European Commission

Environmental Statement 2019

Moving towards a sustainable future

2018 results - Consolidated version

#EUGreenDeal

EMAS
Verified environmental management
REG.NO. BE-BXL-000003

Human Resources and Security

Prepared by the Commission's EMAS Coordination Team with information from EMAS site coordinators and teams in Brussels (OIB, DIGIT, HR), Luxembourg (OIL), the five JRC sites, and DG SANTE at Grange in Ireland.

European Commission - DG Human Resources and Security - D2 Working Environment and Safety.

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Corporate Summary

FOREWORD

This Environmental Statement was produced as the Commission prepared to welcome its new President, Ursula von der Leyen for the period 2019-24. Her Political Guidelines for the Commission recognise the importance of Europe continuing its leading role on the global stage in reducing environmental impacts. They include, at their core, the commitment to develop a *European Green Deal* under which achieving tougher climate related targets will play a particularly important role.

The Commission, through its policies, directives and regulations, ensures that Member States set an example by developing more sustainable economies, through initiatives such as the Clean Energy Package, successive Water Framework Directives, the Circular Economy Package and support for the Paris climate agreement. And the Commission continues to demonstrate its own credentials at a local scale, having recently launched a study to investigate potential paths to carbon neutrality in the long term.

In 2005 the Commission was the first EU Institution to implement the Eco-Management and Audit Scheme (EMAS) in order to reduce the environmental impact of its everyday activities. Initially limited to Brussels, the scheme now includes its eight largest sites in Europe: Brussels, Luxembourg, JRCs Geel (Belgium), Petten (Netherlands), Seville (Spain), Karlsruhe (Germany), and Ispra (Italy), along with DG SANTE at Grange (Ireland). The Commission publishes its environmental performance results in the Environmental Statement.

This Corporate Summary of the Environmental Statement includes Commission results up to 2018 aggregated from the eight sites. It documents long-term trend towards reduced resource consumption and good or excellent progress towards Corporate 2014-20 targets for most core parameters. The eight standalone annexes provide analysis for each site.

In 2018 the Commission was able, following a mid-term review, to set more ambitious 2014-20 targets for selected core performance parameters. So although we continue to face difficult economic conditions and uncertainty, we are able nonetheless to improve the Commission's environmental performance and deliver significant benefits thereby demonstrating our commitment to a more sustainable European Union.

Irene Souka
Director-General
President of the EMAS Steering Committee

VALIDATION PAGE

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).

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,
— 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.

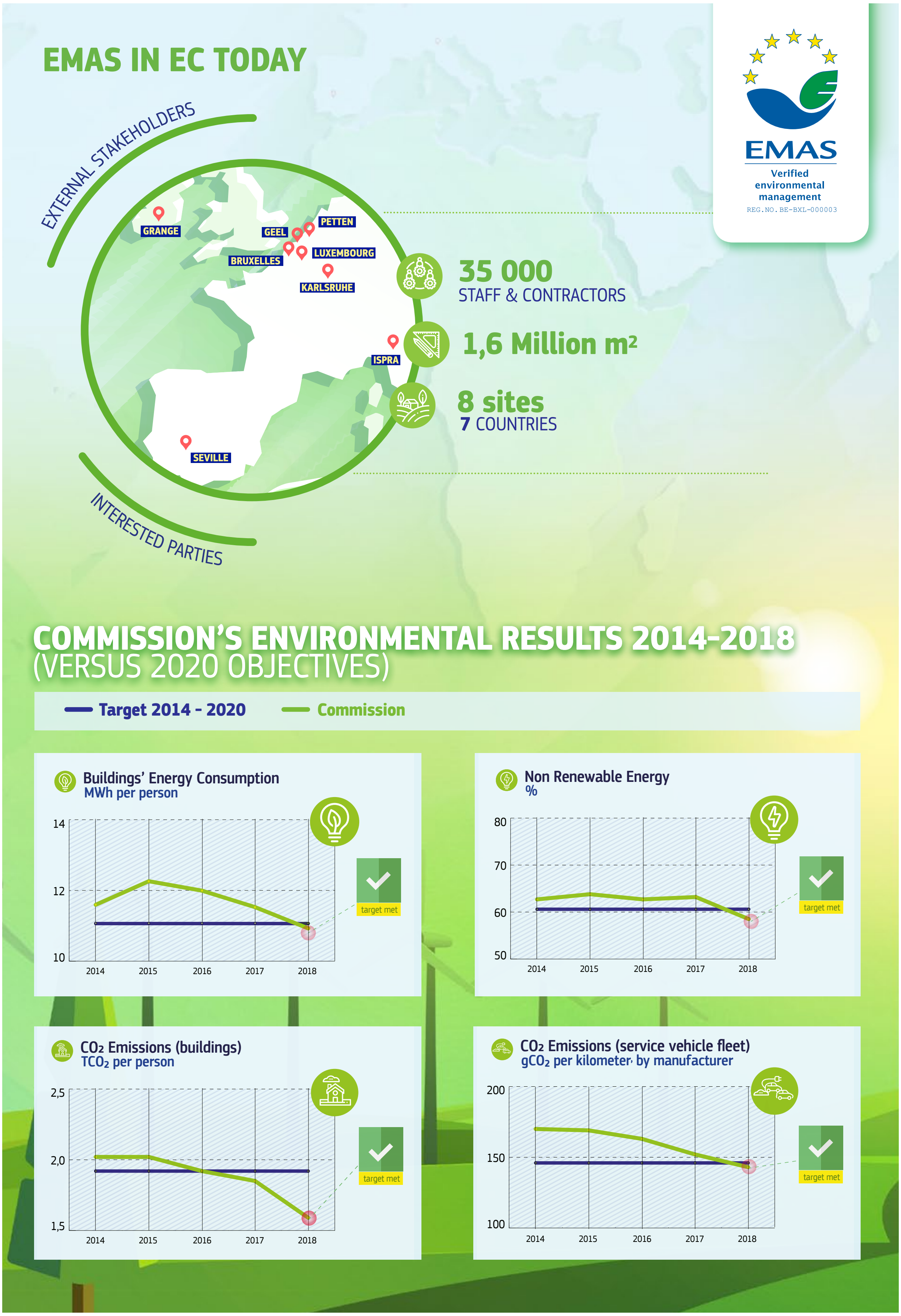
This document is not equivalent to EMAS registration. EMAS registration can only be granted by a Competent Body under Regulation (EC) Nº 1221/2009 amended by Regulation (EU) 2017/1505. This document shall not be used as a stand-alone piece of public communication.

Done at Madrid, on October 7, 2019

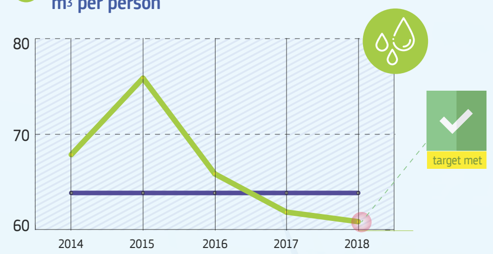
Signature

Rafael GARCÍA MEIRO
Chief Executive Officer

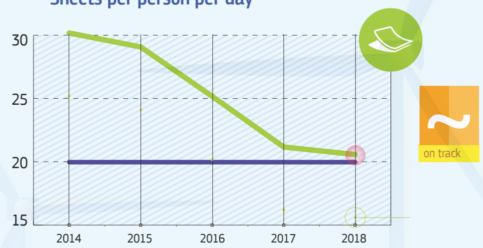
EXECUTIVE SUMMARY



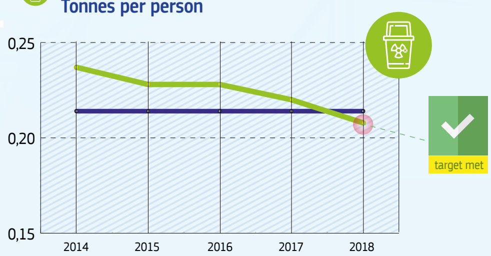
Water Use
m³ per person



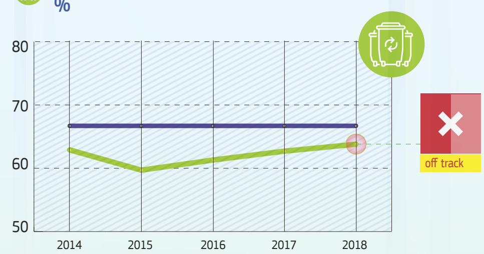
Office Paper Consumption
Sheets per person per day



Non Hazardous Waste
Tonnes per person



Separated Waste
%



COMMISSION'S CARBON FOOTPRINT (EMAS PERIMETER)

BUILDINGS

- Buildings (Fuel for heating)
- Buildings (Electricity)
- Buildings -District heating / cooling
- Buildings - Coolant losses (CO_2e)
- Fixed assets * - buildings

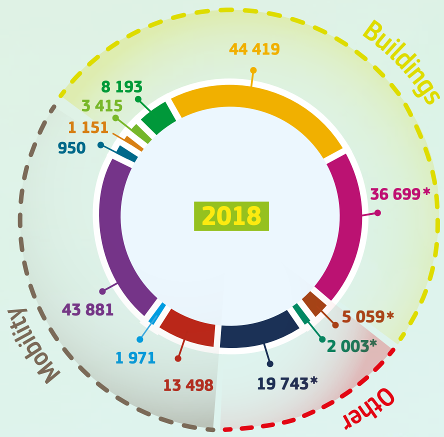
MOBILITY

- Vehicle Fleet - Fuel Consumption
- Missions (air)
- Missions other
- Staff Commuting (contributing sites)

OTHER

- Fixed assets * - IT
- Goods & * services
- Own waste *

*New in 2018 (contributing sites)



EMAS IS ALSO ABOUT ...

- Legal compliance
- Employee involvement
- Management commitment
- External communication
- Leading by example

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

1) Scope: The Commission's EMAS system encompasses its 8 largest sites in Europe:

- The main administrative sites of Brussels (starting in 2005) and Luxembourg (since 2011);
- The five Joint Research Centre sites:
  - JRC Petten (Netherlands), since 2012;
  - JRCs Geel (Belgium) and Seville (Spain), since 2013; and
  - JRC's Karlsruhe (Germany) and Ispra (Italy), since 2014;
- DG SANTE at Grange (Ireland), since 2014

While Brussels, DG SANTE at Grange and JRC Sevilla host mainly administrative buildings, (the latter for research), the remainder also have laboratories, the JRCs in particular have extensive technical infrastructure with JRC Ispra close to being a small town in its own right.

2) Changes: This report for Commission performance up to 2018 and:

- Maintains the existing report structure, with each site submitting an annex, which are used to prepare a corporate summary while forming the basis of external verification
- Includes new, more ambitious corporate 2014-20 targets for some core parameters following a review of performance data for 2014-17. (Non hazardous waste generation, water and paper consumption, vehicle fleet emissions).
- Includes data for additional premises to be registered in Luxembourg
- Takes into account the new EMAS Sectorial Reference Document for public administrations;
- Shows the coherence of EMAS objectives and actions with UN Sustainable Development Goals
- Highlights progress on Green Public Procurement (GPP), most notably through:
  - The preparation and dissemination of a Guide on preparing sustainable events
  - Seeking more detail on the level of GPP achieved in tenders
- Presents an expanded calculation of the carbon footprint, taking into account more indirect (scope 3) emissions, and requiring significant resources. The additional elements are:
  - fixed assets (buildings and IT),
  - purchased goods and services (including catering),
  - waste disposal, and upstream energy emissions.

The largest contributions to the carbon footprint are emissions from buildings construction, and energy consumption and from air travel for missions.

3) Performance summary for core indicators: 2018 saw considerable improvement in performance on several parameters as shown below:

		Commission performance (%)	
No	**Indicator**	**Target 2014-20 (1)**	**Performance 2014-18**
1a	Total energy consumption (Bldgs) - MWh/p	– 5.2	**– 8.8 (target met)**
1a	Total energy consumption (Bldgs) -kW/m²	– 5.2	1.2 (off track)
1c	Non renewable energy (bldgs) - %	– 3.3	**– 6.6 (target met)**
1d	Water consumption - m³/p	– 5.4	**– 9.5 (target met)**
1d	Water consumption - L/m²	– 4.8	0.4 (off track)
1e	Office paper consumption - Sheet/p/day	– 34	– 32 (on track)
1e	Office paper consumption - T/p	– 34	– 31 (on track)
2a	CO_2 emissions (bldgs.) - TCO_2/p	– 5.1	**– 24 (target met)**
2a	CO_2 emissions (bldgs.) - $kgCO_2/m^2$	– 5.2	**– 16 (target met)**
2c	CO_2 emissions (vehicles) - gCO_2/km (manufacturer spec.)	– 14	– 16 (target met)
2c	CO_2 emissions (vehicles) - gCO_2/km (actual)	– 4.9	0.6 (off track)
3a	Non hazardous waste - T/p	– 9.7	**– 15 (target met)**
3b	Hazardous waste - T/p	– 2.6	103.2 (off track)
3c	Separated waste (%)	+6.0	1.4 (off track)
Costs			
	Energy consumption (EUR/p)	752 EUR	**547 EUR (target met)**
	Water consumption (EUR/p)	55 EUR	**47.4 EUR (target met)**

Note (1) Global Annual Action Plan 2019

Some of the more evident reasons for this related to energy included operational initiatives at Brussels, such as closing more buildings in holidays, Luxembourg vacating the JMO building, and JRC Geel moving to a renewable electricity supply. The reduction in non-hazardous waste generation may be due to the rolling out of multiple initiatives to remove single use items, particularly plastic.

Buildings' energy consumption is by far the most important per capita resource cost monitored under EMAS, and it continued its year on year drop. In Brussels it is estimated to have fallen from 1 168 EUR in 2005 to 400 EUR in 2018. This is equivalent to saving well over 10 million EUR per year (in recent years) compared with 2005 consumption rates, and cumulative (unadjusted) savings of over 100 Million EUR since 2005.

4) Going forward: In 2019 and beyond we will need to,

- Further refine the carbon footprint evaluation, which will inform the discussion on future medium and long term targets for reducing emissions;
- Consider formally incorporating the Executive Agencies in Brussels that are under Commission Facilities Management Control;
- Improve the performance of the EMAS network of correspondents; and consider how to benefit more from inter-institutional collaboration;
- Consider appropriate Commission level targets for 2030;
- Continue to engage and respond to stakeholders' requirements.

CONTENTS

Annexes A to H are the site reports validated separately during the verification audits at each site, but with common structure 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	Annex G: JRC Ispra	Annex H: DG SANTE at Grange
1	Overview of core indicators	A5	B6	C3	D3	E3	F3	G5	H5
2	Description of activities, context, stakeholders	A7	B8	C5	D5	E7	F5	G7	H7
3	Environmental impact of activities	A11	B11	C11	D11	E11	F14	G17	H11
4	More efficient use of natural resources	A12	B12	C11	D13	E16	F14	G19	H13
5	Reducing carbon footprint and air emissions	A16	B16	C14	D19	E21	F20	G28	H17
6	Improving waste management and sorting	A22	B20	C18	D23	E24	F24	G36	H19
7	Protecting biodiversity	A24	B21	C19	D26	E27	F26	G43	H21
8	Green public procurement	A24	B21	C20	D28	E28	F27	G46	H21
9	Legal compliance and emergency preparedness	A24	B22	C20	D28	E28	F27	G47	H21
10	Communication	A25	B23	C20	D29	E29	F28	G48	H23
11	Training	A27	B25	C21	D30	E31	F32	G52	H25
12	EMAS costs and savings	A28	B25	C21	D31	E32	F33	G52	H25
13	Conversion factors	A29	B26	C23	D32	E33	F33	G54	H25
14	Summary buildings table (optional)	A30	B27	C24	D33			G55	H26

1 Introduction

1.1 About this Environmental Statement

The European Commission (EC) implements the Eco-Management and Audit System (EMAS) Regulation 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 2018 activities, is the basis for the EMAS registration update for the EC's eight main sites in Europe as listed in Table 1.1 in their order of incorporation into the EC's EMAS registration.

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 plus 5 Executive Agencies), with buildings located in the Brussels Region and in Flanders. (further detail in Annex A)	A
Luxembourg	Luxembourg (EC second administrative centre plus one Executive Agency)	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 (JRC's largest site and administrative centre)	G
Ireland	Facility of the Directorate General of Health and Food Safety, located at Grange, near Trim, County Meath (DG SANTE at Grange)	H

This ES was produced in two phases:

- **Phase 1:** Separate "stand-alone" reports were prepared for each of the eight sites, as Annexes A to H of this report. The same structure was adopted for reporting at each site as described in the previous page; and
- **Phase 2:** The site data was aggregated where possible to produce Commission results which are described in Chapter 2 of this report. Virtually all data included in this volume originates in the site annexes.

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[1] 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 28 Commissioners, assisted by over 30 000 civil servants and other staff working in 31 directorates-general (DGs), 15 services/offices[2] 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.

1 A glossary of terms is provided at the end of the document.
2 https://ec.europa.eu/info/departments_en

The Commission's headquarters are in Brussels (Belgium), but it also has offices in Luxembourg, Ispra (Italy), Grange (Ireland) 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 28 Member States.

1.3 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. It provides financial support for environmental projects via the LIFE programme and has policies on combating global warming and on energy and transport.

The impact assessment system and its application to the myriad of EU policies are not considered in this document[3], but you can find information on these on the Commission's EUROPA website. 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
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. Global warming policy: http://ec.europa.eu/climateaction/index_fr.htm
5. Energy policy: http://ec.europa.eu/energy/index_en.htm
6. Transport policy: http://ec.europa.eu/transport/index_en.htm

The environmental aspects of EU policies for Member States are therefore addressed by the impact assessment system that applies to each legislative initiative. All draft impact assessment reports have to be submitted for quality and scrutiny to the Regulatory Scrutiny Board (RSB)[4] which replaced the Impact Assessment Board in July 2015. A positive opinion is in principle needed from the Board for an initiative accompanied by an impact assessment to proceed. RSB opinions[5] are published alongside the final impact assessment report and proposal at the time of adoption. The EMAS management system is not the appropriate tool for managing these policies. **The Commission's management system therefore deals with the Commission's operational activities, i.e. those that are under the control of or can be influenced by EC management.**

1.4 Corporate responsibility and environmental management at the Commission

The Commission does not look at environmental management in isolation, but rather within the broad context of its approach to corporate social reponsibility. One important way in which the Commission has begun to emphasize and encourage its employees to have a positive impact on their communities local communities is through encouraging them to participate in volunteering.

Staff in Brussels have been encouraged once again in 2018 to participate in a range of voluntary activities across the city, that were concentrated within a volunteer week. While directly benefitting the local community, including disadvantaged groups such as the homeless and refugees, participation also enabled small groups of Commission staff to get to know one another.

