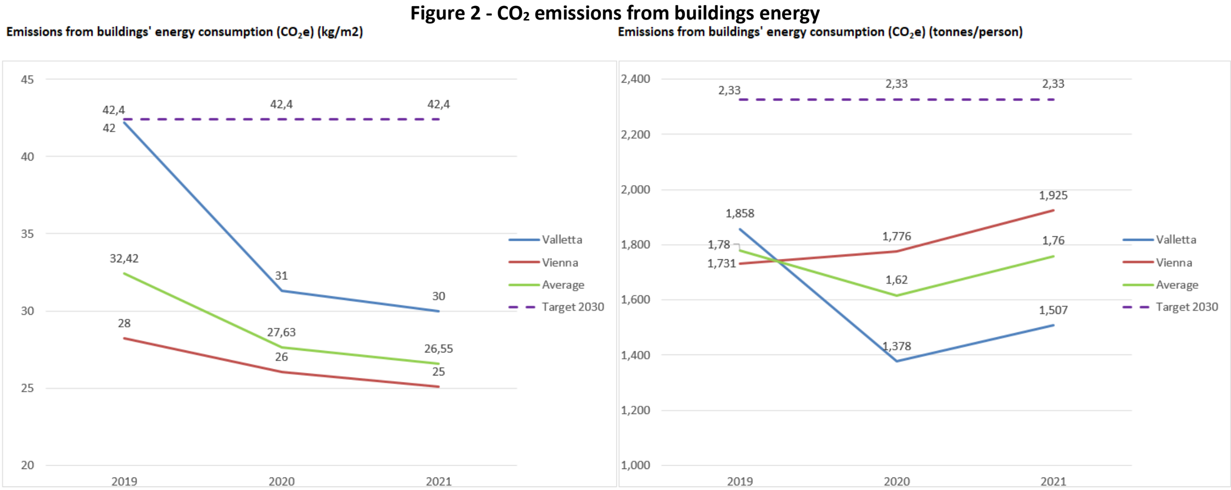
Table I12.10 provides the detailed composition of the carbon footprint elements, combining Valletta and Vienna. Table I12.11 indicates the carbon footprint per person where, in addition to the situation described above, one can perceive also the impact of the decrease in staff numbers on the 2021 per capita values: + 19,7% and +36,7% compared to 2020 and 2019, respectively.

Below we analyse the data per chapter of emission.

I4.1.1 Buildings' emissions from energy use (126,7 tCO_2e in 2021, 35,7 % of carbon footprint)

The evolution of total emissions from buildings energy consumption per capita and per square metre is shown in Figure 7. These follow broadly the same trend as energy consumption.

Figure 2 - CO_2 emissions from buildings energy



The figure above shows a decreasing trend in CO_2 emissions, predominantly due to a reduced office-presence during the pandemic and positive climatic conditions. The increase, in 2021, of the per capita indicator is a consequence of staff reduction (-11,7% compared to 2020).

I4.1.2 Goods and services (121,9 tonnes tCO_2e in 2021, 34,4% of carbon footprint),

Corresponding to:

- Service contracts (119,1 tCO_2e, 33,5%), based on the value of contracts in cleaning, security, facility management, communication and other services.
- Paper purchase (2,8 tCO_2e, 0,8%)

I4.1.3 Fixed assets (71,6 tCO_2e in 2021, 20,2 % of carbon footprint)

Embodied emissions are associated with:

- Buildings, (38,9 tCO_2e, 10,9%), calculated based on an amortisation period of 50 years for old concrete constructions (office type).
- Commission fleet vehicles (1 tCO_2e, 0,3%) calculated based on the kms travelled, applying the corporate factor.[8]
- IT office equipment (31,7 tCO_2e, 8,9%): Amortisation period used for each of 17 types of IT equipment registered in the inventories, applying the corporate factors.
- IT home office equipment (0 tCO_2e, 0%): In 2020, the Commission and the Parliament initiated a policy of reimbursing or supplying screens, docking stations and IT peripherals. Information needed to report on emissions in this category is not currently available, it shall be evaluated in the future.

I4.1.4 Staff travel for missions (17,2 tCO_2e in 2021, 4,8 % of carbon footprint)

Staff travel in the Houses of Europe emanates from the prerogative of the Representations and EPLOs to serve the entire territories of the Member State in which they are based when engaging with stakeholders. In addition, there is a need to regularly liaise with HQ services on organisational and policy-related aspects.

Actions to reduce the need to travel and the environmental impact of missions include:
Upgrading equipment for videoconferencing and online/hybrid events;
Reducing the number of non-essential missions in favor of videoconferencing;
Promoting the use of sustainable means of transport, whenever possible (eg. the night-train Vienna-Brussels);
A study of mission patterns and related environmental impact in the Commission's DG COMM.

The Representation and EPLO in Austria jointly organised a communication campaign on the Future of Europe whereby members of staff toured the country by bike and train, putting into practice sustainable mobility policy objectives promoted by the European Union.

[8] Refer to Chapter 2 "Carbon footprint: factors and technical elements" of the Corporate summary

I4.1.5 Staff travel missions by Representation's vehicles (6 tCO_2e in 2021, 1,7% of carbon footprint)

Tableau 5 - Fleet vehicle characteristics and tailpipe CO_2 emissions

	2019	2020	2021
Number of vehicles (avg. fleet size)	3	3	3
of which electric/hybrid engine	0	0	1
of which Euro 6 engine	1	1	1
of which Euro 5 engine	2	2	1
Internal fleet efficiency (litres/100km)	9,9	9,3	8,6
CO_2 emissions			
i) from diesel (tonnes)	2,00	0,71	1,13
ii) from petrol (tonnes)	3,25	2,29	3,98
Total vehicle tailpipe emissions (tonnes)	**5,25**	**3,00**	**5,11**

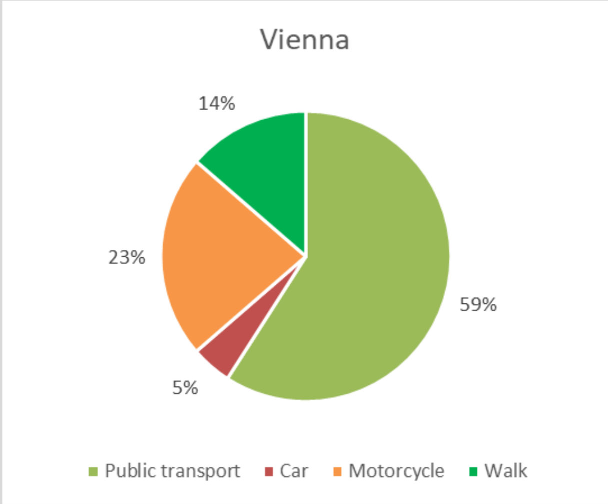
As mentioned above, higher usage of car in 2021 in Vienna offsets the improvement in Valletta from the switch to a more energy-efficient and less polluting plug-in hybrid car. Improvements are expected when the Representation in Vienna replaces, in 2024, their Diesel Euro 5 and Petrol Euro 6 vehicles with electric ones.

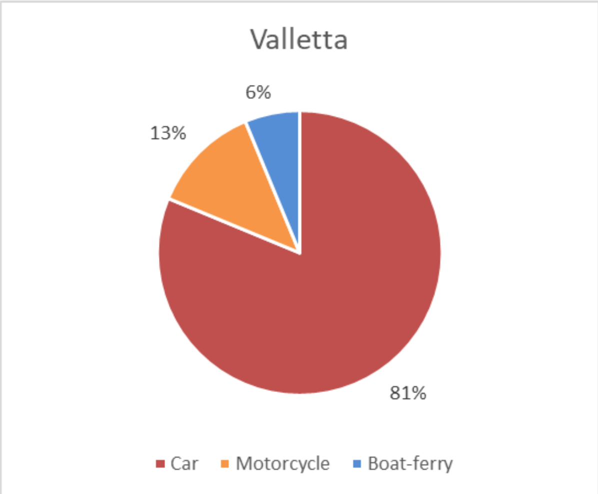
DG COMM (EC) is investing in the electrification of the Representation's car fleet, aiming for a 100% zero and low emissions fleet by 2027 (currently 35%).
Houses of Europe will be progressively equipped with electric car charging stations available for the use of staff. Related procurements are fully integrating the recommended EU Green Public Procurement criteria for road transport.

I4.1.6 Staff commuting (5,6 tCO_2e in 2021, 1,6% of carbon footprint)

Staff commuting modalities are strongly influenced by the available public transport infrastructure which differs considerably between different Houses of Europe. This is clearly illustrated in the figure below which reflects the limited public transport options available to staff in Valletta, where car is the predominant means of transport, as opposed to Vienna where conversely car usage is marginal, in favour of public transport.