The importance of using a holistic approach to staff wellbeing and working conditions has been highlighted as one DG HR's directorates is dedicated to Health, Wellbeing and Working Conditions and has a Corporate Social Responsibility adviser. An initiative entitled *fit@work* has been established which brings together a wide range of corporate services with a focus on:

- improving physical health by focussing on disease prevention though promoting more active lifestyles, and based on health data;

[3] Detailed information on EU policies available on www.europa.eu
[4] http://ec.europa.eu/info/law-making-process/regulatory-scrutiny-board_en
[5] http://ec.europa.eu/smart-regulation/impact/ia_carried_out/cia_2015_en.htm

- improving mental health, for example by dispelling myths and stigma associated with certain health conditions;
- promoting exercise and leisure activities for example though the Commission's 30 sport clubs;
- promoting a healthy work/life balance, for example recognising the additional stresses caused by an expatriate lifestyles and offering flexible work patterns to accommodate this;
- improving the quality of the physical working environment particularly aspects such as ventilation and light levels which significantly effect staff comfort and motivation; and
- providing supportive working conditions (for example by making it easier to obtain psychological support).

There are obvious synergies between initiatives such as *fit@work* and environmental management (EMAS). Taking the stairs instead of the lift not only improves staff fitness, but reduces buildings energy consumption and CO_2 emissions. And cycling or walking to work instead of driving will reduce energy consumption and CO_2 emissions associated with commuting. Encouraging staff to think about eating less meat similarly reduces the amount of non renewable energy used in the food chain, and consequently CO_2 emissions and may also have health benefits. These issues that can be influenced through our building and mobility policies.

1.5 Why implement EMAS?

The EC developped 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) developped 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[6].

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.

1.6 The development of environmental management through EMAS at the Commission

Table 1.2 presents a chronology of the main developments in EMAS implementation at the Commission. Of particular significance was the introduction of the EMAS III Regulation[7] in 2009, replacing the 2001 version and which made it easier to implement EMAS by making it possible to include sites in several different countries under one registration. This has greatly facilitated the expansion of the Commission's EMAS registration which, subject to ongoing administrative procedures by the Brussels EMAS authority, now covers eight sites in seven countries.

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6 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

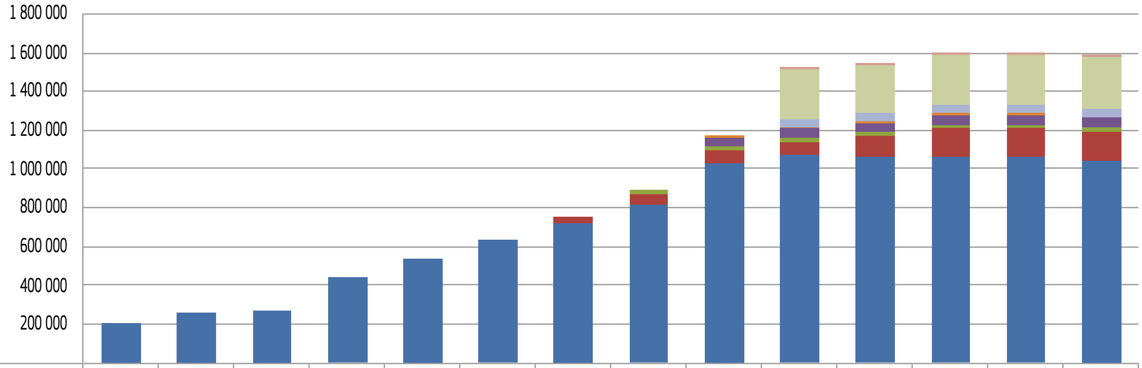
7 Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC.

Historically and for operational reasons, the Commission separated the EMAS registration of its staff activities (departments) and buildings. While the system's communication aspects can be relatively quickly addressed enabling all staff across the Commission to be included, additional buildings must be inspected and certified by the national authorities. This is time consuming, and for this reason 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 whole. 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.

Table 1.2 The Chronology of EMAS Implementation at the European Commission

Year	Action
2001	◆ The EC launches a pilot exercise to apply EMAS (Regulation (EC) No 761/2001) to the activities and buildings of a number of its departments.
2005	◆ The EC obtains the first EMAS registration for the activities of four Commission departments in Brussels, and covering eight buildings (based on data from 2002-4).
2005-9	◆ More buildings were added to EMAS scope in Brussels, giving 32 in total for the verification exercise for 2009.
2009	◆ EMAS III Regulation comes into force enabling the Commission to register sites in different Member States under one authority and with a single reference number.
2009	◆ The EC decides to extend EMAS to all its departments in Brussels and Luxembourg with effect from 1 January 2010. New buildings are to be added annually in accordance with a schedule agreed in Brussels with the IBGE (Brussels Competent Body for EMAS).
2011	◆ The registration was extended to include all EC departments in Brussels.
2012	◆ The registration is further extended to include all its departments in Luxembourg and first two buildings (based on data reported for 2011).
2013	◆ The EC decided to further extend the EMAS to the JRC sites in Europe and to SANTE Grange (Ireland). ◆ JRC Petten included in EMAS registration (based on data reported for 2012). Data is reported in this Environmental Statement for JRC sites at Geel and Seville in anticipation of their inclusion in the EMAS registration in 2014.
2014	◆ JRC sites at Geel and Seville undergo succesful verification and are included in the Commission's EMAS registration. JRC Karlsruhe's verification is postponed until 2015 for administrative reasons. ◆ EMAS begins to address the findings of the European Court of Auditor's (ECA) report 2014/14 into how the European Institutions address their Carbon Footprint. ◆ The Environmental Statement is upgraded by incorporating i) a new standardised approach for reporting at site level to ensure consistency among sites and a first step towards analysing the Commission's performance by aggregate site level data, ii) estimating greenhouse gas emissions associated with missions, and for Brussels also emissions associated with commuting; and iii) incorporating unit cost information to track management costs and key resource expenditure such as energy, water, waste disposal.
2015-6	◆ Verification audits were successful at new sites JRC Karlsruhe, JRC Ispra, and SANTE Grange based on reporting for 2014. The Commission's EMAS registration includes eight sites in seven countries. ◆ Responding to the findings contained in the ECA's Carbon Footprint report, HR.D2 started to make the Commission's agencies aware of EMAS and to follow uptake among other European Institutions through the Inter-institutional Environmental Management Group (GIME). ◆ Longer term objectives for key environmental parameters were proposed to management targetting a 5% reduction over the period 2014 – 2020 in several parameters, and were adopted in early 2016, while automated workflows were became operational for the tracking of audit findings.
2017	◆ Repeat verifications will again be sought at the eight Commission sites. ◆ Additional workflow solutions will be developped to track the status of environmental actions, and potentially to manage communications. ◆ The EC will continue to work closely with the other European Institutions and Agencies in relation to Carbon Footprint estimation and compensation specifically to respond to the European Court of Auditors Report on the subject, and by engaging in joint environmental awareness initiatives. ◆ The EC will continue to prepare for the EMAS Regulation coming into force in September 2018. This will include switching the timing of the internal and verification audits in 2018 so that the latter occurs in the first half of the year and the first in the second half.
2018	◆ EMAS verification exercise undertaken in the first half of the year and demonstrates how the EC has addressed the new requirements of the EMAS Regulation including particularly expanded consideration of context and stakeholders' requirements. ◆ EMAS Sectorial Reference Document for Public Administrations published, and organisations must demonstrate how they have taken into account. ◆ Mid-term review of performance for core parameters 2014-2020, resulting in raised targets for water, paper use, non hazardous waste generation, and vehicle fleet emissions.

Figure 1.1 The evolution of floor space in Commission managed premises[8] to be registered under EMAS (m²)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
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	1 595 702	1 601 444	1 587 460
Grange										10 010	10 010	10 010	10 010	10 010
JRC Ispra										256 077	253 428	254 356	259 828	261 713
JRC Karlsruhe										41 735	41 735	43 170	43 170	43 170
JRC Sevilla									6 497	7 017	7 165	7 165	7 580	7 580
JRC Geel									46 390	48 815	50 538	50 538	50 382	50 499
JRC Petten								19 150	19 150	19 458	21 397	20 502	20 842	19 996
Luxembourg							27 710	53 808	64 703	66 161	100 221	140 479	145 697	152 455
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	1 069 482	1 063 935	1 042 037

In 2019 the EC will be seeking, re-registration of eight sites with nearly 1,6 Million square metres of useful floor space, based on reporting for 2018 including one new building at Luxembourg. The number of staff working within the EMAS certified buildings[9] has risen from 4 033 in 2005 to 35 594 in 2018. The reduction of floor space in Brussels in 2018 is due to OIB managing fewer buildings.

1.6.1 New EMAS Regulation requirements

The Commission published the sectoral reference document (SRD) for public administrations [10] that entered in force on 18 May 2019. An organisation must demonstrate that it has considered the document when, inter alia, defining indicators, establishing targets, reporting, and in particular identifying best practice and benchmarks for excellence.

During the EMAS site coordinators workshop (26-27 March 2019) the Commission evaluated its potential impact on the system. The main outcomes of the discussions were:

- The document formally applies to Brussels, Luxembourg and Grange sites (NACE code 84) and probably Ispra (NACE codes 36 and 37). It has yet to be decided to what extent the Commission will implement the recommendations at the other EMAS sites.
- The Commission already uses most of the indicators (particularly those for environmental performance) and those relating to benchmark for excellence.
- The Commission will need to carefully evaluate the feasibility of changing some indicators. For example there would currently be limited benefit in adopting the SRD's proposal to use full time equivalent (FTE) to represent staff numbers. Similarly identifying which drivers commute by car on their own to work would require changes to existing survey methodologies.

To further develop its understanding of SRD recommendations, the Commission will seek to:

- prepare a table comparing its indicators and performance against the SRD recommendations for discussion at the EMAS site coordinators workshop in Autumn 2019,

8 In Brussels this includes space occupied by Executive Agencies. The premises of all Commission sites have been registered under EMAS other than Luxembourg where the 2017 registration will include 14 of 18 buildings.

9 In Brussels this also includes Executive Agency Staff in the COVE building

10 Commission Decision (EU) 2019/61 of 19 December 2018 on sectoral reference document 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)

- take into account the SRD when evaluating the performance and targets in management reviews, starting with the EMAS Steering Committee of September 2019, and
- include specific SRD references starting from 2020 (results 2019).

1.7 Who implements EMAS in the Commission?

A College of Commissioners Decision[11] ensures EMAS is implemented at a high level. DG HR's Director General chairs the **EMAS Steering Committee**[12] (ESC) which meets twice yearly. It defines environmental policy, adopts the annual global action plan, sets environmental objectives and monitors progress. The ESC is where the Commision demonstrates EMAS leadership. 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 at different levels of responsibilities.

A team based in Brussels (**HR.D2**) within the Working Environment and Safety Unit of DG HR assumes day to day corrdination. 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. It's two other staff members work predominantly on system coordination and on communication and training.

Owing to the Commission's size and geographic spread, HR.D2 works with a network of over 35 correspondents and eight site coordinators within the directorates general and departments and whose job descriptions include their EMAS responsibilities. The network includes:

1. **EMAS site coordinators**: at each of the eight sites who are HR.D2's main contact points and responsible for implementing EMAS at the site level. As such they report on performance at site level, contributing to the Environmental Statement and participate in preparing site level objectives and actions;
2. **EMAS correspondents**: (only in Brussels) providing a link between their directorate-general/department and HR.D2, particularly for communication. The correspondents participate in formal meetings on average three times a year, usually before the start of information campaigns. They are nominated by their services;

EMAS site coordinators at OIB and OIL implement the system in Brussels and Luxembourg respectively as do those at the Joint Research Centre (JRC) and one located at DG SANTE at Grange. The JRC has EN ISO9001/14001 certifications, in addition to OHSAS 18001, which provides a useful base for introducing EMAS. HR.D2 communicates directly with the site coordinators. JRC EMAS coordinator handles some strategic elements of JRC EMAS implementation.

Other staff contribute to EMAS, for example when providing data for reporting on resource consumption or waste generation, or when participating in internal and verification audits. And all staff are exposed to communication campaigns, and can benefit from training designed to improve environmental behaviour. HR.D2 conducts an environmental survey every two years to gauge the evolution in staff attitudes.

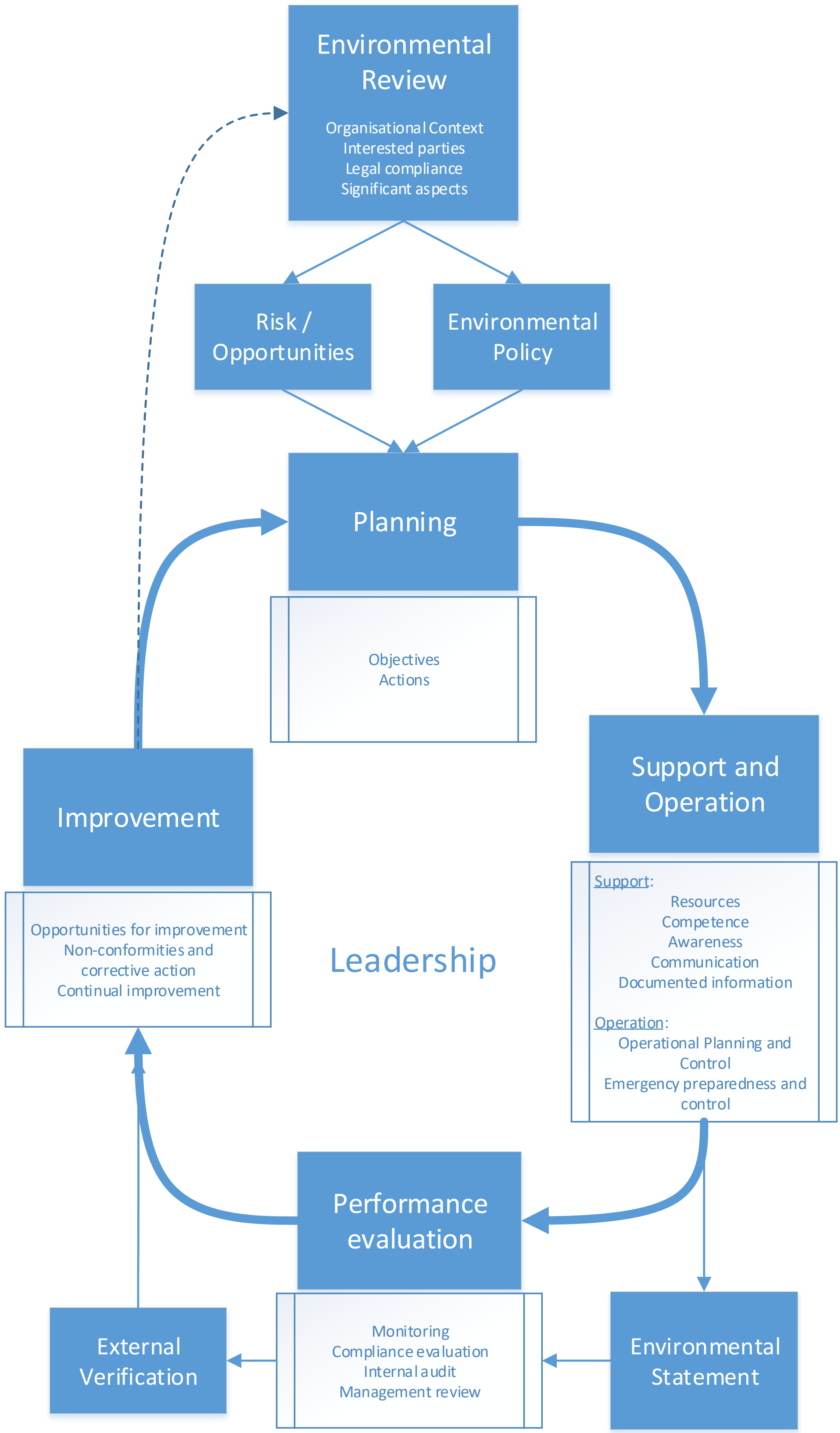
1.8 Key components of the EMAS system

The main elements of the EMAS system are defined in the process diagram in Figure 1.2 which shows the steps required to achieve and maintain an EMAS registration. 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.

[11] 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).

[12] The Steering Committee is made up of the following directorates-general and services: BUDG, CLIMA, DIGIT, ENER, ENV, HR, JRC, MOVE, SG, SANTE, OIB and OIL.

Figure 1.2 The EMAS Cycle, with emphasis on leadership



1.8.1 The Commission's environmental policy

The environmental policy is one of the starting points of the environmental management system. It is signed by the Director General of DG HR, who chairs the EMAS Steering Committee and sets out the Commission's political objectives in concise terms. It was updated in 2014.

EMAS
Verified environmental management
BE-BXL-000003

EMAS ENVIRONMENTAL POLICY

In 1997, the European Commission started a program of green housekeeping and, subsequently in 2001, decided to pilot the environmental management system EMAS[1] which allows organisations to participate voluntarily in a Community based eco-management and audit scheme (EMAS).

In 2009, the Commission decided to extend the environmental management system to all its activities and buildings in Brussels and Luxembourg.[2] In making this commitment the Commission recognised the positive contribution it can make to sustainable development in the long-term, through its policy and legislative processes, as well as through its day-to-day operations and decisions.

In 2013, the Commission decided to progressively extend the EMAS to all the research centers of the Joint Research Centre located in Petten (the Netherlands), Geel (Belgium), Karlsruhe (Germany), Seville (Spain) and Ispra (Italy), and to the Commission services located in Grange (Ireland).[3] This extension includes all research activities.

Consequently, the Commission commits to minimising the environmental impact of its everyday work and to continuously improve its environmental performance by:

(1) **Taking measures to prevent pollution and to achieve more efficient use of natural resources (mainly energy, water and paper);**

(2) **Taking measures to reduce overall CO2 emissions (mainly from buildings and transport);**

(3) **Encouraging waste prevention, maximising waste recycling and reuse, and optimising waste disposal;**

(4) **Integrating environmental criteria into public procurement procedures and into the rules for organising events;**

(5) **Complying with relevant environmental legislation and regulations;**

(6) **Encouraging the sustainable behaviour of all staff and subcontractors through training, information and awareness-raising actions;**

(7) **Progressively extending all the above to all its activities and buildings**

And in relation to the Commission's core business by:

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

(9) **Ensuring the effectiveness of environmental legislation and funding in creating environmental benefits;**

(10) **Promoting transparent communication and dialogue with all interested parties, both internally and externally.**

By virtue of the powers conferred on the Appointing Authorities, the European Commission's EMAS Steering Committee hereby approves this Policy Statement, commits to adopt the Commission's EMAS objectives, targets and action plan, to supervise the system's implementation and to monitor the use of its allocated human and financial resources in order to ensure that the environmental management system runs efficiently.

The Commission's EMAS-registered buildings are noted at the latest EMAS Environmental Statement available at: http://ec.europa.eu/environment/emas/emas_ec/index_en.htm

This document shall take effect on the date of its signature,
Brussels, 24th April 2014

On Behalf of the EMAS Steering Committee,

Irene Souka
Chairman

1 Regulation (EC) n° 1221/2009 of the European parliament and the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) n° 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC.

2 Decision C(2009)6873

3 Decision C(2013)7708

1.8.2 Environmental review

According to the new EMAS regulation, the Commission defines its operational context, its legal obligations and determines which environmental aspects[13] 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.

All these elements are addressed at site level but the context and interested parties are also defined at corporate level.

The above elements provide the basis to define appropriate actions taking into account both risks and opportunities. The Environmental Review provides a global overview of environmental considerations under which strategy and objectives can be defined.

1.8.3 System documentation

HR.D2 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 (or equivalent alternatives), and may develop their own standard operating procedures to cover local conditions.

The three central procedures are: i) EMAS environmental review; ii) Monitoring, reporting and planning and iii) Management of audits and verifications findings.