Figure 8 - Commuting modes for Valletta and Vienna staff in 2021





Source: House of Europe staff mobility survey 2021

DG COMM offers financial support for public transport season tickets to staff in Representations who give up the right to permanent access to a car-parking space. This is accompanied by a gradual decrease of parking spaces allocated to staff in the Houses of Europe.

Service bikes are available to staff in most Houses of Europe and the first e-bikes are expected soon.

Representations promote the corporate EMAS campaigns on sustainable commuting, in addition to local initiatives such as the safe cycling workshop in Valletta pictured on the right.

I4.1.7 Emissions from household energy use (5,2 tCO_2e in 2021, 1,5 % of carbon footprint)

Homeworking emissions were estimated for the first time in 2021 in response to the change in behaviour under the COVID pandemic and comprise emissions from i) work and domestic appliances used while teleworking ii) energy consumption from space heating and cooling, and iii) from the embodied energy of IT fixed assets that the Commission financed (see fixed assets section below).

The Commission and the Parliament seek to influence staff behaviour in relation to teleworking consumption through awareness raising campaigns, guidance shared on the corporate intranets and through dedicated workshops.

I4.1.8 Fugitive emissions from House of Europe buildings (refrigerant/coolants) – (0 tCO_2e in 2021, 0 % of carbon footprint)

Due to their predominantly administrative activity, the technical installations containing refrigerants in the Houses of Europe are limited to HVAC units and kitchenette fridges. The potential leak of refrigerants and resulting contamination have been recognised as a significant environmental aspect in the Houses of Europe and is thus monitored, through periodic checks, in line with applicable regulations. In Valletta, reports from leak tests are being collected as of 2022, following an update of the facility management contract. No refrigerant losses were reported in Vienna for 2021.

I4.1.9 Catering (0 tCO_2e in 2021, 0% of carbon footprint)

The Houses of Europe do not have on-site catering or staff canteens. Emissions from contracted catering at events will be evaluated in the future.

I4.1.10 Experts' travel (0 tCO_2e in 2021, 0% of carbon footprint)

This category does not apply to the Houses of Europe.

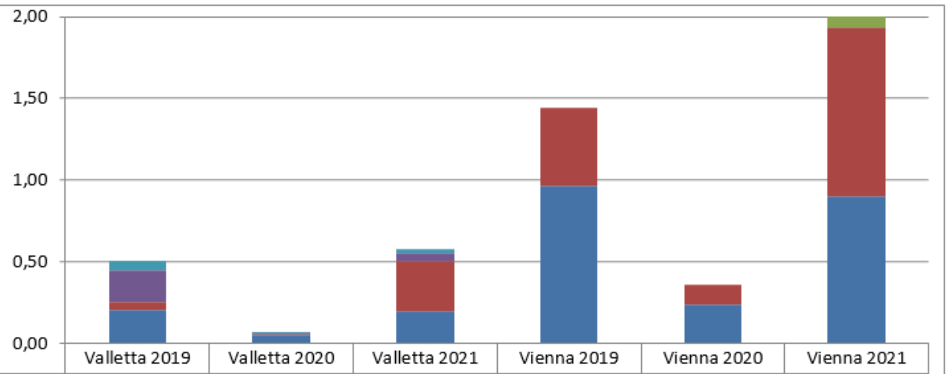
I5. Improving waste management and sorting

The figures presented in this section are for House of Europe buildings only and do not include domestic waste due to homeworking under the COVID pandemic, and which is estimated to be 5,8 tonnes per year or 2,1% of combined hazardous and non hazardous waste in House of Europe buildings.

I5.1 Non hazardous waste

To comply with EMAS data requirements, both Houses of Europe had to adapt their waste management procedures and cleaning contracts, to introduce measurement of and reporting on collected waste. 2019 and (partly) 2020 figures on waste were estimated, which could explain the increase in 2021, despite lower office presence. Waste is separated according to local rules, which vary between locations. For this reason, there is no data on PMC in Valletta (collected together with paper) and for organics in Vienna (not separated).

Figure 9 - Evolution of total non-hazardous waste in Valletta and Vienna (tonnes)

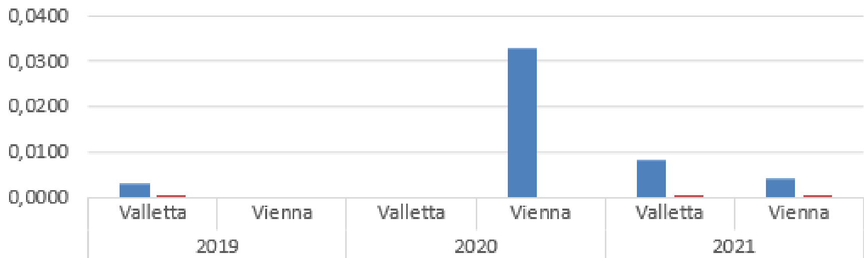


	Valletta 2019	Valletta 2020	Valletta 2021	Vienna 2019	Vienna 2020	Vienna 2021
Total non haz.waste (tonnes/person)	0,02	0,00	0,03	0,04	0,01	0,06
Total non hazardous waste (tonnes)	0,50	0,06	0,58	1,44	0,36	2,05
Glass (20 01 02)	0,05	0,00	0,02	0,00	0,00	0,00
Organics (20 01 08)	0,20	0,00	0,05	0,00	0,00	0,00
PMC (15 01 06)	0,00	0,00	0,00	0,00	0,00	0,12
Paper and card (20 01 01)	0,05	0,01	0,31	0,48	0,12	1,03
Unsorted waste déchets (20 03 01)	0,20	0,05	0,19	0,96	0,24	0,90

I5.2 Hazardous waste

Hazardous waste currently monitored and reported by the Houses of Europe consists of printing devices consumables (toner cartridges), which have seen a decreased use due to the reduced office presence and progress in digitalisation. It is envisaged to encompass other categories, such as electronic and electrical equipment, as future system improvement[9]. The spike in Vienna for 2020 could be the result of disposing of accumulated cartridges from a longer period (no data exists for 2019).

Figure 10 - Evolution of total hazardous waste in Valletta and Vienna (tonnes, tonnes/person)



	2019		2020		2021	
	Valletta	Vienna	Valletta	Vienna	Valletta	Vienna
Total hazardous waste (tonnes)	0,0030	0,0000	0,0000	0,0330	0,0080	0,0040
Total hazardous waste (tonnes/person)	0,0001	0,0000	0,0000	0,0000	0,0002	0,0001

[9] The Representations dispose of most of their obsolete office and IT equipment, which is still useful beyond their economic life, through donations to charities. Obsolete EPLO equipment is reintegrated into the European Parliament's HQ stock and accounted for in the corporate environmental statement. Decommissioned IT equipment and furniture of the European Parliament, including those originating from EPLOs, is donated centrally to charities for reuse.

I5.3 Waste sorting

Waste sorting[10], and waste management in general has improved in both Houses of Europe following the start of EMAS implementation. The drop in waste sorting in Valletta during 2020 can be attributed to the low office presence and possible inconsistencies in waste collection and measurement.

Tableau 6 - Evolution of waste sorting at Valletta and Vienna

	Valletta			Vienna		
	2019	**2020**	**2021**	**2019**	**2020**	**2021**
Percentage of waste not sorted	39,8	88,5	27,6	65,2	65,2	43,8
Percentage of waste sorted	60,2	11,5	72,4	34,8	34,8	56,2

A planned study of waste management practices across all Houses of Europe (regardless of EMAS scope) will map the current situation and provide orientations for possible improvements, as well as the basis for monitoring progress.

Other initiatives to improve waste management include, at both HoEs:

Staff awareness actions to reduce waste and improve waste separation;

Reducing the number of individual bins (VIE);

Providing reusable plastic food containers for the staff's use (VAL);

Informing staff where they can buy package-free food in the office vicinity.

I6. Protecting biodiversity

Given the urban localisation of the buildings, nature-oriented areas are limited to a courtyard with fish-pond in Valletta and a vertical moss-wall in Vienna (introduced in 2021). Nevertheless, Houses of Europe implement measures contributing, directly or indirectly, to protect biodiversity. These include the integration of plants in indoor and outdoor spaces and the use of green public procurement criteria, for instance in requiring cleaning contractors to use eco-friendly products.

Tableau 7 – Evolution of use of land, sealed area nature oriented area in the HoEs

	2019	**2020**	**2021**
Total use of land (m^2)	1,670	1,670	1,679
Total use of land/person	26	28	32
Total sealed area (m^2)	1,639	1,639	1,639
Total sealed area/person	26	27	31
Total nature-oriented area on site (m^2)	30	30	40
Total nature-oriented area on site/person (m^2)	0.5	0.5	0.8
Total nature-oriented area off-site (m^2)	0	0	0
Total nature-oriented area on site/person (m^2)	0	0	0

The House of Europe in Vienna recognised a 9,8 m2 moss-wall, installed in 2021, as nature-oriented area. As it is a vertical surface, the sealed area value is unaffected.