1.8.4 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's core indicators are primarily expressed as output per person. The total number of employees within the EMAS area is therefore a common denominator of most indicator measurements. In addition some indicators, such as energy consumption and gas emissions are expressed per square metre, according to common practice in facilities management.

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

- 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 term objectives for the period 2014-2020 for several indicators.

Indicators are defined in the data tables contained in the individual reports for each site in Annexes A to H. These are grouped under eight main headings that encompass the political objectives set out in the Environmental Policy and as shown in Table 1.3. Not all sites report on all parameters:

[13] 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

Table 1.3 Summary of main policy objectives and associated indicators

No	Environmental Policy Objective	Indicators
		Physically based parameters[14]
I	More efficient use of natural resources	a) Total energy consumption (buildings), b) total energy consumption (site vehicles), c) renewable energy use, d) water consumption, e) office paper consumption and f) offset (professional printing) 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) d) vehicle CO_2 emissions (actual) and e) actual total air emissions including SO_2, NO_x, PM. Also evaluated are emissions from other business travel, and for six sites, commuting.
III	Improving waste management and sorting	a) Total waste, b) controlled waste and c) separated waste (as % of total).
IV	Protecting biodiversity	a) Built surface area, total site surface area.
		Communication/training "soft" parameters[15]
V	Promoting "greener" procurement	a) Percentage of contracts over 60.000 EUR incorporating additional "green" criteria and, b) 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, c) take up of e-learning, 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 information sessions for main subcontractors and suppliers, c) register of local and regional stakeholders and d) 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.

1.8.5 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, where these are granted by the authorities. In Brussels and Luxembourg individual buildings each have their own environmental permit. However 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 organised and coordinated by HR.D2. In 2018 the timing of these was switched:

- "verification" audits that are required to maintain the EMAS registration and which will take place in the spring; and
- "internal" EMAS audits in the autumn.

HR.D2 also monitors the follow-up of these audit findings on a corporate register and reports on progress twice yearly to EMAS Steering Committee. Furthermore, operational checks and corrective actions are routinely carried out at each site under the normal working conditions usually by infrastructure services and/or health and safety units.

14 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.

15 Results obtained in these areas will ultimately be seen through improvements in the areas of policy objectives I to IV, and most parameters measured input based.

Sampling method for buildings audits:

The Commission is a multi-site organisation EMAS buildings/facilities in eight sites across seven countries. Buildings/facilities are verified each year in all these sites.

Buildings/facilities in Geel (Belgium), Petten (The Netherlands), Seville (Spain), Karlsruhe (Germany), Ispra (Italy) and DG SANTE at Grange (Ireland) are verified each year.

The administrative buildings of the Commission headquarters Brussels and Luxembourg are verified on a sampling method based on the EMAS users guide[16]. Any new buildings entering into the scope are verified the year they enter the scope and, in addition, some previously registered buildings are also verified. On average 12 buildings have been visited each year during the past years[17].

1.9 Benchmarking

The EMAS regulations require an organisation's environmental performance to be put into context through comparison with other organisations, i.e. benchmarking. Because implementation of EMAS has been incremental at the Commission, and reporting overall results as an organisation (as opposed to as individual sites) began in 2014, current efforts at benchmarking at an organisational level are limited to very recent data. However individual sites with a long history of reporting, such as Brussels, where EMAS data has been published since 2005 are more useful for benchmarking.

This report includes operational data from eight sites in seven countries, with activities ranging from office administration, to laboratory analysis to large specialist technical and even nuclear installations. Finding suitable organisations to benchmark against is therefore challenging, although in this report results for Brussels site are compared with those for the European Parliament and the Council of the European Union.

16 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).

17 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 into the three years period before the registration renewal (based on 2018 figures).

2 The commission’s environmental performance up to 2018

This section presents an overview of the individual results for the eight sites participating in EMAS, each of which has a separate report in Annexes A to H and where possible aggregated data representing the Commission. A performance summary table is included in the Executive Summary.

2.1 The Commission’s progress towards targets for selected parameters for 2014-20 :

The Commission’s performance trends in recent years and progress towards 2014-20 targets are summarised for selected and often communicated core parameters in Table 2.1.

Performance has improved at most sites and for most parameters as indicated by a majority of figures showing improvement (green) in the right hand side of the table. Indeed some cases of apparently poor performance (red) can arise from particularly unusual circumstances, and could therefore be considered “artificial”.

Table 2.1 Summary of performance for selected parameters at EMAS sites

Physical indicators (Number, description, unit)	Historic data values					Performance trend (%) since:				Target	
	First EMAS data [1]	2014	2016	2017	2018	First EMAS data [1]	2014	2016	2017	2020 [2,3,4] Δ %	2020 [2,3,4] Value
1a) Energy bldgs (MWh/p)											
Brussels	19.06	**6.99**	7.26	7.05	6.68	**- 65.0**	- 4.4	**- 8.0**	**- 5.3**	- 5.0	6.636
Luxembourg	8.35	**17.42**	18.43	14.40	11.09	**32.9**	**- 36.3**	**- 39.8**	**- 23.0**	- 5.0	16.5
JRC Petten	37.46	**23.99**	24.00	23.95	26.41	**- 29.5**	**10.1**	**10.1**	**10.3**	- 5.0	22.79
JRC Geel	60.62	**51.21**	53.16	55.76	53.09	**- 12.4**	3.7	- 0.1	- 4.8	- 5.0	48.65
JRC Sevilla	11.17	**9.13**	8.05	8.11	6.87	**- 38.5**	**- 24.7**	**- 14.6**	**- 15.2**	- 8.0	8.402
JRC Karlsruhe	78.64	**64.03**	67.56	68.64	73.06	**- 7.1**	**14.1**	**8.1**	**6.4**	- 5.0	60.83
JRC Ispra	53.22	**44.32**	43.32	42.86	42.16	**- 20.8**	- 4.9	- 2.7	- 1.6	- 5.6	41.84
Grange	10.21	**12.69**	12.52	11.58	10.75	**5.3**	**- 15.3**	**- 14.1**	**- 7.1**	- 5.0	12.06
Commission		**11.60**	**12.23**	**11.50**	**10.58**		**- 8.8**	**- 13.5**	**- 7.9**	**- 5.2**	**11.00**
1d) Water use (m^3/person)											
Brussels	28.44	**12.57**	11.77	11.66	**11.05**	**- 61.2**	**- 12.1**	**- 6.1**	**- 5.3**	- 8.0	11.56
Luxembourg	12.26	**14.48**	18.61	15.18	**14.21**	**15.9**	- 1.9	**- 23.6**	**- 6.4**	0.0	14.5
JRC Petten	11.50	**11.14**	14.05	11.22	**8.00**	**- 30.5**	**- 28.2**	**- 43.0**	**- 28.7**	- 5.0	10.58
JRC Geel	79.57	**34.75**	26.86	26.95	**28.97**	**- 63.6**	**- 16.6**	**7.9**	**7.5**	- 5.0	33.01
JRC Sevilla	42.81	**21.73**	17.85	20.11	**14.66**	**- 65.8**	**- 32.6**	**- 17.9**	**- 27.1**	- 5.0	20.65
JRC Karlsruhe	16.51	**21.03**	19.24	18.65	**19.11**	**15.7**	**- 9.1**	- 0.7	2.5	- 5.0	19.98
JRC Ispra	1 517	**734.9**	830.5	776.9	**799.8**	**- 47.3**	**8.8**	- 3.7	2.9	- 5.0	698
Grange	30.66	**27.69**	19.76	17.12	**18.11**	**- 40.9**	**- 34.6**	**- 8.4**	**5.7**	- 5.0	26.30
Commission		**67.75**	**66.34**	**62.40**	**61.33**		**- 9.5**	**- 7.5**	**- 1.7**	**- 5.4**	**64.09**
1e) Office paper (sheets/p/day)											
Brussels	77.4	**33.1**	28.0	23.5	22.8	**- 70.6**	**- 31.1**	**- 18.6**	- 3.2	- 35.0	21.49
Luxembourg	32.1	**24.1**	16.8	14.7	16.0	**- 50.1**	**- 33.5**	- 4.5	**8.5**	- 40.0	14.4
JRC Petten	40.0	**15.9**	8.9	11.7	9.6	**- 76.0**	**- 39.4**	**8.1**	**- 17.8**	- 9.0	14.43
JRC Geel		**20.4**	19.0	11.3	13.3	0.0	**- 35.0**	**- 30.3**	**17.5**	- 5.0	19.41
JRC Sevilla	30.6	**12.6**	11.1	11.7	12.8	**- 58.3**	1.7	**14.9**	**8.8**	- 5.0	11.92
JRC Karlsruhe		**17.8**	14.1	10.6	10.8	0.0	**- 39.4**	**- 23.3**	1.6	- 20.0	14.25
JRC Ispra	22.4	**16.5**	14.2	13.6	12.2	**- 45.4**	**- 26.2**	**- 13.7**	**- 9.8**	- 20.0	13.24
Grange	0.0	**9.9**	33.3	20.2	18.7	0.0	**88**	**- 44.0**	**- 7.3**	- 5.0	9.432
Commission		**30.2**	**25.2**	**21.2**	**20.6**		**- 31.8**	**- 18.0**	**- 2.6**	**- 34**	**20.0**
2a) CO_2 emissions from buildings (tonnes/person)											
Brussels	4.77	**0.72**	0.71	0.69	0.64	**- 86.6**	**- 10.9**	**- 10.3**	**- 7.1**	- 5.0	0.683
Luxembourg	0.18	**1.61**	1.89	1.45	0.99	**453.1**	**- 38.2**	**- 47.7**	**- 31.8**	- 5.0	1.5
JRC Petten	14.85	**10.00**	8.88	8.99	3.04	**- 79.5**	**- 69.6**	**- 65.7**	**- 66.2**	- 7.0	9.296
JRC Geel	19.81	**16.89**	17.60	18.51	4.40	**- 77.8**	**- 74.0**	**- 75.0**	**- 76.2**	- 5.0	16.04

Physical indicators (Number, description, unit)	Historic data values					Performance trend (%) since:				Target	
	First EMAS data (1)	2014	2016	2017	2018	First EMAS data (1)	2014	2016	2017	2020 (2,3,4)	
										Δ %	Value
JRC Sevilla	5.03	**3.53**	3.18	3.17	2.60	**- 48.2**	**- 26.2**	**- 18.1**	**- 17.8**	- 5.0	3.353
JRC Karlsruhe	21.98	**20.46**	20.01	22.53	22.72	3.3	**11.1**	**13.5**	0.9	- 5.0	19.43
JRC Ispra	12.39	**10.44**	10.17	10.11	9.89	**- 20.2**	**- 5.3**	- 2.8	- 2.2	- 5.6	9.853
Grange	4.37	**5.14**	4.84	4.32	4.03	**- 7.6**	**- 21.5**	**- 16.6**	**- 6.7**	- 5.0	4.886
Commission		**2.02**	**1.92**	**1.85**	**1.54**		**- 23.6**	**- 19.8**	**- 16.8**	**- 5.1**	**1.92**
3a) Non hazardous waste (tonnes/person)											
Brussels	0.300	**0.222**	0.217	0.204	0.187	**- 37.7**	**- 15.9**	**- 13.8**	**- 8.5**	- 10.0	0.200
Luxembourg	0.25	**0.103**	0.22	0.18	0.13	**- 45.0**	**31.6**	**- 39.2**	**- 24.6**	0.0	0.1
JRC Petten	0.08	**0.105**	0.12	0.14	0.11	**47.8**	**9.3**	- 1.8	**- 16.0**	- 5.0	0.100
JRC Geel	0.267	**0.479**	0.364	0.358	0.292	**9.6**	**- 39.0**	**- 19.6**	**- 18.4**	- 5.0	0.455
JRC Sevilla	0.000	**0.022**	0.060	0.035	0.031	0.0	**40.6**	**- 48.4**	**- 10.9**	- 5.0	0.021
JRC Karlsruhe	0.000	**0.333**	0.253	0.248	0.266	0.0	**- 20.1**	**5.2**	**7.3**	- 20.0	0.266
JRC Ispra	0.474	**0.491**	0.389	0.507	0.546	**15.1**	**11.1**	**40.4**	**7.6**	NA	NA
Grange	0.000	**0.251**	0.264	0.206	0.253	0.0	0.5	- 4.4	**22.8**	- 5.0	0.239
Commission		**0.237**	**0.228**	**0.220**	**0.202**		**- 14.9**	**- 11.5**	**- 8.2**	- 9.7	**0.214**

Note: NA - not applicable, (1) Earliest reported data: 2005 -Brussels, Grange; 2008 - Karlsruhe; 2010 - Petten, Seville; 2011 - Geel, Ispra, Luxembourg; (2) Compared to 2014; (3) EMAS Annual Action Plan 2019

In Luxembourg for example, since 2015, reporting[18] for most parameters has been for the entire site in order to give more representative overall results (rather than only for EMAS registered buildings, which made it more difficult to discern trends from year to year - particularly when newly registered buildings were very different to existing ones). Some parameters such as paper supply may be irregular and in large volume particularly in small sites, making trends in usage difficult to follow. Similarly some hazardous waste removals may also be irregular.

In relation to **per capita buildings' energy consumption:**

- Brussels, Luxembourg, Sevilla and Grange have all achieved at least a 5% reduction in consumption in 2018 (compared to 2017). Luxembourg achieved the greatest reduction, due in part to the JMO being vacated;
- The most populous sites have experienced significant reductions in 2014 to 2018, resulting in the Commission's overall reduction target (5.2 %) for 2014-20 already being met (8.8%).
- JRCs Karlsruhe and Petten have less control over their energy consumption.

In relation to **per capita water use:**

- Brussels, Luxembourg, along with JRCs Sevilla and Petten all achieved at least a 5% reduction in consumption, the latter two both by over 25%;
- The most populous sites have experienced significant reductions in 2014 to 2018, resulting in the Commission's overall reduction target (5.4 %) for 2014-20 already being met (9.5%).

In relation to **office paper** consumption expressed as sheets per person per day:

- Performance in the last year ranges between +/- 18% at the sites, with half reporting an improvement.
- Overall most sites have made significant improvements in the longer term and the Commission is close to achieving its 2014-20 target of 34% reduction.

In relation to per capita CO_2 emissions from buildings energy consumption (which normally correlates with energy consumption):

- Brussels, Luxembourg, JRCs Geel and Sevilla and DG SANTE at Grange all reported a better than 5% improvement in performance in 2018. Luxembourg's improvement of 32% was exceeded by JRC Geel (76%) where, since January 2018, the electricity is from renewables.

18 For verification purposes data for EMAS registered buildings only is also available

- Again the improved performances of most sites led to the Commission's target for a 5.1% reduction for 2014-20 to be easily exceeded in 2018 (24%)
- JRC Karlsruhe has had less control and opportunity to reduce emissions than other sites.

In relation to **non-hazardous waste** generation:

- All sites other than Karlsruhe and Grange recorded more than a 5% improvement in performance;
- The Commission has already exceeded its 2014 to 2020 target of 9.7% reduction. A large contribution comes from Luxembourg, assisted by having completed the move from JMO.

2.2 Description of activities

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 nuclear laboratory operated by DG ENER.

The five JRC sites are all incorporated under EMAS and include:

- JRC's main site at Ispra (Italy): a large campus with offices and research facilities, encompassing in addition many of the activities of a small town with its own power plant, fire station and water treatment works, and over 400 buildings in total. Most of its nuclear activities (including reactors), are no longer operational. Nuclear plants and storage facilities are under a decommissioning programme which aims to restore "green field" status by 2038.
- JRC Karlsruhe (Germany) a relatively modern 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, large power hungry installations, and an array of laboratories.
- JRC Seville (Spain) has advanced computing infrastructure, but lacks experimental laboratories. 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 wholly rented accommodation.

DG SANTE's site at Grange Ireland is a purpose built low level wooden clad structure dating from 2002 and set in countryside 45km north west of Dublin. It accommodates Directorate F, Health and Food Audits and Analysis but was formerly 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.

Table 2.2 presents the NACE[19] codes for the Commission's eight EMAS sites.

[19] Statistical classification of economic activities in the EU

Table 2.2 NACE codes and descriptions of activities at the sites

Code	Description	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Seville	JRC Karlsruhe	JRC Ispra	SANTE Grange
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	Production of electricity							√	
35.30	Steam and air conditioning supply							√	
36.00	Water collection, treatment and supply							√	
37.00	Sewerage							√	

Characteristics of the sites in terms of staff and infrastructure are shown below.

Table 2.3 Basic characteristics of the Commission EMAS sites 2018

Site	Staff		Buildings for registration		Useful surface (m^2)	
	EMAS	Total	EMAS	Total	EMAS	Total
Brussels (all EMAS buildings)	27 687	28 410	58	61	1 042 037	1 079 786
Luxembourg	4 277	5 016	14	18	152 455	180 906
JRC Petten	248	248	12	13	19 996	19 996
JRC Geel	259	259	16	16	50 499	50 499
JRC Karlsruhe	317	317	4	4	43 170	43 170
JRC Sevilla	342	342	1	1	7 580	7 580
JRC Ispra	2 285	2 285	402	402	261 713	261 713
Grange	179	179	3	3	10 010	10 010
Total	**35 594**	**37 056**	**510**	**518**	**1 587 460**	**1 653 659**

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[20] 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 2018 EMAS registered buildings accounted for 84% of floor space and accommodating 85% of staff. It will incorporate the remaining buildings by 2020. During 2016 and 2017 staff remaining in the JMO building were relocated to new office buildings, so 2018 data in Luxembourg is excludes this building. As self-contained sites[21], each of the JRC sites as well as SANTE Grange is incorporated "whole" into EMAS.

[20] Buildings managed by OIB, Executive Agencies in COVE buildings.
[21] JRC Seville occupies part of a commercial building.

2.3 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.

At corporate level the most important contextual issue identified was the high level of expectations for the system and the relatively limited resources available for implementation. These arise from the political, social and technological context but also the culture of excellence and staff expectations that are quite demanding. The limited financial resources requires constant improvements in efficiency and more prioritising between EMAS actions. The associated risk is summarised as a high level of stress and delivery constraints, but this offer the opportunity to promote the EMAS and its achievements at the Commission.

HR.D2 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 a high level of quality in the EMAS deliveries 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. Follow up operational meetings have been held to determine possible follow up actions. DG CLIMA proposed a study to determine what intermediate and long term targets could apply for carbon reduction, including carbon neutrality, and how these could be achieved.