Detailed data, by HoE, is provided in table I12.6.

[10] Refers to percentage of waste separated into waste streams other than residual or urban waste

In the context of the launch of the Green Deal communication campaign, the House of Europe in Valletta organised a beach and shore clean-up accompanied by an exhibition of artwork made by litter recovered from the sea, with the participation of Wave of change[11] founder Neil Agius and members of staff. The event garnered a lot of media attention and helped raise awareness about the fragility of the marine habitat and the need to protect it.

In 2022, the House of Europe in Vienna intends to plant 27 trees (one for each EU Member State) in Vienna, in the context of the "3 billion trees" initiative under the EU Biodiversity Strategy for 2030.[12] The trees shall help cool the city and fix CO_2.

I6.1 Incorporating GPP into procurement contracts

While the European Commission and the European Parliament, and by extension the Representations and EPLOs, share the objective of promoting the use of Green Public Procurement (GPP), the respective practical methods of implementation and reporting are nevertheless slightly different. In the Houses of Europe, most of the procurement is handled by the Representations, whereas the EPLOs, which have fewer staff, lack the administrative and financial capacity and mostly rely on central EP services and their contracts.

Supported by training and procurement templates organised by central services as well as by the inter-institutional GPP Helpdesk, Representations aim to apply GPP to any suitable contract where the market will support it. Examples from Valletta and Vienna in 2021 include the purchase of a plug-in hybrid car, communication and catering services. For the purpose of EMAS reporting, Representations rank their contracts above the corporate threshold of 60.000 EUR between green, not green and green by nature. Nevertheless, the largest share of local contracts are of lower value and are thus currently excluded from the reporting.

Adaptation to the contract classification and reporting requirements could be considered in the medium term, lowering the reporting threshold, possibly to bring it in line with the (current) 15.000 EUR threshold used for Parliament. Enhanced integration of the use of GPP Helpdesk services into procurement procedure workflows could also be considered.

Through the involvement in EMAS, the Representations (via the public procurement and grants team of DG COMM) contribute to improvements of the Public Procurement Management Tool used by many Commission services and of the list of Common Procurement Vocabulary codes which the tool recognises as susceptible for greening. This is expected to deliver improvements in the possibility to track the use of GPP over a larger range of contracts.

[11] https://waveofchangemalta.com/

[12] **https://forest.eea.europa.eu/3-billion-trees/introduction**

I7. Demonstrating legal compliance and emergency preparedness

I7.1 Managing the legal register

The Representations, on behalf of the respective House of Europe, have outsourced the setting-up and maintenance of the environmental legal compliance register to local external consultants, who conduct also a compliance assessment, twice yearly. In addition, internal EMAS audits performed by specialist external consultants and the external verification exercise check how the Houses of Europe demonstrate legal compliance in relation to environmental legislation.

According to the most recent compliance assessment which took place on 31.10.2022 in Valletta and on 4.11.2022 in Vienna, both Houses of Europe are deemed compliant in relation to environmental legislation. The main types of applicable environmental legislation and latest compliance status are provided in section I12.6.

I7.2 Prevention and risk management

As part of the process of setting up an environmental management system in the Houses of Europe, a register of legal obligations, including those linked to environmental permits of buildings, was established. A compliance review, which includes site visits of buildings and inspections of its installations, also plays a key role in incident prevention and risk management. During this exercise, compliance with other legal requirements, such as equipment inspections and maintenance records is also assessed.

Furthermore, environmental context analysis for each House of Europe also includes assessment of environmental risks, opportunities, and where appropriate, proposes mitigating actions.

More detail on emergency tests and exercises aspect of prevention and risk management can be found in section I7.3 below.

I7.3 Emergency preparedness

The Representations manage the emergency preparedness and response processes in the Houses of Europe. They develop annual local contingency and business continuity plans, which take into account potential aspects that can eventually lead to emergency situations, including environmental impacts, in alignment with the corporate guidelines and national rules. These plans are developed as part of the local security and safety plans. Representations contribute to an annual health and safety report produced by DG COMM.

Physical tests and exercises, such as the annual fire emergency drill, were suspended in 2021 due to the low presence in the office, but resumed again in 2022.

At central level, The Commission's DG COMM (sector COMM.D.2.001 - Security and Business Continuity) and the Parliament's DG SAFE coordinate safety and security procedure in Representations and EPLOs, respectively.

I8. Communication and training

I8.1 Internal and external communication

Internal communication may involve House of Europe staff and contractors. Corporate actions, aimed at Commission staff in all sites, including Representations, are detailed in the corporate chapter of this environmental statement. Similarly, the European Parliament reports on its corporate communication actions, directed also to EPLO staff, in its environmental statement. In addition, the Houses of Europe organise local internal communication and awareness raising activities supported by internal communication channels (intranet, functional mailboxes, posters etc.), staff meetings and special events (some past examples include a beach clean-up, safe-cycling workshop, train and cycling tour of Austria etc.).

Communication to national stakeholders can be considered the prime vocation of the Houses of Europe, notwithstanding differences in institutional prerogatives and organisational context between the Commission and the Parliament. In general, the protection of the environment has always been amongst the key EU policies communicated, and with the adoption of the European Green Deal it has risen to front-centre. Based on their country-knowledge, Representations identify in annual country strategies the most relevant topics for promotion, adapted to local concerns and identified target groups. EPLOs, too, follow a similar approach, by way of providing a platform for communication to the elected Members of the European Parliament or when engaging citizens to vote in European Parliament elections.

Communication channels include websites and social media, press activities, communication multipliers such as the Europe Direct network. On-line and increasingly again also physical events, often organised together by the two institutions or in partnership with other organisations, are a mainstay of local EU communication. Building upon the well-established format of town hall meetings, the Houses of Europe organised in 2021 dozens of events in the context of the Conference on the Future of Europe (CoFE)[13], in which citizens were invited to debate on Europe's challenges and priorities, with the environment being one of the key topics. Table I12.12 provides a summary of main actions for 2021. In addition, browsing the social media accounts of the Representations and EPLOs, provided in table I12.13, may offer a glance on the exposure given to environmental issues.

Climate change and the environment featured as 3rd most popular topic at CoFE national events[14] in Austria, co-organised by the Representation and EPLO together with the Austrian Federal Chancellery and of the Federal Minister for the EU and Constitution.

Through the joint implementation of EMAS, the House of Europe in Valletta was able to improve the coordination of external communication by the Representations and EPLO in the field related to the environment.

[13] https://futureu.europa.eu/?locale=en

[14] https://www.eu-zukunftskonferenz.at/user/documents/conference-on-the-future-of-europe-at-overview_2022.pdf

I8.2 Internal and external training

Training activities in 2021 included Commission corporate EMAS courses, which attracted 67,9 % of HoE staff compared to 8,3% in 2020, when EMAS implementation was launched. In addition to this, the Houses of Europe organised local trainings on the topics of sustainability in the workplace and waste management, addressed also to external stakeholders such as contractors or the condominium (in Vienna). The EMAS coordinating teams in the HoEs benefited from many ad-hoc trainings by the Commissions' EMAS Corporate Coordination team and the DG COMM Site Coordinator, particularly in preparation to key milestones in the annual EMAS cycle which they encountered for the first time. In order to develop necessary competences ahead of the first internal audit, in the absence of suitable internal training, the EMAS Site coordinator at DG COMM completed an external ISO 14001 Lead Auditor course. The Commission's EMAS Central Coordination team has since addressed this gap and introduced specific courses on the EMAS Regulation and on preparations for internal and external audit, including root cause analysis. These are open also to EPLO EMAS representatives in the Houses of Europe, beyond institutional boundaries.

A summary of internal and external trainings is provided in Table 12.14.

I9. EMAS Costs and savings, conversion factors

I9.1 Costs and savings

Calculations showing the costs associated with running EMAS in the Valletta and Vienna Houses of Europe are presented section I12.7.

The EMAS direct administrative cost per capita has almost doubled since the start of EMAS implementation in 2020 owing to the higher coordination needs and the addition of legal contractual fees, accompanied by a reduction in overall staff numbers. Given the relatively limited staff numbers amongst which the cost is shared, which limits economies of scale possible at larger sites, the per capita cost of 1.050 EUR is high above the Commission average of 65 EUR for 2021.

The cost for central coordination staff at DG COMM and for internal and verification audits are accounted for under the EMAS Corporate Coordination Team in HR.D7 for the Commission, and by the EMAS Unit, Central Service attached to the Secretary-General, for the Parliament.

I9.2 Conversion factors

Conversion factors (most of which apply to all the sites) are shown in Appendix 2 to the Commission Corporate Summary. They are not directly applicable to Parliament's environmental reporting.

I10. Site breakdown: Buildings' characteristics and performance (selected parameters, indicative data)

Building code	Address	Occupant	EMAS registration	Useful surface area (m^2)	Staff	Office	Café	Self rest	Printing and mail sorting	Electricity	Diesel	District heating and cooling		Water (m3)	Non hazardous waste (t)
1) Building essential details:						2) Building use				3) Energy sources and amount (MWh for 2021)			4) Total building emissions from energy (t CO2 for 2021)	4) Water and waste consumption for 2021	
DG COMM Representations (Houses of Europe)															
VAL	Dar l-Ewropa 254 Triq San Pawl, Valletta VLT 1215	DG COMM (EC), DG COMM (EP)		1 056	21	X				80,45	0,26	0,00	33	212,0	0,70
VIE	Haus der Europäischen Union Wipplingerstraße 35, A-1010 Wien	DG COMM (EC), DG COMM (EP)		2 455	32	X				216,12	0,00	190,17	62	611,5	2,05
TOTALS				**3 511**	**53**					**297**	**0,26**	**190**	**94**	**823**	**3**

I11. Environmental policies and governance structure

I11.1 Environmental policy of the European Commission

European Commission

EMAS ENVIRONMENTAL POLICY

EMAS
Verified environmental management
BE-BXL-000003

As a contribution to the Green Deal, the European Commission demonstrates its commitment to sustainable development, and sound environmental practice, by ensuring that it reduces the impact of its day-to-day activities in a manner consistent with the policies that it has developed for Europe.

Continuing efforts to improve its environmental performance that started in 1997, in 2005, the Commission achieved its first registration under the Eco Management and Audit Scheme (EMAS). In 2020, the Commission implements EMAS across its eight[1] largest sites in Europe.

The Commission will endeavor to continue extending the scope of its registration to the Executive Agencies and to its representations across Europe.

The Commission will continue to protect the environment, including pollution prevention, and in 2019, her President, Ursula von der Leyen committed to make the Commission climate neutral by 2030.

Under EMAS the Commission seeks to continually improve its environmental management system and its environmental performance and therefore reduce the environmental impact of its everyday work in accordance to the UN's Sustainable Development Goals (SDGs) by:

(1) Using natural resources more efficiently, particularly in relation to energy, water and products such as paper;
(2) Continuously reducing our operations' atmospheric emissions (mainly from buildings operation and transport) with the objective of making the Commission climate-neutral by 2030;
(3) Improving waste management and sorting, where waste prevention measures have been exhausted, so that waste recycling is optimised and residual waste reduced;
(4) Protecting biodiversity;
(5) Promoting sustainable and environmentally responsible public procurement procedures for example by introducing appropriate criteria into the tender and contract process, and incorporating life cycle cost considerations where feasible;
(6) Ensuring (and demonstrating) compliance with environmental legislation and regulations including in relation to emergency preparedness, thereby reducing pollution risk;
(7) Encouraging staff and contractors to embrace sustainable behaviour through improved internal communication, awareness-raising, and training; and
(8) Enjoying transparent relations and dialogue with external parties, taking into account and addressing stakeholder expectations;
(9) Improving the EMAS system including ensuring consistency with European Union policies.

Additionally, and though not falling within the EMAS scope, the Commission will ensure through assessments carried out by its services, that in relation to its core business, it will:

(10) Systematically assess the potential economic, social and environmental impacts of major new policy and legislative initiatives and promote systematic integration of environmental objectives into Community policies;
(11) Ensure the effectiveness of environmental legislation and funding in creating environmental benefits;

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 staff and financial resources in order to ensure that the environmental management system runs efficiently.

This document is effective from the date of signature,

Brussels, 06/10/2020

On Behalf of the EMAS Steering Committee,

Gertrud INGESTAD
President

[1] Brussels, Luxembourg, Ispra (Italy), Geel (Belgium), Karlsruhe (Germany), Seville (Spain), Petten (The Netherlands) and Grange (Ireland).

I11.2 Environmental policy of the European Parliament

Европейски парламент Parlamento Europeo Evropský parlament Europa-Parlamentet Europäisches Parlament
Euroopa Parlament Ευρωπαϊκό Κοινοβούλιο European Parliament Parlement européen Parlaimint na hEorpa
Europski parlament Parlamento europeo Eiropas Parlaments Europos Parlamentas Európai Parlament
Parlament Ewropew Europees Parlement Parlament Europejski Parlamento Europeu Parlamentul European
Európsky parlament Evropski parlament Euroopan parlamentti Europaparlamentet

THE EUROPEAN PARLIAMENT'S ENVIRONMENTAL POLICY

The European Parliament recognizes its responsibility for making a positive contribution to sustainable development as a long-term goal. Parliament fulfils this responsibility in its political and legislative role, but also in the way it operates and the decisions it takes on a day-to-day basis.

In 2007, the European Parliament therefore decided that its administration would embark on the path of applying the EMAS (Eco-Management and Audit Scheme) standard, with the aim of continually improving its environmental results with regard to activities, products and services.

The European Parliament's Environmental Policy is implemented through its Environmental Management System (EMS). The Environmental Policy and the EMS cover Parliament's main environmental aspects, both directly and indirectly, as well as their impact on the sites concerned, and make it possible to establish corresponding objectives.

Interest in the environmental performance of organisations has become a mainstream issue, and it continues to increase in importance. A proactive corporate sustainability strategy to tackle environmental challenges is the hallmark of successful organisations. A broad range of benefits arise from EMAS registration, including reduced costs for resources and waste management, risk minimization, regulatory compliance and improved relations with internal and external stakeholders.

The European Parliament hereby

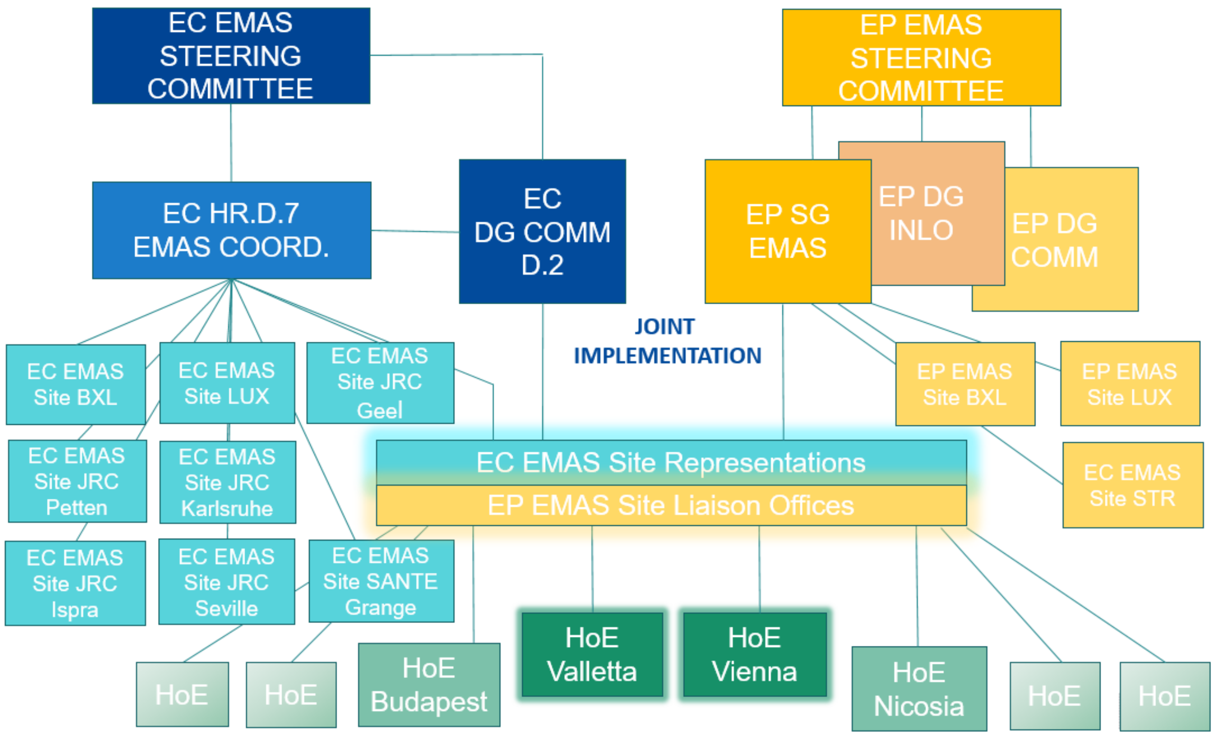
- *reaffirms its commitment to maintaining its EMAS registration and its environmental approach of continuous improvement, with a view towards achieving environmental sustainability in all its administrative activities;*
- *stresses the already good overall performance of the EMS at the European Parliament as demonstrated by the achievement of the key environmental performance indicator (KPI) objectives for the previous target period, while emphasising the need to further intensify efforts, particularly in the area of greenhouse gas emissions;*
- *aims to strengthen efforts in order to reach its newly set-up medium- and long-term key environmental performance indicator objectives in the areas of greenhouse gas emissions, electricity consumption, gas, heating oil, and district heating consumption, paper consumption, water consumption, production of waste, waste recycling, renewable energy, food waste, green public procurement, and sustainable mobility;*
- *undertakes to ensure compliance with objectives and requirements laid down by local, regional, national, as well as EU legislation;*
- *undertakes to implement preventive measures to further improve its environmental performance and to ensure that environmental considerations and sustainability criteria are integrated in all its administrative activities;*
- *endeavours to provide sufficient resources for its EMS and activities relating thereto, recognising that development and implementation of specific individual activities should be subject to an assessment in terms of costs, technical feasibility and availability of adequate resources;*
- *undertakes to include and apply strict environmental and energy efficiency criteria in all of its building policies and building projects;*
- *endeavours to establish a waste management strategy setting a priority order among waste prevention and management options, including recommendations in terms of prevention, re-use, recycling, energy recovery and disposal;*
- *aims to examine the feasibility of applying the principles of circular economy in the future planning of Parliament's infrastructure, management of stocks, and in future purchases of goods and services by, inter alia, considering relevant circular economy criteria, such as smart design, reuse of materials and recyclability;*
- *encourages responsible and appropriate behaviour by training, providing information and increasing the awareness of all its staff, but also its Members and their assistants, about EMAS-relevant aspects of their activities;*
- *undertakes to introduce best practices with regard to its main environmental impacts, in particular greenhouse gas emissions and waste management, as well as an efficient use of energy, water and paper;*
- *undertakes to apply best practices in activities associated with its EMS, if appropriate by offsetting carbon emissions, including possible joint offsetting projects with other EU institutions and bodies, greening events organised in and by the European Parliament, and, whenever possible, contributing to expansion and increased quality of green urban areas;*
- *aims for its EMS activities to contribute to achieving the current Sustainable Development Goals as set by the United Nations General Assembly*
- *endeavours to further strengthen its sustainable procurement approach as a key tool in environmental management by applying targets for the classification of contracts, combining implementation of established good practices in sustainable procurement with potential innovative sustainable procurement solutions while keeping in mind the specificity of each market;*
- *aims to promote, encourage and facilitate the use of sustainable transport for daily commutes, missions and other travel related to its administrative and political activities*