2.4 Environmental impact of Commission activities and actions for mitigation

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

Table 2.4 also includes objectives for Commission wide indicators associated with the target for 2014 - 2020 performance. 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 2.4 Significant environmental aspects at EMAS sites 2018, associated indicators and Commission level targets for 2014-2020

A/ Significance of aspects at site level (*)									**B/ Indicator and Commission level target for 2014-2020 (where stated)**			
Political objective group and significant aspect	**BX**	**LX**	**PE**	**GE**	**SE**	**KA**	**IS**	**GR**	**Indicator**	**Units**	**Target % (1)**	**Target**
1) Efficient resource use												
Buildings energy consumption	√	√	√	√	√	√	√	√	1a Total energy consumption (bldgs.)	MWh/p kW/m² EUR/p	– 5.2 – 5.2 – 4.6	11.0 223 752
	√						√		1c Non-renewable energy use (bldgs.)	%	– 3.3	60.6
Vehicle energy consumption	√						√		1b vehicle energy consumption	MWh/p kW/m²		
Water consumption	√	√	√	√			√		1d Water consumption	M³/p L/m² EUR/p	– 5.4 – 4.8 – 1.3	64.1 1 308 55.0
Paper consumption	√		√	√			√		1e Office paper consumption	T/p Sheet/p/d	– 34 – 34	0.0198 20.0
2) Reducing emissions to air												
CO_2 emissions (from buildings energy consumption)	√	√	√	√		√	√		2a CO_2 emissions (buildings)	TCO_2/p $kgCO_2$/m²	– 5.1 – 5.2	1.68 34.1
Equivalent CO_2 emissions refrigerants (from buildings)	√			√	√	√	√	√	2b Refrigerant losses	TCO_2/p $kgCO_2$/m²		
Emissions from transport	√						√		2c CO_2 emissions (vehicle fleet) manufacturer actual	gCO_2/km gCO_2/km	– 14 – 4.9	146 218
Emissions of particles, dust, noise etc	√		√				√	√	2d Bldgs emissions(NO_x,SO_2, PM_{10}	Tonnes/p		
Nuclear emissions		√	√	√		√	√					
3) Improving waste management												
Non hazardous waste	√	√	√	√			√	√	3a Non-hazardous waste	T/p	– 9.7	0.214
Hazardous waste	√	√	√	√			√	√	3b Hazardous waste	T/p	– 2.6	0.0074
									3c Separated waste	%	+ 6.0	66.7
Wastewater/liquid waste	√	√	√	√			√	√	3d Non dom. wastewater discharge	M³/p		
Nuclear waste						√	√					
4) Protecting biodiversity												
Protecting biodiversity	√						√		4a Built surface area	m²/p, %		
5) Promoting green procurement												
Contractor behaviour	√						√		5a Contracts with "eco" criteria	%		
6) Legal compliance and emergency preparedness												
Ensuring emergency compliance and preparedness	√		√	√								

(*) Brussels (BX), Luxembourg (LX), JRC Petten (PE), JRC Geel (GE), JRC Seville (SE), JRC Karlsruhe (KA), JRC Ispra (IS), DG SANTE at Grange (GR).

2.4.1 The Annual Action Plan

The EMAS Steering Committee adopted the 2019 EMAS Global Annual Action Plan, prepared in the manner introduced in 2018, and with progress towards the objectives for each site, grouping actions by category.

a) Targets

These were formulated through consultation with the sites and cover most of the significant aspects that were identified by a majority of sites. The Commission level target is a weighted average of sites' individual targets. Following a mid-term review of performance from 2014-17, the EMAS Steering Committee revised some **Commission level targets** for 2014-2020 (Table 2.4) for core parameters, making them more ambitious (water use, paper consumption, vehicle fleet emissions, non hazardous waste).

Sites may also develop individual targets or objectives for indicators for which no Commission level target has been set. This may the case for example in the sites with nuclear activity or communication or training activities.

b) Actions

The EMAS Global Annual Action Plan has at its core a database of nearly 500 actions, past and present, across all the sites that seek to improve the Commission's environmental performance. Every January the EMAS Steering Committee formally adopts a new plan, and the latest one included the actions described in Figure 2.1 and Tables 2.5 and 2.6.

Figure 2.1 Status of actions in the EMAS Global Annual Action Plan 2019[22]

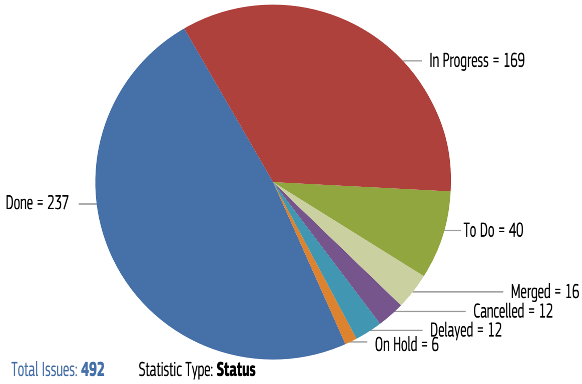


Table 2.5 EMAS Global Annual Action Plan, actions by main objective in 2018 and 2019

Main EMAS objective	2018		2019	
	Actions	Proportion	Actions	Proportion
I More efficient resource use	142	34%	164	33%
III Reducing and managing waste	50	12%	74	15%
VI Ensuring legal compliance and emergency preparedness	67	16%	71	14%
VII Communicating environmental responsibility and training	59	14%	64	13%
II Reducing CO_2 (and CO_2e) emissions to air, and of other pollutants	35	8%	44	9%
V Promoting green procurement	20	5%	24	5%
IX Other - EMAS system Management	17	4%	22	4%
VIII Promoting dialogue with external partners	13	3%	17	3%
IV Protecting biodiversity	9	2%	12	2%
Total for all objectives	**412**	**100%**	**492**	**100%**

The greatest number of actions is associated with more efficient resource use, and includes those related to reducing energy, water and paper consumption. In 2019, in addition to there being an additional 80 actions in the database compared to 2018, there were 50% more actions to reduce and manage waste, a result of the Commission's initiative to reduce single use plastic. Table 2.6 presents the breakdown of active actions by site.

[22] ARES(2019)3039474

Table 2.6 Distribution of 'active'[1] actions by site for main objectives

'Active' actions	Sites								
Main ojectives	**Brussels**	**Grange**	**JRC Geel**	**JRC Ispra**	**JRC Karlsruhe**	**JRC Petten**	**JRC Sevilla**	**Luxembourg**	**Total**
I More efficient resource use	20	5	14	20	4	2	3	10	78
II Reducing CO_2 (and CO_2e) emissions to air, and of other pollutants	3		2	6	1		4	4	20
III Reducing and managing waste	8	4	3	8			4	4	31
IV Protecting biodiversity		1	4	4		1			10
V Promoting "green" procurement	4		1	2		1	2	1	11
VI Ensuring legal compliance and emergency preparedness	8		4	1	3		2	4	22
VII Communicating environmental responsibility and training	16	1	4	1			3	1	26
VIII Promoting dialogue with external partners	7	1		2			3	1	14
IX Other - EMAS System Management	10		1				3	1	15
Total	**76**	**12**	**33**	**44**	**8**	**4**	**24**	**26**	**227**

Note: [1] active actions – those with status in progress, to do, on hold, delayed

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. However this is because most actions that reduce energy consumption also reduce emissions, and these are not counted separately in this this analysis.

As in 2018, the 2019 Global Action Plan summarises by core indicator the type of actions in place at each site.

c) EMAS objectives and the UN Sustainable Development Goals (SDGs)

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 Millenium Develoment Goals that applied only to developing countries. The 17 SDGs can be grouped as follows:

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

Table 2.7 shows the coherence of the Commissions main EMAS objectives and core indicators with certain SDGs. There is considerable overlap in the definition.

Table 2.7 EMAS core indicators of global objectives and selected SDGs

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
1) Efficient resource use												
1a Total energy consumption (buildings)				■	■	■	■	■				
1c Non-renewable energy use (buildings)				■	■	■	■	■				
1b vehicle energy consumption				■	■	■	■	■				
1d Water consumption			■						■			
1e Office paper consumption							■			■		
2) Reducing emissions to air												
2a CO_2 emissions (buildings)				■	■			■				
2b Refrigerant losses				■				■				
2c CO_2 emissions (vehicle fleet) manufacturer, actual	■				■			■				
2d Buildings emissions (NO_x,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 Built surface area										■		
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							■				■	■

d) **Further conclusions of the EMAS Global Annual Action Plan (2019) were:**

- The mid-term review of site and Commission level environmental performance against targets for 2014-20 resulted in sites raising them for several core parameters where the 2020 objective had been reached. This in turn resulted in the Commission raising its targets for reducing:

i) water use from -4% to -5%;

ii) paper consumption from -0.4% to 34%;

iii) manufacturer specifications for fleet vehicle emissions from -6% to 14%; and the generation of non-hazardous waste from -2% to -10%.

In addition, individual sites have raised their targets for some specific parameters (energy consumption and associated emissions, actual vehicle emissions and separated waste) but the overall Commission target remains unchanged.

- The EMAS Coordination team's activities are included along with the communication and training plan for 2019 (in Annex).
- The document listed certain UN SDG targets that are pertinent to EMAS activity.

Moreover, the data shows that:

- 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 don't require registration of individual buildings because their special legal status permits them to be incorporated into EMAS as a whole.

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 will seek to reduce CO_2 emissions by 40% in 2030, although the Commission is planning to increase this to 55%. The Commission has also called for a climate neutral Europe by 2050.

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

2.5 Making more efficient use of natural resources

2.5.1 Climate influence

Climate influences buildings' energy consumption. One simple means of describing the annual variability is temperature, and Figure 2.2 shows the number of heating degree-days and cooling degree-days for meteorological stations near the Commission EMAS sites since 2012.

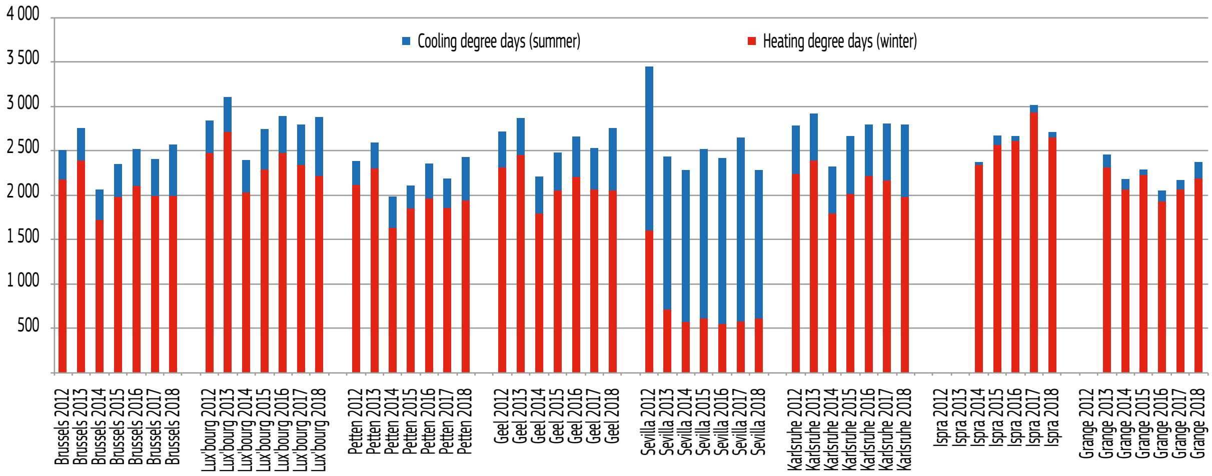
Comparing the total number of degree-days from year to year at a site will suggest whether to expect more energy consumption. In Figure 2.2, it is noteworthy that:

- the more northern sites (Brussels, Luxembourg, Petten, Geel and Grange) all experienced more degree days in 2018 than 2017 (a reverse of the previous year's trend) and would, other factors being equal, need more energy[23] than in 2017.
- The remaining sites located further south experienced fewer degree-days making it potentially easier to demonstrate reductions in energy consumption.

The 2014-20 target for reducing energy consumption will be challenging because the baseline year 2014, was relatively mild.

[23] A simplistic argument as factors such as humidty and windspeed are also important.

Figure 2.2 Heating and cooling degree-days for weather stations close to the EMAS sites

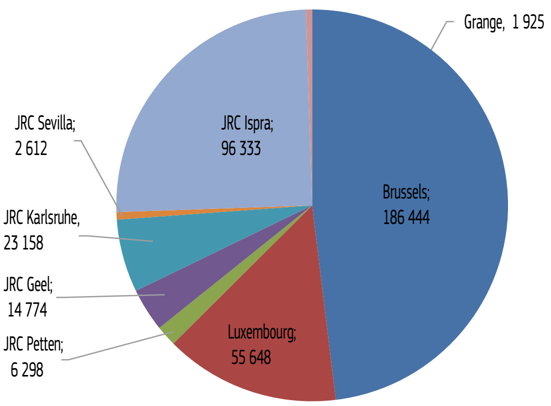


2.5.2 Energy consumption

a) Energy use in buildings, breakdown by site

Figure 2.3 shows the EMAS sites' consumption of energy for buildings.

Figure 2.3 Buildings energy consumption at EMAS sites in 2018 (MWh)

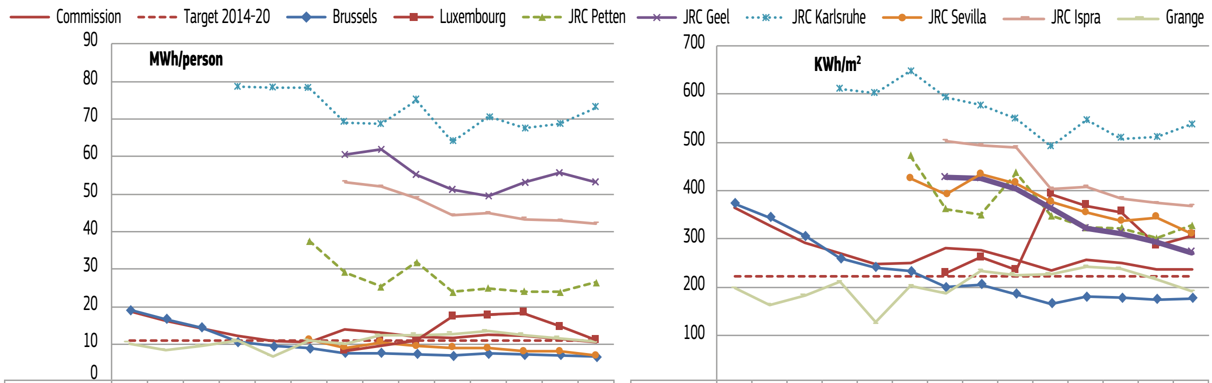


Brussels and JRC Ispra[24] account for nearly three quarters of energy consumption at the Commission sites, reflecting that they have the largest amount of infrastructure.

Figure 2.4 shows the evolution in per capita and per square meter buildings energy consumption for the EMAS sites, together with the Commission value obtained by "weighting" the values for individual sites and the target for the period 2014-2020.

Although degree-day data suggest mixed climatic conditions in 2018 overall Commission consumption decreased or the second year in a row.

Figure 2.4 Annual buildings energy consumption at Commission sites to 2018



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	18.6	16.3	14.3	12.3	10.8	10.7	14.0	13.2	11.8	11.6	12.6	12.2	11.5	10.6
Target 2014-20	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Brussels	19.1	16.6	14.4	10.6	9.43	8.97	7.72	7.72	7.30	6.99	7.51	7.26	7.05	6.68
Luxembourg							8.35	10.7	10.7	17.4	17.7	18.4	14.4	11.1
JRC Petten						37.5	29.1	25.4	31.8	24.0	24.9	24.0	23.9	26.4
JRC Geel							60.6	61.9	55.0	51.2	49.5	53.2	55.8	53.1
JRC Karlsruhe				78.6	78.4	78.4	69.0	68.7	75.0	64.0	70.8	67.6	68.6	73.1
JRC Sevilla						11.2	9.13	10.5	9.55	9.13	8.98	8.05	8.11	6.87
JRC Ispra							53.2	51.9	49.0	44.3	44.9	43.3	42.9	42.2
Grange	10.2	8.40	9.44	10.9	6.65	10.9	10.1	12.3	12.4	12.7	13.5	12.5	11.6	10.8

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	365	326	293	269	249	250	281	276	257	235	256	250	236	238
Target 2014-20	223	223	223	223	223	223	223	223	223	223	223	223	223	223
Brussels	373	344	306	260	241	234	201	206	186	167	181	179	175	177
Luxembourg							229	262	235	393	369	356	286	308
JRC Petten						472	362	350	437	348	323	323	302	328
JRC Geel							427	424	404	363	321	311	293	272
JRC Karlsruhe				610	601	648	591	577	548	491	546	507	512	536
JRC Sevilla						425	393	434	414	376	355	337	345	310
JRC Ispra							502	493	489	404	407	385	376	368
Grange	199	164	184	213	129	204	188	233	226	227	242	238	217	192

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

The JRC sites with laboratory or heavy experimental apparatus (Karlsruhe, Geel, Ispra and Petten) have the highest per capita energy consumption from 20 to 80 MWh per annum with the predominantly office dominated sites of Brussels, Luxembourg, Grange and JRC Seville closer to 10 MWh.

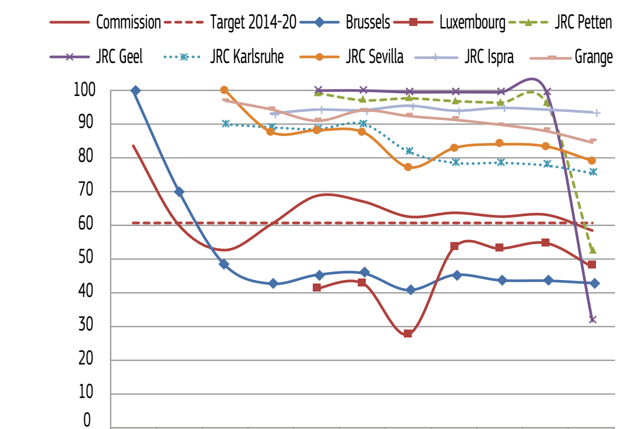
Most sites have shown a downwards trend in energy consumption, either over time or in recent years. The marked increase in Luxembourg in 2014 is due to the inclusion of two data centres in the EMAS reporting in 2014. Karlsruhe has the highest consumption figures, and this is due to the legal requirement to continue full time circulation of air through the nuclear facilities (a permanent flow of around 300 000 m^3).

Brussels heavily influences Commission performance that trended upwards in 2011 when the JRC sites were included. Several sites reduced per capita consumption in 2018, most notably JRCs Geel and Sevilla along with Brussels and Luxembourg (with the largest decrease). However, Luxembourg recorded a large increase (per sq. metre). JRCs Geel and Sevilla, Ispra and SANTE at Grange all recorded decreases on this measure.

b) Buildings energy from renewable sources

The percentage of buildings metered energy consumption generated from non-renewable sources has been decreasing in recent years, as shown in Figure 2.5, and in 2018 met the 2020 target Both Brussels and Luxembourg have been purchasing almost all of their electricity from renewable sources, the former introducing its renewable energy contract in August 2009.

Figure 2.5 Percentage of Commission buildings' energy generated from non-renewable sources



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	83.8	60.0	52.7	60.3	68.9	67.2	62.7	63.8	62.7	63.2	58.5
Target 2014-20	60.6	60.6	60.6	60.6	60.6	60.6	60.6	60.6	60.6	60.6	60.6
Brussels	100	70.1	48.4	42.9	45.5	46.0	41.0	45.5	43.9	43.8	43.1
Luxembourg					41.3	42.8	27.8	53.7	53.2	54.8	47.8
JRC Petten					99.4	97.3	97.8	97.0	96.5	96.4	52.3
JRC Geel					100	100	99.5	99.5	99.5	99.5	31.8
JRC Karlsruhe			90.1	89.2	88.7	90.2	82.0	78.8	78.8	78.0	75.8
JRC Sevilla			100	87.8	88.4	87.8	77.4	83.2	84.2	83.6	79.3
JRC Ispra				93.1	94.3	94.2	95.5	94.0	94.8	94.3	93.5
Grange			96.9	94.4	91.1	94.1	92.5	91.4	89.9	88.1	84.7

Several sites have developed photovoltaics to generate energy on site, and both JRC Ispra (starting in 2015) and JRC Petten use ground source heat pumps.