The European Parliament undertakes to describe in detail, implement and pursue this Environmental Policy, to communicate it to Members, staff, contractors and any other interested parties and to make it accessible to the public.

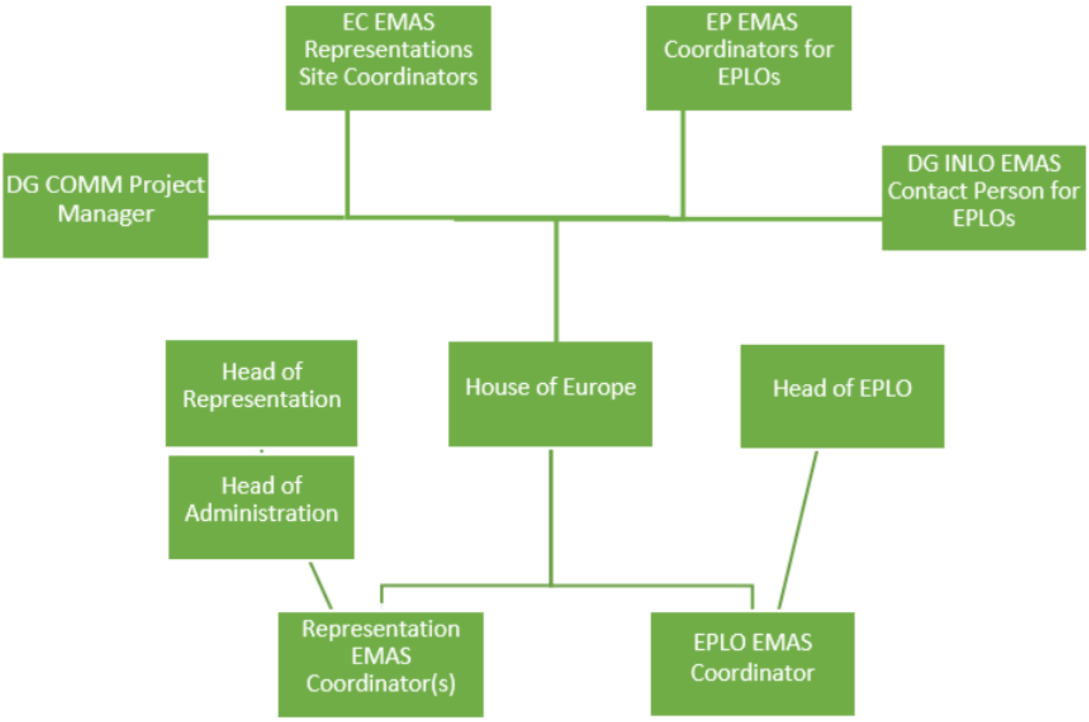
David Maria SASSOLI, President
Brussels, 6 November 2019

Klaus WELLE, Secretary-General
Brussels, 6 November 2019

I11.3 Governance structure for the joint implementation of EMAS in the Houses of Europe by the European Commission (EC) and the European Parliament (EP)



I11.4 Project actors at central and local level



I12. Tables

I12.1 Summary of main stakeholders' requirements to be addressed in the management system as obligations for the Houses of Europe

Stakeholder Group	HoE	Stakeholder needs & expectations	EMS obligations
European Institutions	VAL VIE	Development plans and successful operational activities in line with EU policy level.	To ensure a high-quality service within the EU political scope and budgetary constraints.
National and local authorities	VAL VIE	Compliance with national regulations, potential cooperation; Strategic and operational plans compliant with National and Regional regulations and targets (example Energy Efficiency Directive).	Implementation of the EMS: to promote the European Institutions' role of leading by example regarding environmental compliance and practices.
Regulatory authorities (EMAS competence bodies)	VAL VIE	Compliance with Regional and EMAS regulations.	To ensure legal compliance on facility management activities and involved stakeholders. Provide access to appropriate information.
General public, citizens	VAL VIE	Transparent communication, accountability Access to appropriate information,	Promote the green Deal and lead by example. Promote the EMAS and deliver good and useful information. Commission and Parliament as a green workplace.
Specific associations/professions	VAL VIE	Transparent communication, accountability Access to appropriate information	Proactive planning and communication giving reassurances on Representation activities to the press and NGOs (example, the publication of the Environmental statement).
Suppliers / contractors	VAL VIE	Information on environmental requirements, targets and technical specifications	Implementation by management: to define appropriate environmental criteria at the relevant stages of the procurement and project management process, use EU GPP criteria
Clients	VAL VIE	Effective and timely facility management services in compliance with environmental legislation	Implementation by management: quality of the facility management service and modern infrastructure supplied by the technical and administrative management responsible at central EP level DG INLO)
Building Management and Condominium	VIE	Timely information on needs and joint projects.	Regular communication on EMAS advancement
EU Information Providers/ Europe Direct (ED) partners	VAL	Punctual needs on specific topics	Incorporation of ED events in EC Rep communication action plan
Staff	VAL VIE	Responsible environmental behaviour, transparent communication regarding environmental procedures and impacts	Infrastructure and operational services quality; communication plan: environmental engagement by DG COMM, reflecting the needs and aspirations of the staff, through communication plans and activities.

I12.2 Summary of significant environmental aspects for the Houses of Europe

	Indicators Global Annual Action Plan (A3), 2014-23/30	Environmental Aspect	Environmental impact	Valletta	Vienna
1	**Reducing resource consumption**				

	Total final energy consumption	Building energy consumption	Resources depletion, air emissions, global warming	√	√
	Water use	Water	Resources depletion	√	√
	Office paper consumption	Office supplies and furniture	Resources depletion, air emissions, global warming		√
2	**Reducing emissions to air (Carbon footprint)**				
	CO_2 emissions (from bldgs. energy use and fixed IT)	Emissions such as of CO_2, NO_x, SO_x and VOCs.	Resources depletion, air emissions, global warming, acid rain	√	√
	Buildings refrigerant loss	HCFC releases			√
	CO_2 emissions (cars)	Emissions such as of CO_2, NOx, SOx and VOCs.		√	√
	IT fixed assets				√
	Staff missions – tonnes			√	√
	Staff commuting – tonnes			√	√
3	**Improving waste management**				
	Non-hazardous waste	Chemicals disposal/ leaks of chemicals/ leaks of Gasoil unsorted waste production	Air, soil and water contamination Resources depletion, pollution,	√	√
	Unseparated waste			√	√
4	**Protecting biodiversity**				
	biodiversity	Land use, use of chemical products	Resources depletion, loss of biodiversity, land degradation	√	√
5	**Promoting GPP (and Circular economy)**				
	Green public procurement	Green criteria	Resources depletion, pollution	√	√

Legend:

√ significant environmental aspects

√ medium environmental aspects

I12.3 Evolution of EMAS baseline parameters

	2019	2020	2021
Population: staff in EMAS perimeter	64	60	53
Population: total staff	64	60	53
Population: EC staff	43	40	36
Population: EP staff	21	20	17
No. buildings for EMAS registration	4	4	4
Total no. operational buildings	4	4	4
Useful surface area in EMAS perimeter, (m^2)	3.511	3.511	3.511
Useful surface area for all buildings, (m^2)	3.511	3.511	3.511

Surface measured according to DIN227

I12.4 Vehicle energy consumption, by HoE

	Valletta			Vienna		
	2019	2020	2021	2019	2020	2021
Total (MWh/yr)	3,84	1,31	1,23	13,78	8,78	15,97
Total as % of tot. building energy consumption	3,52	1,60	1,57	2,90	2,07	3,93
MWh/person	0,16	0,05	0,06	0,34	0,24	0,50
kWh/km (per 1000 kms)	1,002	0,868	0,416	0,969	0,910	0,900
Diesel used (m3)	0,36	0,12	0,12	0,27	0,10	0,24
Petrol used (m3)	0,00	0,00	0,00	1,16	0,82	1,42

I12.5 Renewable energy use in buildings and vehicles, by HoE

	Valletta			Vienna		
Contributions to renewable energy	2019	2020	2021	2019	2020	2021
i a) electricity contract 1 (% renewables)	7,3	7,3	7,3	100,0	100,0	100,0
electricity contract 1 (MWh renewable)	8,0	6,0	5,7	100,0	78,4	73,3
i b) electricity contract 2 (% renewables)	n/a	n/a	n/a	18,6	19,7	21,1
electricity contract 2 (MWh renewable)	n/a	n/a	n/a	35,7	33,8	30,1
v) district heating and cooling (% renewable)	0,0	0,0	0,0	135,7	112,3	103,5
district heating and cooling (MWh renewable)	0,0	0,0	0,0	46,5	44,9	47,9
viii) (PV) (% renewable)	n/a	n/a	n/a	n/a	n/a	n/a
(MWH renewable)	n/a	n/a	n/a	n/a	n/a	n/a
Total renewables (MWh)	**8,0**	**6,0**	**5,7**	**177,6**	**153,8**	**148,3**
Total renewables (%)	**7,3**	**7,3**	**7,3**	**37,3**	**36,3**	**36,5**
Total non ren. energy use, (MWhr/yr)	**101,3**	**75,9**	**72,7**	**298,2**	**269,5**	**257,9**
Non ren. energy as part of total, (%)	**92,7**	**92,7**	**92,7**	**62,7**	**63,7**	**63,5**

I12.6 Evolution of use of land, sealed area nature oriented area indicators by HoE

	Valletta			Vienna		
	2019	2020	2021	2019	2020	2021
Total use of land (m^2)	363	363	363	1,235	1,235	1,235
Total use of land/person	15	15	17	31	34	39
Total sealed area (m^2)	363	363	363	1,277	1,277	1,277
Total sealed area/person	15	15	17	32	35	40
Total nature-oriented area on site (m^2)	30	30	30	0	0	10
Total nature-oriented area on site/person (m^2)	1.3	1.3	1.4	0.0	0.0	0.3
Total nature-oriented area off-site (m^2)	0	0	0	0	0	0
Total nature-oriented area on site/person (m^2)	0	0	0	0	0	0

I12.7 EMAS administration and energy costs for buildings in the EMAS area

Parameter	**2019**	**2020**	**2021**
Total Staff in EMAS perimeter	64	60	53
Total Staff	64	60	53
EMAS administrative cost (EUR)/staff	**0**	**570**	**1.050**
Total energy cost for EMAS office buildings (EUR)	18.647	14.819	19.567
Total per capita energy cost for EMAS office buildings (EUR/person)	**194**	**79**	**191**

I12.8 Summary of performance for selected parameters in Valetta and Vienna

Physical indicators (Number, description , unit)	Historic data values 2019 (first EMAS data)	2020	2021	Performance trend (%) since 2019	Future targets 2019-23 Δ %	2019-30 Δ %
1a) Energy bldgs (MWh/p)						
Valletta	4,6	3,4	3,7	-18,0	-3,0	-5,0
Vienna	11,9	11,8	12,7	6,7	-3,0	-5,0
Houses of Europe	**9,1**	**8,4**	**9,1**	0,0	**-3,0**	**-5,0**
1a) Energy bldgs (kWh/m²)						
Valletta	103,5	77,5	74,3	-28,3	-3,0	-5,0
Vienna	193,8	172,4	165,5	-14,6	-3,0	-5,0
Houses of Europe	**166,7**	**143,9**	**138,0**	-17,2	-3,0	-5,0
1c) Non renewable energy use in buildings (%)						
Valletta	92,7	92,7	92,7	0,0	n/a	n/a
Vienna	62,7	63,7	63,5	1,3	n/a	n/a
Houses of Europe	**70,1**	**70,8**	**70,7**	-0,1	n/a	n/a
1d) Water use (m³/person)						
Valletta	22,9	11,1	7,4	-67,9	0,0	-5,0
Vienna	14,4	12,5	19,1	32,9	0,0	-5,0
Houses of Europe	**17,6**	**11,9**	**14,5**	-17,7	**0,0**	**-5,0**
1d) Water consumption (L/m²)						
Valletta	520	252	146	-71,9	0,00	-5,00
Vienna	234	183	249	6,3	0,00	-5,00
Houses of Europe	**320**	**204**	**218**	-31,9	**0,0**	**-5,0**
1e) Office paper consumption (T/p)						
Valletta	0,008	0,001	0,002	-79,4	-40,0	-60,00
Vienna	0,015	0,009	0,011	-25,4	-40,0	-60,00
Houses of Europe	**0,012**	**0,006**	**0,007**	-39,7	**-40,0**	**-60,0**
1e) Office paper (sheets/p/day)						
Valletta	7,1	1,2	1,5	-79,4	-40,0	-60,0
Vienna	14,0	8,2	10,4	-25,4	-40,0	-60,0
Houses of Europe	**11,4**	**5,4**	**6,9**	-39,7	**-40,0**	**-60,0**
2a) CO_2 emissions from buildings (tonnes/person)						
Valletta	1,9	1,4	1,5	-18,9	-3,0	-5,0
Vienna	1,7	1,8	1,9	11,2	-3,0	-5,0
Houses of Europe	**1,8**	**1,6**	**1,8**	-1,1	**-3,0**	**-5,0**
2a) CO_2 emissions from buildings (kgCO2/m²)						
Valletta	42,2	31,3	30,0	-29,0	-3,0	-5,0
Vienna	28,2	26,0	25,1	-11,1	-3,00	-5,00
Houses of Europe	**32,4**	**27,6**	**26,6**	-18,1	**-3,0**	**-5,0**
2c) vehicle fleet emissions (gCO_2/km) - manufacturer						
Valletta	150	150	55	-63,3	-42,00	-90,00
Vienna	156	156	156	0,0	-42,00	-90,00
Houses of Europe	**154**	**154**	**122**	-20,6	**-42,0**	**-90,0**
2c) vehicle fleet emissions (gCO_2/km) - actual						
Valletta	298	259	183	-38,7	n/a	n/a
Vienna	60	33	43	-28,5	n/a	n/a
Houses of Europe	**111**	**63**	**63**	-43,1	**n/a**	**n/a**
3a) Non hazardous waste (tonnes/person)						
Valletta	0,02	0,00	0,03	31,5	-20,0	-25,0
Vienna	0,04	0,01	0,06	78,0	-20,0	-25,0
Houses of Europe	**0,03**	**0,01**	**0,05**	63,4	**-20,0**	**-25,0**
3c) Unseparated waste (%)						
Valletta	39,8	88,5	33,4	-16,1	n/a	n/a
Vienna	65,2	65,2	43,8	-32,8	n/a	n/a
Houses of Europe	**58,6**	**68,4**	**41,2**	-29,7	**n/a**	**n/a**
3c) Unseparated waste (T/p)						
Valletta	0,008	0,002	0,009	9,7	n/a	n/a
Vienna	0,024	0,007	0,028	17,2	n/a	n/a
Houses of Europe	**0,018**	**0,005**	**0,021**	13,7	**n/a**	**n/a**

I12.9 Split of key resource parameters results and carbon footprint between EC and EP for the purpose of corporate-level data aggregation applying the 60% EC/ 40%EP ratio, save where mentioned otherwise