A wood chip boiler, served by sustainable forests in the immediate region, generates part of Luxembourg's electricity supply.

JRC Geel's reduction is due to a new electricity contract from renewable sources.

Lake water abstraction reduces JRC Ispra's requirement for cooling energy.

2.5.3 Water use

Figure 2.6 Water use at Commission sites in 2018 (m^3)

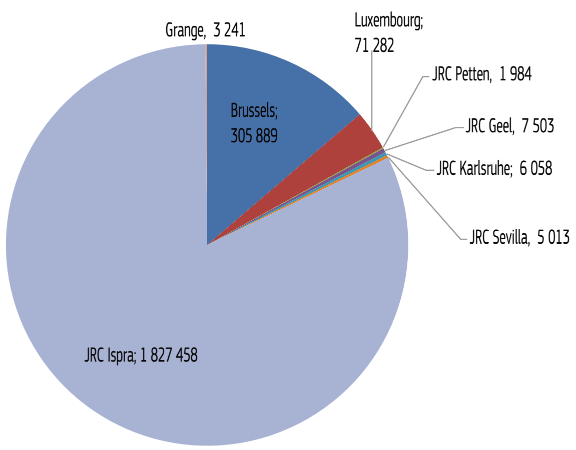


Figure 2.6 shows the JRC Ispra is by far the greatest user of water, and along with Brussels accounts for 98% of water consumed.

Instead of using a mains source, JRC Ispra was designed to use its own intake from nearby Lake Maggiore. This low cost and readily available water supply was one reason to select the site to host EURATOM facilities. The resulting widespread water use in the buildings and underground for cooling are therefore due to the site design.

The site also contains fire services, a water treatment works and extensive water-cooling circuits (for buildings,

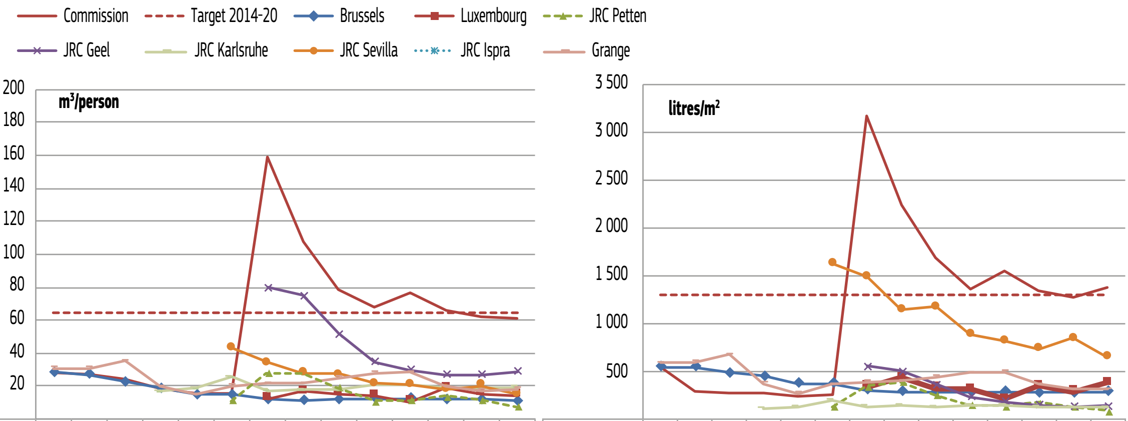
laboratories, nuclear plants and installations, etc.), sports centres and supplies residential properties for Commission staff; its water use is inevitably higher than that of other sites.

Figure 2.7 shows water consumption measured on a per capita and per square metre basis for the sites. As with energy, consumption has fallen at most sites in recent years. Data for JRC Ispra are in tabular format only, as they are off the graphical scale.

Per capita water consumption in Brussels has more than halved since 2005. The JRCs at Seville Geel and Ispra have recorded the largest reductions in consumption over the last three to four years, with Ispra introducing through several infrastructure related initiatives, although there was an increase in 2018 at both JRC Ispra and Luxembourg.

JRC Petten suffered a major leak in 2011/2 owing to a faulty valve control in the water treatment plant of the fuel cell laboratory building resulting in a spike in water consumption.

Figure 2.7 Annual water consumption in the EMAS area to 2018



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	29	27	24	19	15	15	159	107	78	68	76	66	62	61
Target 2014-20	64	64	64	64	64	64	64	64	64	64	64	64	64	64
Brussels	28	27	22	19	15	15	12	11	11.7	12.6	12.4	11.8	11.7	11.0
Luxembourg							12	17	15	14	11	19	15	14
JRC Petten						12	28	29	19	11	12	14	11	8
JRC Geel							80	75	51	35	30	27	27	29
JRC Karlsruhe				17	19	25	17	18	18	21	21	19	19	19
JRC Sevilla						43	35	28	27	22	21	18	20	15
JRC Ispra							1 517	1 150	937	735	959	830	777	800
Grange	31	31	35	20	15	20	22	22	25	28	28	20	17	18

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	558	302	280	286	254	272	3 177	2 248	1 698	1 374	1 552	1 355	1 282	1 379
Target 2014-20	1 308	1 308	1 308	1 308	1 308	1 308	1 308	1 308	1 308	1 308	1 308	1 308	1 308	1 308
Brussels	556	555	499	464	384	384	312	299	297	300	299	290	290	294
Luxembourg							352	442	335	327	219	359	302	394
JRC Petten						145	354	398	264	161	152	189	142	99
JRC Geel							560	514	378	246	195	157	142	149
JRC Karlsruhe				128	144	210	147	148	133	161	161	144	139	140
JRC Sevilla						1 627	1 489	1 145	1 187	895	832	748	854	661
JRC Ispra							14 297	10 921	9 339	6 705	8 686	7 372	6 808	6 983
Grange	597	605	681	383	284	377	400	411	451	495	506	375	322	324

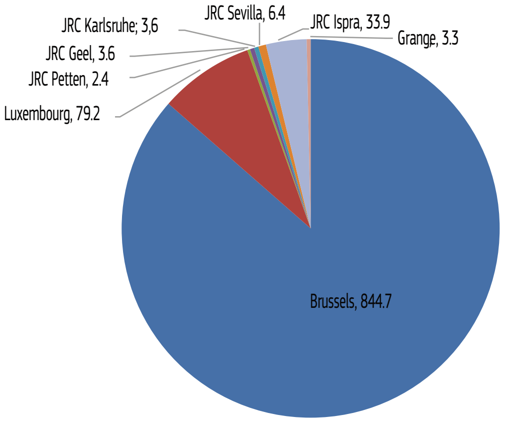
Ispra's consumption heavily influences the weighted Commission value as indicated by the sudden increase in 2011 when it started reporting. In this instance the weighted Commission value is quite unrepresentative of most of the Commission sites. The increase in water consumption in 2015 at Ispra was due to i) extraordinary maintenance interventions lasting eight months resulting in the newly installed water pumping regulation system being unavailable and ii) to a particularly hot summer requiring more cooling water than normal.

Ispra is currently investigating the feasibility of separating water used predominantly for cooling purposes from consumption. Overall Commission per capita water consumption slightly reduced in 2018, achieving the more ambitious 2014-20 target (per capita) but has risen slightly above that measured per square metre.

2.5.4 Paper consumption

Figure 2.8 shows annual total paper consumption at the Commission, which in both Brussels and Luxembourg applies to the whole Commission site.

Figure 2.8 Total paper consumption at the Commission EMAS sites in 2018 (tonnes)



Total paper consumption comprises:

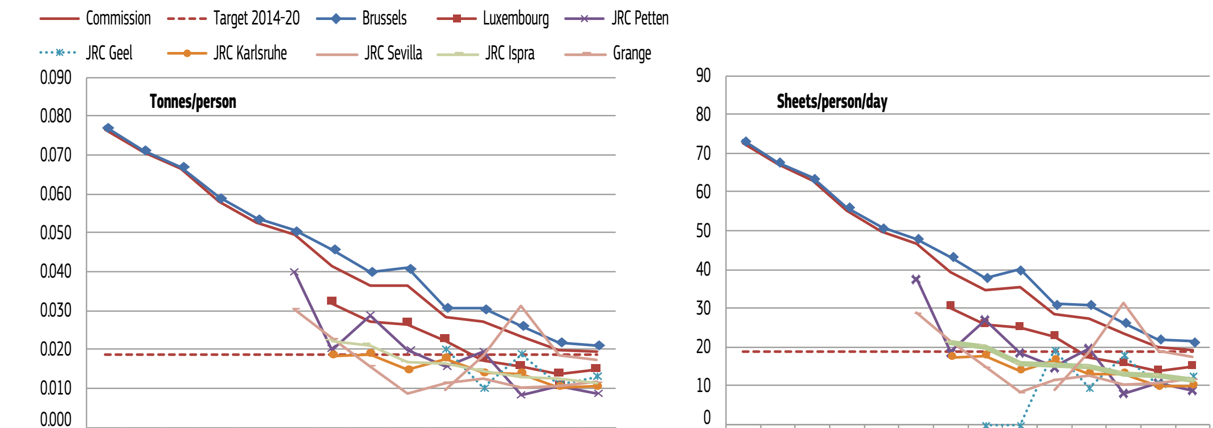
i) Office paper - A3 or A4 typically used for printing in offices and representing about 80% of total paper consumption, and

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

Brussels, as expected, was by far the largest consumer of paper in 2018, followed by Luxembourg and Ispra with these three sites responsible for more than 95% of the total.

a) Office paper

Figure 2.9 Office paper consumption at Commission EMAS sites to 2018



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	0.081	0.075	0.070	0.061	0.056	0.052	0.044	0.039	0.039	0.030	0.029	0.025	0.021	0.021
Target 2014-20	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Brussels	0.081	0.075	0.071	0.062	0.057	0.053	0.048	0.042	0.043	0.033	0.032	0.028	0.023	0.022
Luxembourg							0.034	0.029	0.028	0.024	0.018	0.017	0.015	0.016
JRC Petten						0.042	0.021	0.030	0.021	0.017	0.021	0.009	0.012	0.009
JRC Geel										0.022	0.011	0.020	0.012	0.014
JRC Karlsruhe							0.020	0.020	0.016	0.019	0.015	0.015	0.011	0.011
JRC Sevilla						0.032	0.024	0.017	0.009	0.012	0.013	0.011	0.012	0.013
JRC Ispra							0.024	0.023	0.018	0.017	0.016	0.014	0.013	0.012
Grange										0.010	0.020	0.033	0.020	0.018

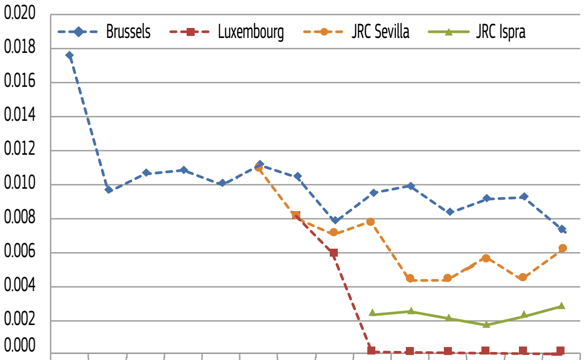
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	76.7	70.9	66.7	58.2	52.8	49.6	41.5	36.6	37.7	30.2	29.1	25.2	21.2	20.6
Target 2014-20	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Brussels	77	71	67	59	54	51	46	40	43	33	33	28	24	23
Luxembourg							32	27	27	24	19	17	15	16
JRC Petten						40	20	29	20	16	21	9	12	10
JRC Geel								0	0	20	10	19	11	13
JRC Karlsruhe							19	19	15	18	14	14	11	11
JRC Sevilla						31	23	16	9	13	13	11	12	13
JRC Ispra							22	21	17	17	16	14	14	12
Grange										10	20	33	20	19

The reduction in paper consumption continues with a slight improvement for the Commission in 2018, and Commission performance is already close to the revised target for 2020. While continual promotion of electronic circuits and communication explains the decrease, OIB also introduced 75g/m^2 office paper in 2013 (replacing 80g/m^2 paper in Brussels) with most other sites adopting this approach. Some Commission services are investigating the feasibility of using even lighter office paper.

The JRC sites have lower consumption than either Brussels or Luxembourg. Peaky trends at the smaller sites can be due to bulk orders, and the reported figures reflect purchase rather than consumption.

b) Offset paper consumption

Figure 2.10 Evolution of offset paper consumption to 2018 (tonnes/person)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Brussels	0.017	0.010	0.011	0.011	0.010	0.011	0.010	0.008	0.009	0.010	0.008	0.009	0.009	0.007
Luxembourg							0.008	0.006	0.000	0.000	0.000	0.000	0.000	0.000
JRC Sevilla						0.011	0.008	0.007	0.008	0.004	0.004	0.006	0.004	0.006
JRC Ispra									0.002	0.002	0.002	0.002	0.002	0.003

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 2.10.

Luxembourg switched from conventional offset printing to using digital presses in 2013. JRC Seville contracts a large amount of offset printing per capita compared to other sites. JRC Ispra prints for other JRC sites.

Brussels has been using a new parameter for measuring waste paper in the print shop for several years.

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

2.6.1 Definition of scopes

Reporting on Greenhouse gases (GHG) emitted owing to its direct or indirect activities is an important part of establishing an organisation's carbon footprint. Emissions can be defined under different "scopes"[25]:

- 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), waste disposal (waste, recycling), leased assets franchising and outsourcing, purchased goods and services, purchased materials and fuels (e.g. extraction, processing and production), fixed assets.

2.6.2 The Commission's approach to calculating its carbon footprint

Although strictly belonging to scope 3, emissions from leased buildings and vehicles are included for operational purposes under Scope 1 as they are under direct the Commission's direct management control. The table below shows the elements reported for each EMAS site, of which the four last categories were new for 2018.

25 http://www.ghgprotocol.org/calculation-tools/faq

Table 2.8 Contributions to the Commission's Carbon Footprint by site (2018)

Scope	Description	BX	LX	PE	GE	SE	KA	IS	GR
1	Fuel for buildings: mains gas	√	√	√	√	√	√	√	NA
1	Fuel for buildings: tanked gas	NA	NA	NA	NA	NA	NA	NA	√
1	Fuel for buildings: diesel	√	√	√	√	√	√	√	√
1	Fuel for Commission vehicle fleet	√	√	√	√	√	√	√	√
1	Refrigerant leaks (tCO_2 equivalent)	√	√	√	√	NR	NR	√	√
2	External electricity supply	√	√	√	√	√	√	√	√
2	District heating	NA	√	NA	√	NA	√	NA	NA
3	Missions: air (including radiative forcing, RFI=2)	√	√	√	√	√	√	√	√
3	Missions: rail	√	√	√	√	√	√	√	√
3	Missions: hire car	√	√	√	√	√	√	√	√
3	Missions: private car (1)	√	√	√	√	√	√	√	√
3	Missions: air taxi (2)	√	NA	NA	NA	NA	NA	NA	NA
3	Staff Commuting (3)	√	NR	NR	√	√	√	√	√
3(4)	Fixed assets (Buildings)	√	√	√	√	NR	NR	√	√
3(4)	Fixed assets (IT) (5)	√	√	√	√	NR	NR	√	√
3(4)	Purchased goods and services (excluding catering)	√	√	√	√	NR	NR	√	√
3(4)	Purchased goods and services (catering)	NR	NR	NR	√	NR	NR	√	NR
3(4)	Waste	√	√	√	√	NR	NR	√	√

Notes: NA Not applicable; NR Not recorded;
(1) Fixed proportion of hire car mileage; (2) attributed to Brussels as this is due to Commissioner's travel;
(3) Data estimated using the three yearly staff mobility surveys in Brussels and surveys at other locations;
(4) Reported since 2018 (5) DIGIT supplies data for Brussels, Luxembourg, Grange

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 special report on the subject. The Commission significantly expanded its Scope III reporting in 2018, to include fixed assets (buildings and IT), purchased goods and services, and waste and upstream emissions due to energy consumption.

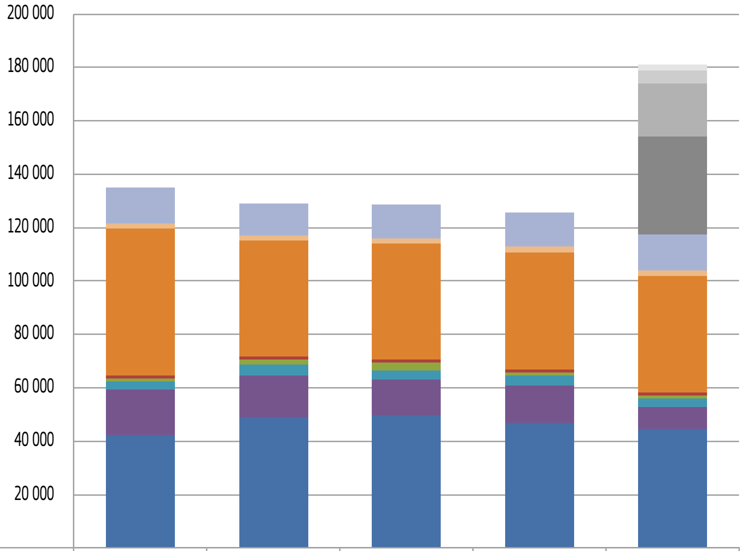
2.6.3 An overview of the Commission's carbon footprint

Figure 2.11 shows the estimated carbon emissions for the Commission using data provided under the above categories. The four largest contributors recorded in 2018 in order were:

- fuel for heating buildings (scope 1 and 3),
- missions - air travel (Scope 3),
- fixed assets (buildings construction) (Scope 3), and
- fixed assets (IT equipment) (Scope 3).

Buildings policy and operation are therefore the largest single influence on the carbon footprint.

Figure 2.11 The Commission's carbon footprint (CO_2 or equivalent emissions 2014-18 (tonnes))



	2014	2015	2016	2017	2018
Total (CO_2 + CO_2e)	134 937	129 146	128 646	125 812	180 983
Own waste					2 003
Goods and services					5 059
Fixed assets - IT					19 743
Fixed assets - buildings					36 699
Staff commuting (contributing sites)	13 577	11 946	12 611	12 972	13 498
Missions other	1 769	2 080	2 120	1 946	1 971
Missions (air, RFI=2)	55 111	43 530	43 320	44 169	43 881
Vehicle fleet - fuel consumption	967	978	1 003	948	949
Buildings - coolant losses (CO_2e)	1 121	1 840	2 962	1 184	1 151
Buildings - district heating/cooling	3 125	4 120	3 652	3 728	3 415
Buildings - electricity	16 803	15 507	13 106	14 014	8 193
Buildings - fuel for heating	42 465	49 145	49 873	46 852	44 419

Note: Contains contributions from individual sites according to Table 2.8

Emissions generated by staff commuting are also significant. Before 2016 these were reported only for Brussels, but in 2016 JRCs Geel, Karlsruhe, Seville and Ispra also reported, along with Grange.

The downward trend in total emissions (excluding the new categories included in 2018) is due in large measure to reduced emissions from electricity, as sites move to sources from renewable contracts, as well as a reduction, since 2015, of gas used for heating the buildings. In 2018, JRC Geel started an electricity contract that used renewable sources which in part explains the large reduction in electricity consumption at this time.

Table 2.9 shows a more detailed breakdown by scope, with emissions expressed as per capita. The newly included upstream losses for energy consumption are relatively minor compared to other categories.

Table 2.9 Per capita CO_2 equivalent (CO_2e) emissions by scope, 2014-8 (tonnes)

	2014	2015	2016	2017	2018
Scope 1 - Own direct fuel consumption and direct losses	**1.20**	**1.27**	**1.30**	**1.16**	**1.06**
Buildings fuel consumption	1.14	1.19	1.19	1.11	1.01
Vehicle fleet	0.02	0.02	0.02	0.02	0.02
Coolant losses (CO_2e)	0.04	0.05	0.09	0.03	0.03
Scope 2 - Purchased energy	**0.44**	**0.41**	**0.36**	**0.38**	**0.27**
Electricity	0.34	0.30	0.26	0.29	0.18
District heating/cooling	0.10	0.11	0.10	0.10	0.09
Scope 3 - Other "indirect" sources	**2.63**	**2.05**	**2.02**	**2.02**	**3.73**
Upstream losses (buildings fuel consumption)	0.24	0.25	0.25	0.23	0.21
Upstream losses (vehicle fleet)	0.02	0.01	0.01	0.01	0.01
Upstream losses (electricity)	0.09	0.08	0.07	0.07	0.05
Upstream losses (district heating)	0.00	0.01	0.01	0.01	0.01
Missions (air, RFI=2)	1.78	1.28	1.25	1.27	1.21
Business (non air travel)	0.06	0.06	0.06	0.06	0.05
Commuting	0.44	0.35	0.36	0.37	0.37
Fixed assets - buildings					1.01
Fixed assets - IT					0.54
Goods and service contracts					0.21
Own waste					0.06
Total	**4.26**	**3.72**	**3.67**	**3.57**	**5.06**

Note: Partial data for commuting, fixed assets, goods and services contracts, own waste categories

Scope 3 emissions represent the greatest proportion of the carbon footprint. In 2018 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.

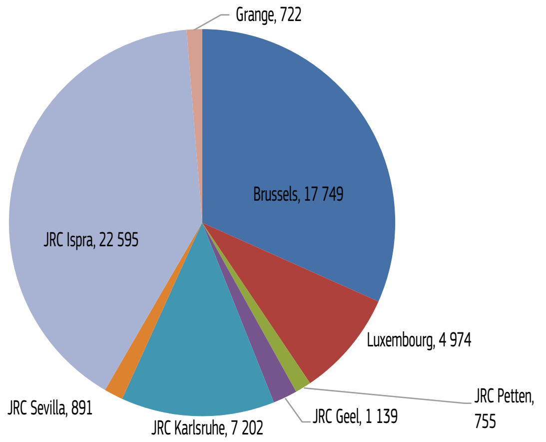
This means that particular attention is required in the tendering process to ensure that contracts include the measures necessary to reduce emissions. Commission level targets for 2014-20 emissions reduction apply to emissions from buildings fuel consumption and vehicle fleet operation.

2.6.4 CO_2 emissions from buildings

a) Emissions due to buildings' energy consumption

Figure 2.12 presents the relative contribution of individual EMAS sites to the Commission's overall emissions in 2018. 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 2.12 CO_2 emitted from Commission buildings' energy consumption in 2018 (tonnes)

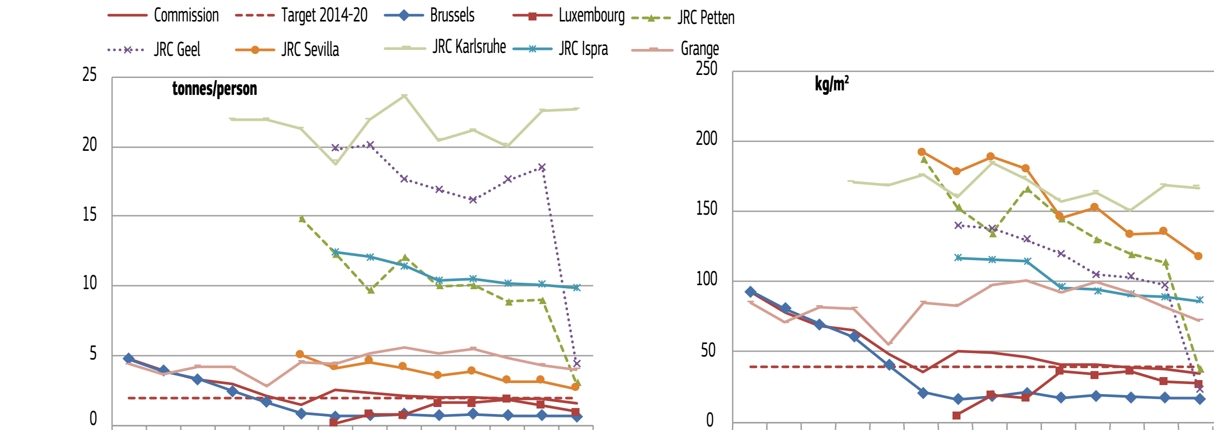


JRC Ispra accounts for a significantly greater proportion of the total (and Brussels significantly less), than their contributions for energy consumption reflecting for Brussels, that electricity is supplied from renewable sources.

At JRC Ispra the co-generation gas plant provides for a more efficient energy supply for the site, than would be provided by the market.

The historical trends in buildings emissions generation are demonstrated in Figure 2.13 along with the weighted Commission value and the 2014-20 target.

Figure 2.13 Evolution of CO_2 emissions from buildings to 2018



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	4.75	3.91	3.34	2.98	2.09	1.52	2.51	2.34	2.13	2.02	2.02	1.92	1.85	1.54
Target 2014-20	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92
Brussels	4.77	3.92	3.31	2.46	1.66	0.86	0.67	0.73	0.82	0.72	0.79	0.71	0.69	0.64
Luxembourg							0.18	0.79	0.78	1.61	1.61	1.89	1.45	0.99
JRC Petten						14.9	12.3	9.66	12.1	10.00	10.03	8.88	8.99	3.04
JRC Geel							19.8	20.1	17.6	16.9	16.1	17.6	18.5	4.4
JRC Karlsruhe				22.0	22.0	21.2	18.7	22.0	23.7	20.5	21.2	20.0	22.5	22.7
JRC Sevilla						5.03	4.13	4.56	4.14	3.53	3.85	3.18	3.17	2.60
JRC Ispra							12.39	12.16	11.49	10.44	10.46	10.17	10.11	9.89
Grange	4.37	3.64	4.21	4.15	2.83	4.54	4.46	5.16	5.54	5.14	5.53	4.84	4.32	4.03

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	92.9	78.0	68.8	65.3	48.2	35.5	50.2	49.0	46.3	40.9	41.0	39.3	38.1	34.7
Target 2014-20	38.8	38.8	38.8	38.8	38.8	38.8	38.8	38.8	38.8	38.8	38.8	38.8	38.8	38.8
Brussels	93	81	70	61	41	21	16	18	21	17	19	18	17	17
Luxembourg							5	19	17	36	34	37	29	27
JRC Petten						187	153	134	166	145	130	120	113	38
JRC Geel							139	138	130	120	105	103	97	23
JRC Karlsruhe				170	169	176	160	185	173	157	164	150	168	167
JRC Sevilla						191	178	189	180	145	152	133	135	118
JRC Ispra							117	115	114	95	95	90	89	86
Grange	85	71	82	81	55	85	83	97	101	92	99	92	81	72

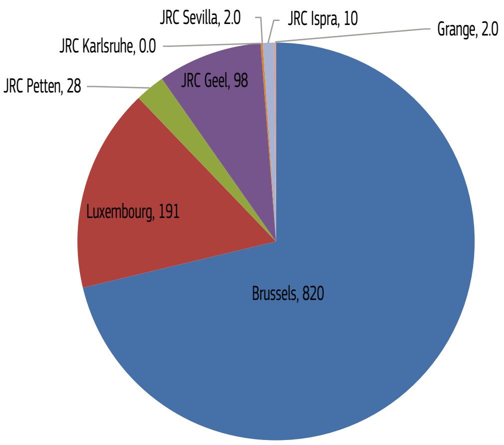
The data in Figure 2.13 show that in the last year and over the longer term, overall Commission emissions have reduced along with those for most of the sites. Most notably JRC Geel significantly reduced its emissions by switching to an electricity contract with predominantly renewable sources, and employing heat pumps in one of the main buildings.

Brussels has reduced per capita emissions by over a half since 2005. Both Brussels and Luxembourg have the lowest emissions in recent years because they contract 95% and 100% respectively of their electricity from renewable sources. However, these lower emissions are balanced by higher emissions from the JRC sites, where energy is largely from non-renewable sources, resulting in almost constant overall Commission emission levels since the JRC sites started reporting (2010) by both types of measure. Karlsruhe has seen a significant reduction in emissions since 2012/13 and this is due largely to a new heating control system in one of the laboratory wings although emissions were greater in 2017 and 2018.

Overall the Commission has reduced emissions gradually since all sites have been included in reporting in 2011, and had met both 2014-20 targets above in 2017 and 2018.

b) Emissions due to refrigerant or coolant loss

Figure 2.14 CO_2 losses from refrigerant leaks at the Commission sites in 2018 (tonnes)

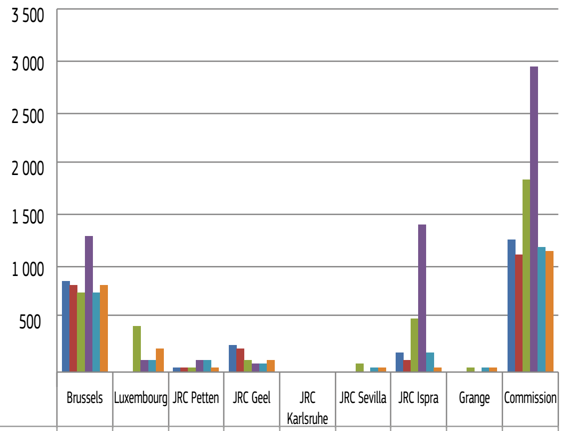


Refrigerants have Global Warming Potentials (GWP) typically between 1 000 and 10 000 meaning that a leak of just a few kilograms can have the equivalent atmospheric global warming impact of a few tonnes of CO_2. But they typically account for no more than 1 to 2% of buildings CO_2 emissions.

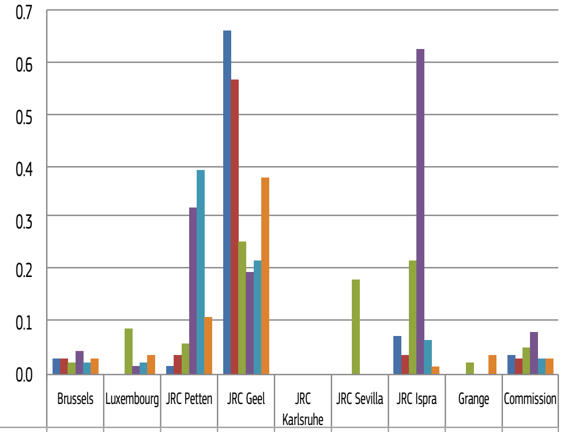
All sites have had programs to replace R22 as required by legislation. Figure 2.14 shows that, perhaps not surprisingly, the three largest sites are responsible for 95% of the total emissions.

Figure 2.15 shows losses measured on a total and per capita basis since 2013. Thirteen refrigerants are recorded across the sites and are included in EMAS reporting. Until 2016 JRC Geel had the highest losses although these have diminished significantly since 2013, and in 2016 expanded monitoring picked up unusually high losses. Overall Commission losses peaked in 2016 but have trended downwards since.

Figure 2.15 Refrigerant losses recorded at Commission sites 2013-8 (tCO_2e, and tCO_2e/person)



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Sevilla	JRC Ispra	Grange	Commission
2013	864		53	226			162		1 258
2014	821		12	196			92		1 121
2015	763	407	17	85		51	513	47	1 840
2016	1 315	89	88	60	0	0	1 410	0	2 962
2017	749	108	103	59	0	1	161	1	1 184
2018	820	191	28	98	0	2	10	2	1 151



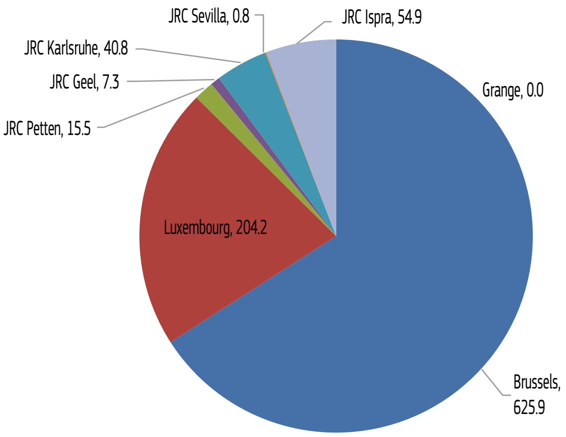
	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Sevilla	JRC Ispra	Grange	Commission
2013	0.033	0.000	0.020	0.662	0.000	0.000	0.073	0.000	0.037
2014	0.030	0.000	0.042	0.566	0.000	0.000	0.039	0.000	0.032
2015	0.028	0.087	0.059	0.258	0.000	0.182	0.224	0.026	0.052
2016	0.048	0.019	0.318	0.202	0.000	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	0.033
2018	0.029	0.038	0.113	0.378	0.000	0.000	0.005	0.040	0.031

Total losses reduced significantly at JRCs Ispra and Petten in 2018. Karlsruhe continues to report no losses during normal operation. JRCs Geel and Petten which accommodate large experimental installations requiring cooling or insulation. The highest per capita losses reported by JRC Geel largely comprise R404a.

2.6.5 CO_2 emissions from the site vehicle fleet

Figure 2.16 shows CO_2 emissions from Commission fleet vehicles. As expected the three largest sites, which also have the largest number of fleet vehicles, also generate the most emissions.

Figure 2.16 CO_2 emissions from Commission fleet vehicles in 2018 (tonnes)



Total vehicle fleet emissions in 2018 were almost since 2017 at 950 tonnes, with Brussels and Luxembourg accounting for over 85 percent.

The Commission has reduced the size of its vehicle fleet since 2015 by 30% and JRC Ispra reduced its fleet by the largest amount (11 vehicles) in 2018. Sites other than Luxembourg reduced the total distance travelled – Brussels by 8%, JRC Ispra by 18% resulting in the Commission reducing its total by overall by 4%.

Table 2.10 Site vehicle fleet characteristics

Site	Fleet vehicles (average)					Total kms					Kms/ vehicle				
	2014	**2015**	**2016**	**2017**	**2018**	**2014**	**2015**	**2016**	**2017**	**2018**	**2014**	**2015**	**2016**	**2017**	**2018**
Brussels	114	117	107	129	126	2 456 406	2 477 072	2 829 675	2 508 253	2 311 311	21 547	21 172	26 446	19 444	18 344
Luxembourg	25	25	30	30	33	623 890	665 992	771 824	731 060	812 152	24 956	26 640	25 727	24 369	24 611
JRC Petten	5	4	4	4	4	4 500	30 513	55 440	61 324	56 473	900	7 628	13 860	15 331	14 118
JRC Geel	7	7	7	7	7	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
JRC Karlsruhe	10	11	11	12	12	183 400	137 616	133 520	124 944	124 944	18 340	12 511	12 138	10 412	10 412
JRC Sevilla	1	1	1	1	1	4 440	4 356	3 192	4 016	3 859	4 440	4 356	3 192	4 016	3 859
JRC Ispra (1)	104	122	123	121	110	258 622	286 517	216 753	172 951	141 775	2 487	2 349	1 762	1 988	1 611
Grange	1	1	1	1	1	7 674	NR	NR	NR	NR	7 674	NR	NR	NR	NR
Commission	**267**	**288**	**284**	**218**	**207**	**3 538 932**	**3 607 221**	**4 013 332**	**3 605 476**	**3 453 442**	**13 254**	**12 525**	**14 131**	**19 595**	**19 962**

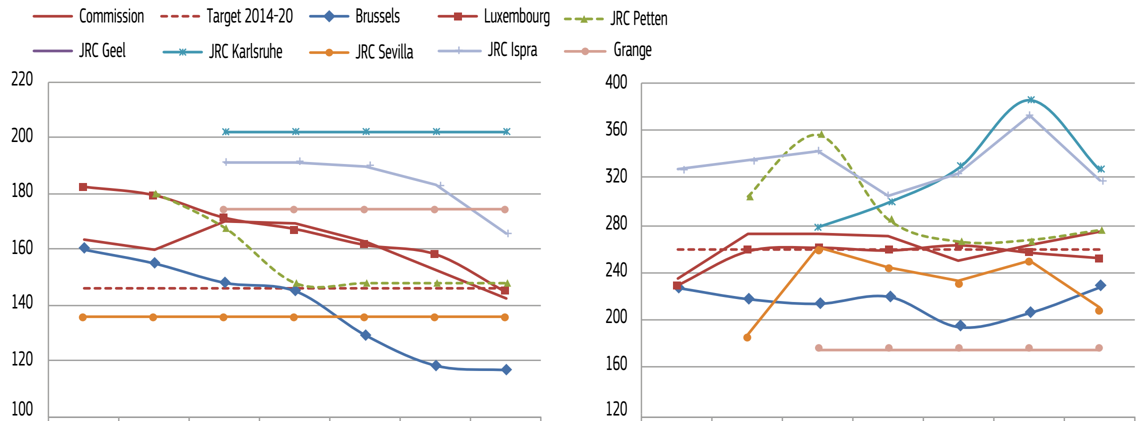
NR: Not reported;

(1) Total kms and kms/vehicle presented for conventional (petrol or diesel) vehicles, ie 87 in 2017, in 74 in 2018

Luxembourg vehicles were used the most intensively in 2017 and 2018, and the Commission average rose slightly to just under 20 000 km/vehicle. Since 2015 the Commission has tended towards having fewer vehicles and using them more intensively.

Figure 2.17 shows the target for the 2014-20 reduction in tailpipe CO_2 emissions as defined by manufacturer specifications and actual performance. While the Commission met both targets in 2016, actual emissions increased in 2017-8.