	2021	EC	EP
Total energy buildings, (MWh)	484,71	290,82	193,88
Total non renewable energy, (MWh)	330,65	198,39	132,26
Total energy consumption Commission vehicle fleet, (MWh)(1)	17,20	17,20	0,00
Water usage in buildings, (m^3)	765,88	459,53	306,35
Office paper consumption, (tonnes)	0,38	0,23	0,15
Printshop paper consumption (tonnes)	2,39	1,43	0,96
Total non hazardous waste (tonnes)	2,65	1,59	1,06
Total hazardous waste (tonnes)	0,00	0,00	0,00

	2021	EC	EP
Scope 1: Fuel consumption and fugitive emissions, excl. vehicles	0,07	0,04	0,03
Commission vehicle fleet (1)	4,13	4,13	0,00
Scope 2: Purchased energy	112,40	67,44	44,96
Scope 3: Other indirect sources, excl. vehicles	12,67	7,60	5,07
Commission vehicle fleet (upstream) (1)	0,98	0,98	0,00
Business travel (2)	17,19	10,71	6,48
Business travel: air (combustion) + (including air taxi)	14,59	8,75	5,83
Business travel: air (WTT)		0,00	0,00
Business travel: rail (combustion)	1,07	0,64	0,43
Business travel: rail (WTT)		0,00	0,00
Business travel: hire car (combustion)	1,03	0,62	0,41
Business travel: hire car (WTT)		0,00	0,00
Business travel: private car (combustion)	0,50	0,30	0,20
Business travel: private car (WTT)		0,00	0,00
Experts' travel: air emissions	0,00	0,00	0,00
Experts' travel: rail emissions	0,00	0,00	0,00
Commuting (combustion)	5,63	3,38	2,25
Fixed assets - buildings, IT	70,60	42,36	28,24
Fixed assets - Commission vehicles (1)	1,03	1,03	0,00
Paper supply	2,77	1,66	1,11
Service contracts	119,11	71,47	47,65
Catering	0,00	0,00	0,00
Own waste	0,40	0,24	0,16
Teleworking emissions	5,19	3,11	2,08
Sum	**352,18**	**211,31**	**140,87**

Notes
(1) EC 100%
(2) Precise calculation

I12.10 Carbon footprint elements, combining Valletta and Vienna (tonnes CO_2e)

Scope 1: Fuel consumption and fugitive emissions	**2019**	**2020**	**2021**
Fuel for bldgs: mains gas	0,00	0,00	0,00
Fuel for bldgs: tanked gas	0,00	0,00	0,00
Fuel for bldgs: diesel	0,00	0,00	0,07
Biomass	0,00	0,00	0,00
Commission vehicle fleet	4,22	2,42	4,13
Refrigerants	3,87	0,00	0,00
Scope 2: Purchased energy			
External electricity supply (grey),	103,07	85,52	74,04
External electricity supply contract (renewables), combustion	0,00	0,00	0,00
District heating (combustion) (1)	37,46	34,75	38,36
Scope 3: Other indirect sources			
Fuel for bldgs: mains gas (upstream)	0,00	0,00	0,00
Fuel for bldgs: tanked gas (upstream) (1)	0,00	0,00	0,00
Fuel for bldgs: diesel (upstream)	0,00	0,00	0,02
Commission vehicle fleet (upstream)	1,03	0,58	0,98
Site generated renewables (upstream)	0,00	0,00	0,00
External grey electricity supply, line losses	10,31	7,61	6,59
External 'renewables' electricity contract (upstream with line loss)	0,00	0,00	0,00
District heating (upstream) (1)	5,92	5,49	6,06
Business travel: air (combustion) + (including air taxi)	30,49	8,19	14,59
Business travel: air (WTT)			
Business travel: rail (combustion)	1,02	0,24	1,07
Business travel: rail (WTT)			
Business travel: hire car (combustion)	0,63	0,10	1,03
Business travel: hire car (WTT)			
Business travel: private car (combustion)	0,49	0,22	0,50
Business travel: private car (WTT)			
Experts' travel: air emissions	0,00	0,00	0,00
Experts' travel: rail emissions	0,00	0,00	0,00
Commuting (combustion)	14,11	3,53	5,63
Fixed assets - buildings	38,89	38,89	38,89
Fixed assets - IT	41,22	32,23	31,71
Fixed assests - Commission vehicles	0,90	0,56	1,03
Paper supply	0,77	2,16	2,77
Service contracts	45,53	66,89	119,11
Catering	0,00	0,00	0,00
Own waste	0,42	0,10	0,40
Teleworking emissions (equipment electricity use)	0,00	0,00	2,64
Teleworking emissions (fixed assets, equipment)	0,00	0,00	0,08
Teleworking emissions (space heating)	0,00	0,00	2,47
Sum	**340,35**	**289,48**	**352,18**

Note : (1) Vienna only

I12.11 Per Capita CO_2 equivalent (CO_2e) emissions by scope and HoE (tonnes)

	Valletta			Vienna		
	2019	2020	2021	2019	2020	2021
Scope 1: Fuel consumption and fugitive emissions						
Fuel for bldgs: mains gas	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: tanked gas	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel	0,00	0,00	0,00	0,00	0,00	0,00
Biomass	0,00	0,00	0,00	0,00	0,00	0,00
Commission vehicle fleet	0,04	0,01	0,01	0,09	0,06	0,14
Refrigerants	0,00	0,00	0,00	0,10	0,00	0,00
Scope 2: Purchased energy						
External electricity supply (grey),	1,69	1,26	1,42	0,54	0,52	0,42
External electricity supply contract (renewables), combustion	0,00	0,00	0,05	0,00	0,00	0,03
District heating (combustion)	0,00	0,00	0,00	0,94	0,97	1,19
Scope 3: Other indirect sources						
Fuel for bldgs: mains gas (upstream)	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: tanked gas (upstream)	0,00	0,00	0,00	0,00	0,00	0,00
Fuel for bldgs: diesel (upstream)	0,00	0,00	0,00	0,00	0,00	0,00
Commission vehicle fleet (upstream)	0,01	0,00	0,00	0,02	0,02	0,04
Site generated renewables (upstream)	0,00	0,00	0,00	0,00	0,00	0,00
External grey electricity supply, line losses	0,17	0,11	0,13	0,05	0,05	0,04
External 'renewables' electricity contract (upstream with line loss)	0,00	0,00	0,00	0,06	0,09	0,09
District heating (upstream)	0,00	0,00	0,00	0,15	0,15	0,19
Business travel: air (combustion) + (including air taxi)	0,72	0,25	0,37	0,33	0,37	0,42
Business travel: rail (combustion)	0,01	0,00	0,00	0,02	0,01	0,03
Business travel: hire car (combustion)	0,03	0,00	0,03	0,00	0,00	0,01
Business travel: private car (combustion)	0,00	0,00	0,00	0,01	0,01	0,02
Experts' travel: air emissions	0,00	0,00	0,00	0,00	0,00	0,00
Experts' travel: rail emissions	0,00	0,00	0,00	0,00	0,00	0,00
Commuting (combustion)	0,46	0,12	0,19	0,07	0,02	0,05
Fixed assets - buildings	0,38	0,38	0,44	0,74	0,82	0,93
Fixed assets - IT	0,68	0,53	0,53	0,59	0,51	0,61
Fixed assests - Commission vehicles	0,01	0,00	0,01	0,02	0,01	0,03
Paper supply	0,01	0,00	0,00	0,01	0,06	0,09
Service contracts	0,12	0,12	0,92	1,16	1,94	3,33
Catering	0,00	0,00	0,00	0,00	0,00	0,00
Own waste	0,00	0,00	0,00	0,01	0,00	0,01
Teleworking emissions (equipment electricity use)	0,00	0,00	0,09	0,00	0,00	0,02
Teleworking emissions (fixed assets, equipment)	0,00	0,00	0,00	0,00	0,00	0,00
Teleworking emissions (space heating)	0,00	0,00	0,01	0,00	0,00	0,07
Sum	**4,3**	**2,8**	**4,1**	**4,9**	**5,3**	**7,5**

I12.12 Summary of main communication actions in 2021

HoE	Title	Objectives
VALLETTA	EU “Green Deal National Campaign: Launch event and Roadshow”.	Green Deal, communication campaigns addressed to a broad audience
VALLETTA	Theatrical Production on Green Deal	Science in the City campaign addressing young people
VALLETTA	RRF: RRP/European Semester fact-finding mission – Government	Meetings at governmental level to monitor the implementation of Green and Climate objectives in Malta
VALLETTA	Integration of EU Green Deal in national TV programme	EU Green Deal the “Farm to Fork” strand debate broadcasted on the national TV to a large audience