Figure 2.17 Manufacturer (left) and actual (right) tailpipe emissions for vehicle fleet, (gCO_2/km)



	2012	2013	2014	2015	2016	2017	2018
Commission	163	160	170	169	163	152	143
Target 2014-20	146	146	146	146	146	146	146
Brussels	160	155	148	145	129	118	116
Luxembourg	182	179	171	167	161	158	145
JRC Petten		180	168	148	148	148	148
JRC Geel							
JRC Karlsruhe			202	202	202	202	202
JRC Sevilla	136	136	136	136	136	136	136
JRC Ispra			191	191	190	183	165
Grange			174	174	174	174	174

	2012	2013	2014	2015	2016	2017	2018
Commission	234	273	273	271	250	263	275
Target 2014-20	260	260	260	260	260	260	260
Brussels	227	217	213	219	193	205	227
Luxembourg	228	257	260	258	263	256	251
JRC Petten		304	357	284	265	266	275
JRC Geel							
JRC Karlsruhe			278	299	328	386	327
JRC Sevilla		187	260	244	232	250	210
JRC Ispra	327	334	343	304	323	374	317
Grange			174	174	174	174	174

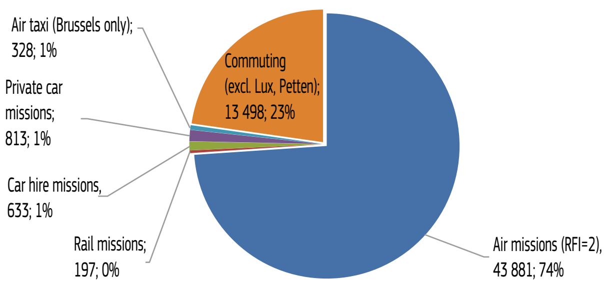
Commission emissions per kilometre (manufacturers' specifications) have fallen, as expected due to fleet replacement and the introduction of electric vehicles, so the 2014-20 target was achieved in 2018. Actual emissions, as calculated from fuel purchases have not demonstrated the same trend at Commission level and remain above the 2014-20 target.

JRC Ispra has increased the number of electric vehicles from 3 in 2014 to 36 in 2018. Brussels has increased the number of charging points to 13, for four new service vehicles. Further installations are ongoing for staff vehicles. It is possible that the relative 'actual' inefficiency of the JRC Ispra fleet compared to those of other sites shown in Figure 2.17 is due to a large number of journeys being of a very short distance. If conventional engines do not warm up, they do not approach optimum performance.

2.6.6 Scope 3 CO_2 emissions from staff missions and commuting

Air travel accounts for over 90% of missions emissions. Air travel and staff commuting together represent 97% of the measured emissions for staff mobility as shown in Figure 2.18.

Figure 2.18 CO_2 emissions from commuting and mission travel in 2018 (tonnes and %)



CO_2 emissions resulting from missions undertaken by staff at the EMAS sites have been estimated using data from the Commission's proprietary management system[26] along with data reported by the Commission's travel agency[27].

Estimates of emissions generated by staff commuting use mobility survey data for the sites, although these

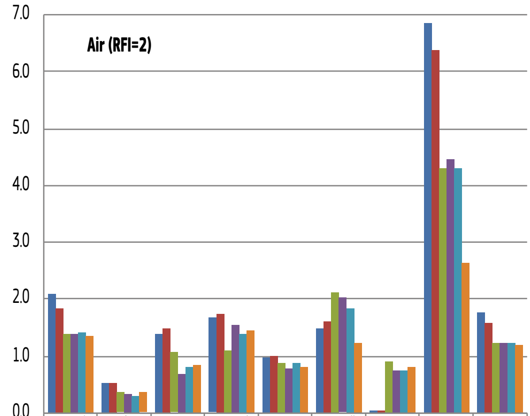
26 Commonly known as MIPS.

27 American Express report CO_2 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 Ispra staff are not generally made through this agency so figures are under reported in 2013, 2014, estimations made from 2015.

are not necessarily 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.

In relation to air travel, the overall warming effect of aircraft emissions, especially at higher altitudes, ie 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[28] index (RFI) of 2[29] has been used to calculate flight emissions.

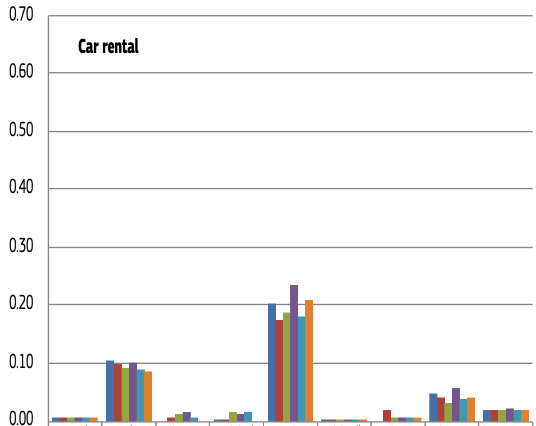
Figure 2.19 Per capita emissions for air for missions by air (RFI=2), car rental and rail [30]



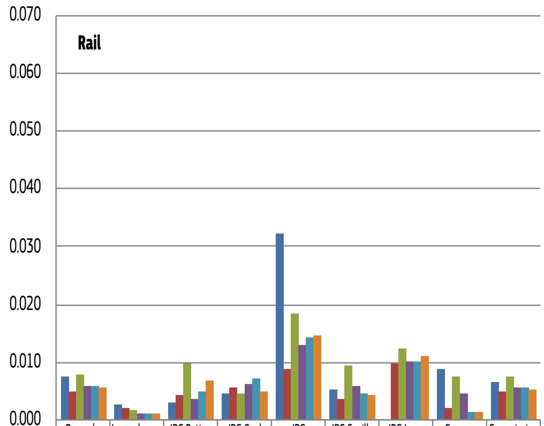
	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Sevilla	JRC Ispra	Grange	Commission
2013	2.09	0.53	1.39	1.67	0.98	1.48	0.02	6.86	1.77
2014	1.83	0.51	1.48	1.74	1.01	1.61	0.02	6.38	1.57
2015	1.39	0.35	1.06	1.10	0.88	2.13	0.89	4.31	1.23
2016	1.39	0.33	0.70	1.55	0.78	2.04	0.75	4.47	1.22
2017	1.42	0.31	0.8	1.39	0.87	1.84	0.76	4.32	1.24
2018	1.35	0.36	0.85	1.46	0.80	1.23	0.81	2.64	1.18

DG SANTE at Grange has the highest per capita emissions for air travel. This is expected as its staff include mainly food and veterinary inspectors who conduct frequent missions throughout the world. The trend for Grange and for the Commission is slightly downwards.

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, as shown below).



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Sevilla	JRC Ispra	Grange	Commission
2013	0.0068	0.1036	0.0000	0.0028	0.2021	0.0003	0.0000	0.0471	0.0196
2014	0.0065	0.0965	0.0072	0.0003	0.1748	0.0012	0.0191	0.0392	0.0193
2015	0.0063	0.0916	0.0136	0.0168	0.1860	0.0028	0.0057	0.0308	0.0193
2016	0.0067	0.1010	0.0157	0.0129	0.2327	0.0019	0.0048	0.0559	0.0214
2017	0.0043	0.0881	0.0072	0.0153	0.1816	0.0012	0.0049	0.0373	0.0174
2018	0.0043	0.0846	0.0000	0.0000	0.2099	0.0000	0.0052	0.0414	0.0171



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Sevilla	JRC Ispra	Grange	Commission
2013	0.0077	0.0026	0.0031	0.0046	0.0324	0.0052	0.0000	0.0087	0.0067
2014	0.0048	0.0022	0.0043	0.0056	0.0088	0.0037	0.0098	0.0022	0.0049
2015	0.0078	0.0019	0.0098	0.0046	0.0184	0.0094	0.0122	0.0074	0.0074
2016	0.0060	0.0012	0.0038	0.0064	0.0131	0.0060	0.0102	0.0045	0.0057
2017	0.0059	0.0012	0.0050	0.0073	0.0143	0.0045	0.0102	0.0014	0.0056
2018	0.0055	0.0011	0.0070	0.0051	0.0145	0.0042	0.0109	0.0015	0.0053

Per capita rail emissions are roughly one hundredth of those for air travel.

DG DIGIT has steadily increased the number of video conferencing facilities across the Commission.

28 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.

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

30 Reduced from Agency data, corrections applied to account for journeys not booked through the Commission's travel agency

2.6.7 Scope 3 emissions from fixed assets (buildings and IT), purchased goods and services waste disposal, and upstream energy losses

Reporting for the first time for 2018, considerable effort was required to collect and process information for up to 48 new categories of data[31]. The approach adopted was as follows:

- Fixed assets (buildings (7 types) and IT (16 types)): Annual emissions were calculated using an amortisation approach. The total emissions associated with each type of building and IT equipment were calculated using conversion factors. The annual emissions represented a fraction of the total emissions for those buildings or IT items that had not already been amortised (ie not older than the assumed design life, eg 25 years for buildings and 4 years for IT equipment).
- Purchased goods and services (13 types): The emissions associated with some service contracts such as security or cleaning were estimated from staff full time equivalent (FTE), and others such as consultants, on contract value. The emissions for paper supply were based on tonnage as were those for the seven categories of food, including meat, fish, dairy and coffee. Data for food consumption was the most difficult to obtain.
- Waste disposal (11 types): Emissions were estimated using tonnage.
- Upstream energy losses: a conversion factor was applied to all types of energy consumption to account for energy losses in supply.

2.6.8 Total air emissions of other pollutants

The EMAS regulation requires emissions of other air pollutants to be reported where appropriate (including as a minimum NO_x, SO_2 and PM_{10}), and the results for 2017 are as follows:

Table 2.11 'Other' air emissions at Commission sites in 2018 (kg)

Site	Emissions in 2017 of:					Emissions in 2018 of:				
	NO_x	SO_2	PM_{10}	VOC	CO	NO_x	SO_2	PM_{10}	VOC	CO
Brussels	16 459	63	86	1 805	NR	16 151	62	84	1 771	NR
Luxembourg	5 771	23	30	633	NR	4 176	16	22	458	NR
JRC Petten	425	NM	NM		NR	448	NM	NM	65	NR
JRC Geel	581	15	17		45	566	15	17		51
JRC Karlsruhe	NA	NA	NA	NA	NA	NA	NA	NA	NA	
JRC Sevilla	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
JRC Ispra	14 283	NA	NA	NA	16 518	9 732	NA	NA	NA	14 359
Grange	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Commission	37 519	101	133	2 438	16 564	31 073	93	123	2 294	14 410

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

Total reported emissions of all parameters reduced in 2018. Brussels, owing to the large number of buildings (and consequently boilers), is the largest contributor of NO_x. JRC Ispra's gas plant generates electricity and is therefore responsible for a large proportion of the reported NO_x emissions and the site is the only one to report CO emissions.

JRC Petten has reported since 2010 and includes physical measurements and calculations for NO_x and whereas VOC data is based on purchase and consumption of solvents. SO_2 and PM_{10} emissions are excluded because 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.

[31] Factors advised by internal auditor, based largely on the BASE CARBONE, ADEME

2.7 Improving waste management and sorting

Waste management practices vary from site to site. Some, such as 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 Karlsruhe, that due to its nuclear status must ensure that all site waste generated is disposed of by very tightly controlled channels. In most other sites, the quantity of waste directly disposed by contractors may not be included in the site's figures.

2.7.1 Non hazardous waste[32]

Figure 2.20 indicates that in 2018 Brussels generated nearly 75% of the Commission's non-hazardous waste, with JRC Ispra and Luxembourg responsible for much of the remainder. 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 Ispra contribute to significant year on year variation. Figure 2.21 shows the evolution of per capita waste generation at Commission sites and the 2014-20 targets.

Figure 2.20 Generation of non-hazardous waste at Commission sites in 2018 (tonnes)

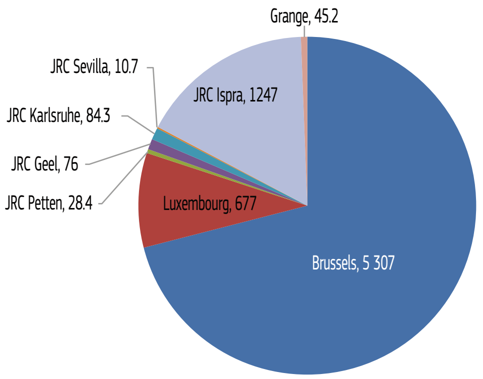
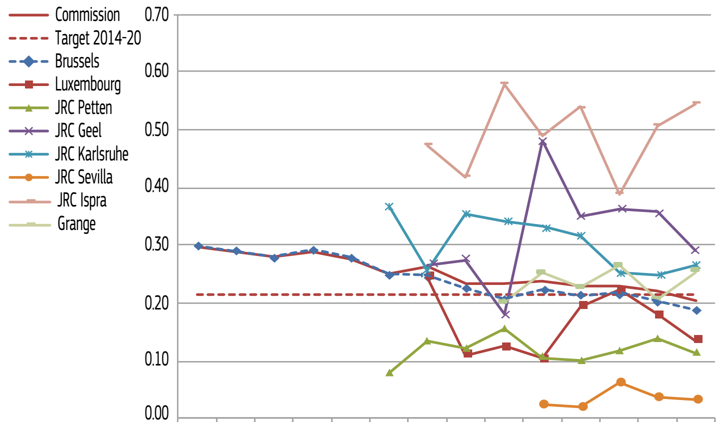


Figure 2.21 Evolution of non-hazardous waste generation (tonnes/person)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	0.297	0.288	0.279	0.288	0.276	0.249	0.263	0.233	0.233	0.237	0.228	0.228	0.220	0.202
Target 2014-20	0.214	0.214	0.214	0.214	0.214	0.214	0.214	0.214	0.214	0.214	0.214	0.214	0.214	0.214
Brussels	0.300	0.291	0.282	0.290	0.278	0.249	0.248	0.225	0.210	0.222	0.209	0.217	0.204	0.187
Luxembourg							0.245	0.110	0.124	0.103	0.194	0.222	0.179	0.135
JRC Petten						0.078	0.132	0.120	0.155	0.105	0.100	0.117	0.136	0.115
JRC Geel							0.267	0.276	0.180	0.479	0.351	0.364	0.358	0.292
JRC Karlsruhe						0.365	0.256	0.354	0.340	0.333	0.317	0.253	0.248	0.266
JRC Sevilla										0.022	0.019	0.060	0.035	0.031
JRC Ispra							0.474	0.419	0.578	0.491	0.538	0.389	0.507	0.546
Grange									0.201	0.251	0.225	0.264	0.206	0.253

The Commission has reduced non-hazardous waste generation from nearly 300 kg/person in 2005 to 190 kg/person in 2018, and already meets the newly revised 2014-20 target. There is some fluctuation in recent years particularly of sites newer to EMAS. JRC Seville cooperated with its landlord to develop a new waste management plan.

Luxembourg experienced a considerable reduction in per capita waste generation in 2012, but 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.

The Commission sought particularly in 2018 to reduce the use of single use plastics in its vending machines and catering facilities, and part of this involved replacing non-recyclable cups and installing water fountains. The EMAS Coordination team was able to identify and report on 49 actions across the 8 EMAS sites demonstrating progress in this initiative.

2.7.2 Hazardous waste[33]

The Commission generates far less hazardous than non-hazardous waste. Figures 2.22 and 2.23 show the composition in 2018 and trend in total amount generated by site. Per capita hazardous waste for the Commission

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

[33] Such as batteries, oils, greases, toners, fluorescent tubes, chemicals mineral oils, etc

as a whole was up slightly in 2018 continuing an upwards trend since 2015 and above the 2014-20 target. JRC Petten made a hazardous waste disposal in 2017, not having done so in 2016, and Luxembourg's figure increased in 2017 owing to JMO closure.

Figure 2.22 Hazardous waste generation in 2018 (tonnes, %)

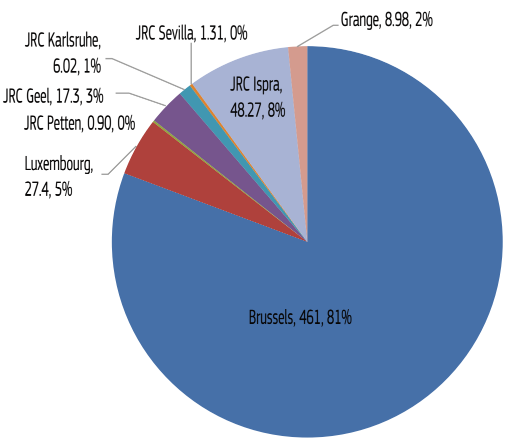
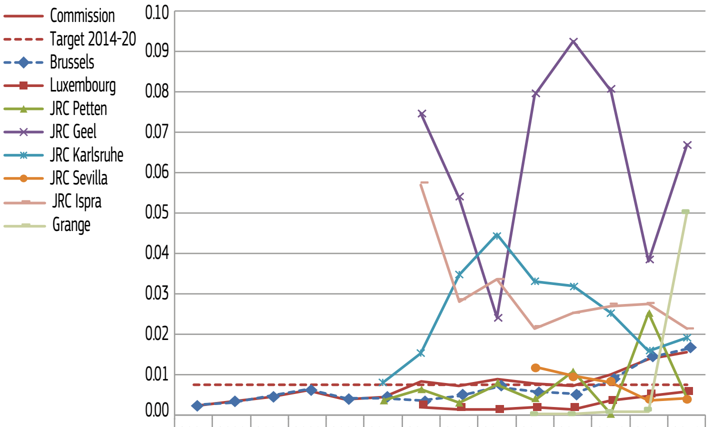


Figure 2.23 Evolution in hazardous waste generation at Commission sites (tonnes/person)



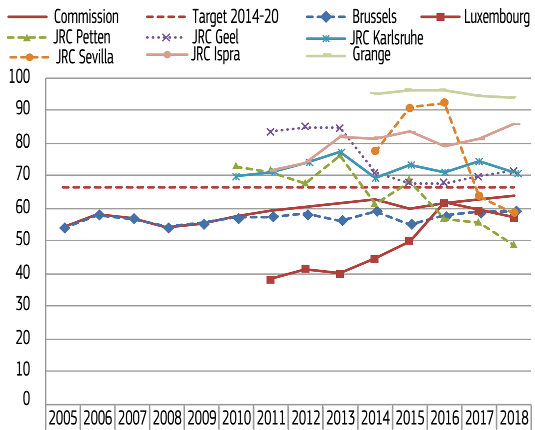
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	0.0020	0.0031	0.0044	0.0059	0.0037	0.0041	0.0079	0.0069	0.0089	0.0076	0.0068	0.0096	0.0138	0.0154
Target 2014-20	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074
Brussels	0.002	0.003	0.004	0.006	0.004	0.004	0.003	0.005	0.007	0.006	0.005	0.008	0.014	0.016
Luxembourg							0.002	0.001	0.001	0.001	0.001	0.003	0.005	0.005
JRC Petten						0.003	0.006	0.003	0.007	0.003	0.010	0.000	0.025	0.004
JRC Geel							0.075	0.054	0.024	0.079	0.093	0.081	0.038	0.067
JRC Karlsruhe						0.008	0.015	0.035	0.045	0.033	0.032	0.025	0.016	0.019
JRC Sevilla										0.012	0.009	0.008	0.004	0.004
JRC Ispra							0.057	0.028	0.033	0.021	0.025	0.027	0.027	0.021
Grange										0.000	0.000	0.001	0.001	0.050

Ispra has recorded a significant drop since 2011 due to a new site policy aimed at reducing the quantities of chemicals used and stored in laboratories. Karlsruhe achieved a significant drop in 2014 which continued in following years.

Year to year comparisons for the research sites may not always be appropriate because some hazardous wastes may be stockpiled prior to disposal for months.