VALLETTA	Communication actions of "9 May", launch the Conference on the Future of Europe	European Green Deal, Europe Fit for the digital age, ccampaigns addressed to a broad audience
VALLETTA	RRF: presentation and discussion of Malta's RRP (11/11/2021)	Recovery Campaign on digitalisation, green and digital transition communication campaigns on a national level
VALLETTA	CAST OUT – 1st OCTOBER 2021, GOZO	Creation of an art installation made by means of raw material collected at community clean-up events all over the Maltese Islands
VIENNA	Future of Europe-Tour with bike and train through all Austrian provinces	“Europa on Tour” travelling climate friendly engage with Austrian citizens
VIENNA	Citizens' Dialogue with EU-Commissioner Sinkevicius and Climate Minister Gewessler on EU Green Deal	Hybrid citizen’s dialogue on Green Deal
VIENNA	Online EU-Youth Discussion with EVP Timmermans and Climate Minister Gewessler on EU Green Deal	Green Deal and Climate transition, broad audience
VIENNA	Interview with Commissioner Sinkevičius about climate change in "Kurier" newspaper	Green Deal climate change; broad audience
VIENNA	Event “Fit for 55 — How do we achieve our climate goals?”	Green Deal, Event in cooperation with the Federal Ministry for Climate Action

I12.13 Selected social media accounts of the Houses of Europe

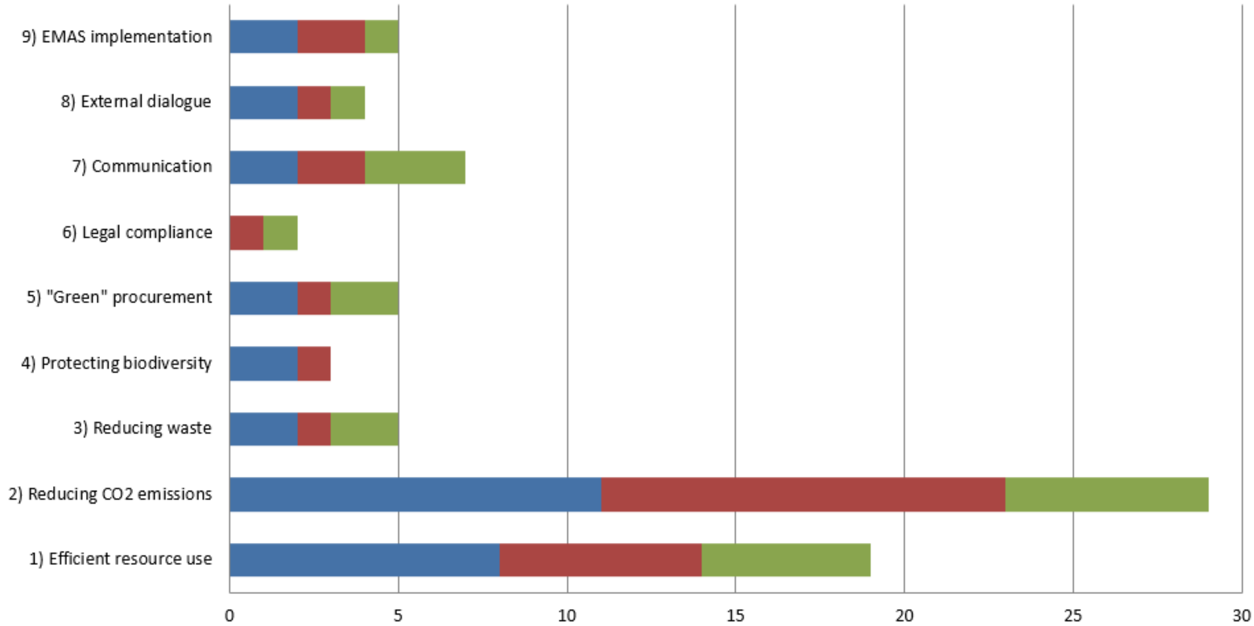
	House of Europe Valletta		House of Europe Vienna	
	EPLO	Representation	EPLO	Representation
Facebook	ParlamentEwropew	KummissjoniEwropea	EPOesterreich	EKOesterreich
Instagram	@epvalletta	@euinmalta	@euparlament_at	@EUKommWien
Twitter	@Europarl_MT	@ecrepmalta	@Europarl_AT	@eukommission_at

I12.14 Trainings in 2021

WHEN	WHERE	TRAINING	FORMAT	TITLE	ATTENDEES
27/01/2021	VALLETTA	EMAS Environmental Review	Online	Workshop on environmental review	2
05/03/2021	VALLETTA	EMAS Network (EC) introductory training	Online	Introductory training for new EMAS network members	3
09/03/2021	VALLETTA	EMAS basics for EC Staff	Online	EMAS introductory training for Rep staff	3
23/03/2021	VALLETTA	EMAS Spring Campaign	Online	How to organise “greener events” as part of the new normal?	1
24/03/2021	VALLETTA	EMAS Spring Campaign	Online	How to make our professional trips even greener?	1
20/04/2021	VALLETTA	EMAS site coordinator webinar	Online	Panel discussion on "Lessons-learnt during the COV19 lockdown that can help us reach climate neutrality in 2030"	4
22/06/2021	VALLETTA	EMAS ECORs Training on EMS	Online	EMAS ECORs Training on EMS	2

27/10/2021	VALLETTA	Towards a Caring Culture	Online	Creating Energy for more sustainability at home and at work	2
28/10/2021	VALLETTA	Towards a Caring Culture	Online	Mobilising our collective energy for a more sustainable works	1
05/03/2021	VIENNA	EMAS Network (EC) introductory training	Online	Introductory training for new EMAS network members	1
09/03/2021	VIENNA	EMAS basics for EC Staff	Online	EMAS introductory training for Rep staff	14
24/03/2021	VIENNA	Emissions from travelling	Online	How to make our professional trips even greener?	2
12/10/2021	VIENNA	Green Public Procurement (GPP)	Online	Inter-institutional GPP Helpdesk presentation: eco labels and verification of environmental criteria	1
17/11/2021	VIENNA	Green Public Procurement (GPP)	Online	Introduction to the principle of GPP	2
29/11/ 2021	VIENNA	Waste management	In-person	Waste separation, waste reduction and environmental footprint	28

I12.15 Distribution of active actions in the global and local action plans for main objectives, with corresponding quantitative targets (where available) addressing significant environmental impacts, risks and opportunities and stakeholder expectations



	1) Efficient resource use	2) Reducing CO2 emissions	3) Reducing waste	4) Protecting biodiversity	5) "Green" procurement	6) Legal compliance	7) Communication	8) External dialogue	9) EMAS implementation
Valletta	8	11	2	2	2	0	2	2	2
Vienna	6	12	1	1	1	1	2	1	2
Global	5	6	2	0	2	1	3	1	1
Total	19	29	5	3	5	2	7	4	5

Physical indicators: (Number, description and unit)	**Future targets (tentative)** 2019-23 Δ %	 2019-30 Δ %
1a) Energy bldgs (MWh/p)	-3.0	-5.0
1a) Energy bldgs (KWh/m^2)	-3.0	-5.0
1c) Non ren. energy use (bldgs) %	n/a	n/a
1d) Water (m^3/p)	0.0	-5.0
1d) Water (L/m^2)	0.0	-5.0
1e) Office paper (Tonnes/p)	-40.0	-60.0
1e) Office paper (Sheets/p/day)	-40.0	-60.0
2a) CO_2 buildings (Tonnes/p)	-3.0	-5.0
2b) CO_2 buildings (kg/m^2)	-3.0	-5.0
2c) CO_2 vehicles (g/km, manufacturer)	-42.0	-90.0
2c) CO_2 vehicles (g/km, actual)	n/a	n/a
3a) Non haz. waste (Tonnes/p)	-20.0	-25.0
3c) Unseparated waste (%)	n/a	n/a
3c) Unseparated waste (T/p)	n/a	n/a

n/a: target for the Houses of Europe not yet established

I12.16 Main applicable environmental legislation and compliance status, by HoE

HoE	Legislation (type, Act)	Latest status (September 2022)
VALLETTA	Waste management Regulations	Compliant
VALLETTA	Energy performance of buildings Regulations	Compliant
VALLETTA	Electrical installations Regulations	Compliant
VALLETTA	Inspection of lifts Regulations	Compliant
VALLETTA	Ambient air quality Regulations	Compliant
VALLETTA	Certain Fluorinated Greenhouses Gases Regulation	Compliant
VIENNA	Waste management Act	Compliant
VIENNA	Building code for Vienna	Compliant
VIENNA	Heating and air conditioning installations Act	Compliant
VIENNA	Refrigerating equipment Regulation	Compliant
VIENNA	Electricity protection Regulation	Compliant
VIENNA	Workplace Regulation	Compliant
VIENNA	Radiation Protection Act	Compliant

For further information on environmental performance in the Houses of Europe please contact:

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the EMASNet page on the EP Intranet or EMAS/Green corner on the EC Intranet