2.7.3 Waste sorting

Figure 2.24 Evolution of sorted waste as proportion of total waste at EMAS sites (%)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	53.9	57.9	56.9	54.4	55.5	57.3	59.5	60.4	61.4	62.9	59.7	61.3	62.7	63.8
Target 2014-20	66.7	66.7	66.7	66.7	66.7	66.7	66.7	66.7	66.7	66.7	66.7	66.7	66.7	66.7
Brussels	53.9	57.9	56.9	54.4	55.5	57.1	57.5	58.2	56.2	59.2	55.2	57.8	59.0	59.3
Luxembourg							38.2	41.4	40.1	44.7	49.9	61.8	59.3	57.0
JRC Petten						72.9	71.2	67.5	76.1	61.0	68.3	56.5	55.5	48.7
JRC Geel							83.6	84.8	84.6	71.0	67.8	67.7	69.8	71.4
JRC Karlsruhe						69.8	71.2	73.9	77.2	69.2	73.2	71.2	74.6	71.0
JRC Sevilla										77.4	90.8	92.2	63.8	58.6
JRC Ispra							71.3	73.9	82.1	81.5	83.4	79.1	81.3	85.8
Grange										94.9	96.3	96.0	94.2	93.7

Figure 2.24 presents the percentage of waste sorted into different streams other than that which is "thrown away" when all other sorting options have been exhausted. It therefore represents everything except what is usually referred to as "domestic" or "municipal" waste.

The Commission reached its highest value of nearly 64% in 2018, but is still 2.9 points below the 2014-20 target.

JRCs Geel, Karlsruhe and Ispra sort considerably more of their waste (over 70%) than either Brussels or Luxembourg (less than 60%). Grange records very good results (over 90%) largely because the waste contractor undertakes additional sorting post collection, and report the data to site. Results at individual sites were mixed in 2018.

2.7.4 Recycling obselete IT and office equipment:

DG DIGIT has a framework contract with Oxfam Solidarité (Oxfam) and 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 its humanitarian and welfare activities. Through the contract, DIGIT aims to reuse on average at least 70% of units collected from the Commission. Actual recycling rates have usually been far higher and within the range of 82% (2010) to 91% (2012) as shown in Table 2.9 which was compiled for IT collected in Brussels since 2010, although the contract started in 2006.

Table 2.12 Number of IT items collected and recycled in Brussels

	Year of collection								
Parameter	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Collected items	15 462	12 531	19 360	24 744	27 513	30 918	23 969	17 961	17 961
Processed items[1]	15 301	12 531	19 251	19 935	27 375	30 918	10 246	17 916	17 916
Items for second hand use	12 509	10 960	17 469	17 298	24 759	27 952	9 103	14 188	14 188
Second hand use (%)	82	87	91	87	90	90	89	79	79
Recycled or dismantled (%)	18	13	9	13	10	10	11	21	21
Weight of collected items (tonnes)	42.72	34.62	53.49	68.37	76.02	72.33	45.00	67.50	55.54

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

Since 2010 the re-use rate has mostly exceeded 80%. 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 high re-use rates particularly since 2010 were achieved despite the falling cost of new IT 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 Solidarity in the context of its EMAS registration.

The weight of IT material collected was reported by Oxfam for the first time in 2015 at 72 tonnes almost doubling the quantity of hazardous waste that is generated by Brussels, and has been incorporated into the Brussels waste reporting. The amount of collected by OXFAM (including donations to CLOSE THE GAP fell from 68 tonnes in 2017 to 56 tonnes in 2018.

Detailed figures for IT collected by the Namur facilities of OXFAM Solidarité (where Luxembourg IT equipment is recycled) were available for the first time in 2015. The re-use rate (92% of 2 318 processed items) is comparable to the one in Brussels but still need confirmation over years.

Recycled office equipment under the same contract amounted to over 500 tonnes in 2016 to 2018.

2.8 Protecting biodiversity

Sites started collecting data to report for the EMAS biodiversity indicator (per capita built surface area at ground level in 2013). The JRC sites have reported this figure, but both Brussels and Luxembourg, with more property, are considering how to report in future, given that most of their sites are in built up areas. The next Environmental Statement will in future report biodiversity under different metrics as required by the new Annex IV of the EMAS Regulation

Table 2.13 Biodiversity indicators to 2018

Site	Built surface (m²)					Built surface (m²/p)					Built surface area (% of site)				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
Brussels															
Luxembourg															
JRC Petten	13 248	14 545	13 526	13 526	13 526	47	52	49	51	55	4.3	4.8	4.4	4.4	4.4
JRC Geel	70 623	71 286	71 286	70 203	70 309	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
JRC Karlsruhe	68 000	71 640	71 640	71 640	72 100	213	222	221	222	227	29	31	31	31	31
JRC Sevilla	7 073	8 168	8 168	8 168	8 168	24	29	27	25	24	61	70	70	70	70
JRC Ispra	692 984	664 907	663 999	662 845	666 655	297	290	294	291	292	42.7	41.0	40.9	40.8	41.1
Grange	5 453	5 453	5 453	5 453	5 453	30	30	29	29	30	6.4	6.4	6.4	6.4	6.4

NR: Not Reported

As shown in Table 2.13, per capita built surface area in 2018 varied between 20 m² and 300 m². The JRC sites, with the exception of Seville, have larger footprints than both Brussels and Luxembourg owing to their extensive laboratories, technical installations and/or nuclear facilities.

Part of the JRC Petten site is located in a Natura 2000 protected habitat, and the site is one of the stakeholders involved in its management. A forestry management plan at JRC Geel aims to restore diversity in the surrounding forest. In recent years pine has become overwhelmingly dominant at the expense of native broad leave species.

JRC Ispra recently conducted a study to record the main plant species and natural habitats and map the different types of green areas. A field survey recorded the population of different species of amphibians, including a protected species of frog. The site used the BREEAM certification process for the refurbishment of a new building under which it evaluated its ecological impact from construction to operation and designed mitigation measures for implementation.

2.9 Green Public Procurement (GPP)

2.9.1 Incorporating GPP into procurement contracts

Table 2.14 Contracts greater than 60k EUR with additional "eco" criteria (%)

Site	2012	2013	2014	2015	2016	2017	2018
Brussels	0	94	80	100	82	93	100
Luxembourg	65	92	100	100	94	83	100
JRC Petten	NR	NR	NR	NR	NR	NR	75.8
JRC Geel	NR	NR	NR	NR	22	33	35
JRC Karlsruhe*	NR	NR	8	8	8	28	17
JRC Sevilla*	NR	NR	1	2	1	1	2
JRC Ispra	NR	17	32	8.8	8.8	9.5	17
Grange*	0	0	2	4	3	3	3

* Number of contracts rather than percentage of total; NR - Not Recorded

Both Brussels and Luxembourg have increased the number of their procurement contracts, managed by 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.

DG ENV chairs an inter-service working group on developing and promoting GPP as part of the Commission's response to its obligations under the Circular Economy Package. The Commission participates in an inter-institutional GPP contract managed by the European Parliament and which allows staff-preparing tenders to seek specialist advice regarding implementation of environmental criteria from a helpdesk provided by an external service provider.

a) **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[34] to show the degree to which tenders incorporate sustainability. Table 2.15 is the first attempt to present the results at site level for the five categories starting from not 'green' to 'green' by nature.

Table 2.15 Breakdown of the extent of incorporating GPP criteria in tenders in 2018

Site	Not 'green'	Light 'green'	'Green'	Very 'green'	'Green' by nature	Total
Brussels (1)	9	0	15	0	2	26
Luxembourg	0	1	3	1	0	5
JRC Petten	0	0	0	0	0	0
JRC Geel	22	4	4	3	1	34
JRC Karlsruhe	28	7	3	0	0	38
JRC Sevilla	0	0	0	0	0	0
JRC Ispra	75	9	5	0	1	90
SANTE at Grange	0	1	1	1	0	3
Commission	**134**	**22**	**31**	**5**	**4**	**196**

Note: (1) 'Green' total includes Light 'green' and Very 'green'

Overall 29% of contracts in 2018 were either *green by nature* or had some degree of GPP.

b) **IT procurement**

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.

In addition to continuing to include environmental criteria in various stages of a range of procurement contracts DIGIT provides information and training to staff who are involved in preparing calls for tender for the provision of equipment and services.

The performance of desktop computers purchased by the Commission has improved while power consumption has decreased as shown below. The policy now is increasingly to replace desktop computers with laptops.

Figure 2.25 Improved power consumption in Commission recent desktop computers

	DI-6720				**DI-7350**		**DI-7630**
	Energy Star 5.0	**Energy Star 5.0**	**Energy Star 5.2**	**Energy Star 5.2**	**Energy Star 5.2**	**Energy Star 6.1**	**Energy Star 6.1**
Power Consumption (Wattage)	Dell Optiplex 780 DT	Dell Optiplex 790 DT	Dell Optiplex 7010 DT	Dell Optiplex 3020 SFF	HP ProDesk 600 G1 SFF	HP ProDesk 600 G2 SFF	HP ProDesk 600 G3 SFF
Year in production	2009	2011	2012	2014	2014	2016	2017
Maximum	114.04	78.03	70.76	78.15	42		
Short Idle						14.662	14.3
Idle Mode	55.65	47.15	39.25	26.09	17.5	12.705	13.43
S3 "Sleep" Mode	0.94	0.94	0.87	1.36	1.5	2.131	0.84
Off				0.46	0.57	1.154	0.72
ETEC (kWh/year)				**94.23**	**64.72**	**67.13**	**64.70**

2.9.2 Office supply catalogues

Data in Table 2.16 shows that Brussels and Luxembourg have increased the percentage of "green" products in the standard office supply catalogue. Since 2012, at both Brussels and Luxembourg the percentage of "green"

[34] Scale recommended in 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 ?"

items has roughly doubled. JRC Ispra has a smaller proportion of "green" products in the catalogue, but a large number of items.

Table 2.16 Proportion and value of "green" products in the office supply catalogue

	Percentage "green"							Number "green"						
	2012	2013	2014	2015	2016	2017	2018	2012	2013	2014	2015	2016	2017	2018
Brussels	27	36	36	46	47	48	48	169	186	186	330	364	358	351
Luxembourg	18	23	26	23	26	36	35	99	88	94	89	87	118	108
JRC Ispra	26	26	24	24	32	30	28	153	153	165	171	232	200	210

2.10 Demonstrating legal compliance and emergency preparedness

2.10.1 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.

They also monitor the number of EMAS non conformities[35] (NCs) identified through external verification audits as shown in Table 2.17.

Table 2.17 Non-conformities from EMAS verification audits at Commission sites

Site	2011	2012	2013	2014	2015	2016	2017	2018
Brussels	21	5	3	3	4	1*	1	1
Luxembourg	19	3	0	0	2	4	6	4
Petten			1	1	1	1	4	4
Geel				3	3	2**	4	4
Sevilla				1	0	0	0	2
Karlsruhe					4	4	1	0
Ispra					0	0	0	1
Grange					4	3	4	3
Total	**40**	**8**	**4**	**8**	**18**	**12**	**20**	**19**

Notes: * an open non conformity from 2015, ** non conformities with several elements

HR.D2 encourages the external auditors to take into account the resources available to Commission staff when formulating their findings, particularly in relation to non-conformities, and prioritise accordingly. As well as identifying non-conformities, the audit findings make observations (which if not addressed could become non-conformities), and scopes for improvement (professional advice). Auditors also identify good practice.

Since 2016, HR.D2 has circulated to site management a summary[36] of the main outcomes each verification exercise including a "heat map" showing how the audit findings correlate with different parts of the EMAS Regulation. The summary for 2018 results took note of the following challenges:

- Audits in the first semester (June) instead of the second (October/November); and
- Demonstrating that the Commission had incorporated the requirements of the EMAS Regulation's amended annexes into its management system.

Overall findings included:

- A large number of positive findings, testament to the efforts of EMAS site coordinators, correspondents, colleagues and contractors, particularly noteworthy were the many remarks on the cleanliness of facilities and good housekeeping, and several relating to audit follow up and reporting;
- 19 minor non conformities an improvement over 2017 when there 18 minor NCs but also 2 major NCs;

[35] NCs can be either "major" - posing an immediate threat to the integrity of the management system and which if not addressed in the short term can result in unsuccessful EMAS verification (non renewal of certification), and "minor" which if not addressed could become "major".

[36] Internal Commission communication Ares(2018)6519155 - 18/12/2018

- Six NCs relating to new parts of the EMAS Regulation, indicating further work is needed to more completely address organisational context, stakeholder expectations, risks and opportunities; and
- No NCs for JRC Karlsruhe, but a first for JRC Ispra
- The verification process took longer than in 2017. This was largely attributed to not completely addressing audit findings immediately after the site audits and before the summer period.

2.10.2 Improving compliance by registering more buildings in EMAS

Brussels and Luxembourg are both large urban sites with many buildings. Owing to the administrative workload associated with incorporating new buildings in EMAS (including system implementation, data preparation and reporting internal and external audits), its scope 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 the case of new buildings[37], registration in EMAS is not instantaneous.

In Luxembourg, reporting on environmental performance has included all buildings although the number of EMAS registered buildings is 14 out of 18 (152 455 m^2 out of 180 906 m^2 (or 84% of useful floor space).

As indicated in Table 2.3, 510 of 518 building structures (98.4%) are included in the EMAS scope in 2018, representing 96 % of useful floor space (1 587 460 out of 1 653 659 m^2).

2.10.3 Emergency preparedness

Each Commission site has structures and procedures for responding to emergencies. In 2015, a page was introduced into the EMAS intranet corporate portal (MyIntracomm) explaining 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. In addition, summary sheets of emergency contact numbers are circulated to offices, and HR.D2 is also in the process of preparing an intranet page to relay air quality alerts from the local authorities in Brussels

2.11 Internal communication and training

This section describes the corporate communication and training actions common for all the Commission sites. Every year, HR.D2 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. The more important actions are outlined below.

2.11.1 Leadership and commitment

During 2018, Commission's senior management took an active role demonstrating leadership and commitment in relation to the environmental management system. Specific examples include:

[37] MO15 and MERO. PALM will also not be included in the 2018 registration owing to major refurbishment.

a) A Director’s personal testimonial: Why am I a vegan? (17/01 and 13/06)

Nearly 50 colleagues attended this talk by Fernando Garcia Ferreiro – Director of HR.D Health & Wellbeing - Working Conditions, providing environmental, ethical and health reasons behind his decision to become a vegan. Due to high demand, he delivered a second talk in Luxembourg that attracted 25 participants.

As a result a group of volunteers created the EC-staff for Sustainable Food which has 50 members.

b) Commissioner Vella joins hundreds for a beach clean-up (25/03)

Over 400 people, including staff from 38 DGs and cabinets and their families, joined Commissioner Karmenu Vella, responsible for Environment, Maritime Affairs and Fisheries on a Sunday in Blankenberge. It was part of a larger Belgian event that gathered over 3 000 volunteers. Participants removed some 5.5 tonnes of garbage, about the weight of a killer whale!

Volunteers collected many cigarette butts, straws and small pieces of plastic, as well as bottles, cans and even tyres. The European Environment Agency processed the data through its Marine LitterWatch. The event had a wide impact, thanks to social media. A Facebook Live chat was organised with Commissioner Vella, who explained the goals of the recently adopted plastics strategy.

c) Director General presents the 2nd Sustainable Commission (EMAS) Awards (28/05)

The Sustainable Commission Awards ceremony took place for the first time during EMAS week, an event dedicated to making the Commission more sustainable by raising awareness and exchanging best practice among staff. Initiatives from DG RTD, OIB, the JRC and DG DGT received prizes, acknowledging their success in reducing paper and energy consumption and waste generation, promoting sustainable mobility and promoting staff participation. DG HR Director-General Irene Souka, and President of the EMAS Steering Committee, handed out the awards. Congratulating the winners, she said:

“The EMAS Awards projects demonstrate that the Commission leads by example in reducing the environmental impact of its everyday activities.”

She also referred to EMAS as a valuable partner for the fit@work programme[38] and social corporate responsibility:

"By taking care of our staff, the communities we are living in and the environmental impact of our own activities, we deliver significant benefits and we implement the Commission's vision of a more sustainable European Union."

d) Commissioner attends EU Mobility Week event (16-22/09)

The European Mobility Week 2018 focused on 'multi-modality' (mixing several transport means) with more than 2 700 participating towns and cities in 54 countries. As well as the activities across Europe, the Commission's own events included lunchtime conferences, safe cycle training courses and guided bicycle tours. A highlight of the week for staff was the Mobility Village at the Berlaymont esplanade. The 15 stands attracted around 500 visitors, including the Commissioner for Budget & Human Resources, Günther Oettinger, who tried out an e-car, e-cargo bike and e-scooter.

e) Our Ocean conference 2018, Bali (29-30/10): Commission delivers on its 2017 commitments

The EU made 23 new commitments[39] during the conference to improve the condition of our oceans and tap their potential. Moreover, the Commission delivered on its *Our Ocean conference 2017* commitments to gradually suppressing the single-use items in its own premises, in line with the new EU Plastics Strategy[40]. These include, as presented at the EMAS Steering Committee meeting on 28/09/2018, 49 actions at site level, including preparation of a Commission guide on organising sustainable events and meetings. The additional number of actions in the Commission's Global Action Plan that are related to removing single use plastics has significantly increased the overall efforts to reduce and manage waste.

Commissioner Karmenu Vella, responsible for Environment, Maritime affairs and Fisheries, said:

"We need the oceans and the oceans need us. We have to urgently reduce marine litter and other sources of pollution, halt illegal fishing and support fragile marine ecosystems. We have to develop our blue economy - create sustainable jobs and growth - supported by cutting-edge research and new technologies. It is for this reason that we are making these commitments."

f) Senior managers were EMAS Ambassadors in the "Less Waste, More Action" campaign (November 2018)

These included Director Generals Ms Florika Fink-Hooijer (DG Interpretation) and Mr João Aguiar Machado (DG Maritime Affairs and Fisheries) who provided short enthusiastic video testimonials of their services' actions respectively supporting organisation of sustainable events and removal of single-use items.

In addition, Ms Irmfried Schwimann the Deputy Director General of DG Internal Market, Industry, Entrepreneurship and SMEs (GROW) promoted local best-practises on paper reduction. Two Directors in DG Climate Action (CLIMA), Ms Yvon Slingenberg and Mr Artur Runge-Metzger

[38] The fit@work is the Commission's cross-cutting, multi-annual health and wellbeing programme for the period 2017-2020.
[39] http://europa.eu/rapid/press-release_MEMO-18-6210_en.htm
[40] http://europa.eu/rapid/press-release_IP-18-5_en.htm

promoted tap water, while Henriette Geiger Director in DG International Cooperation and Development (DEVCO) supported the reduction of organic waste and sustainable food choices. Ms Marie-Pierre Darchy, Head of Unit OIB's Operations and Services supported the suppression of single-use plastics and the promotion of tap water.

g) Commissioner cycles as VéloMai goes interinstitutional (and reaches the moon!) (May 2018)

As part of the fit@work programme, the Commission participated in the VéloMai challenge to promote the use of the bicycle as a healthy and sustainable mode of transport to commute to work. Colleagues across the Commission challenged each other and other services to cycle the furthest and/or make the most rides during May. The 2018 VéloMai challenge went interinstitutional[41], and succeeded in collectively pedalling 395 000 km, the distance to the moon!

The winners gathered for the closing ceremony at the Berlaymont. Arriving by bike, Commissioner Violeta Bulc, responsible for Transport, opened the event and congratulated the participants for the "incredibly impressive" results. Stressing its role in the multimodal strategy promoted by the Commission she said:

"I believe that cycling is the best way to move around!"

2.11.2 Communication to staff

a) Corporate seasonal communication campaigns:

The following two main corporate communication campaigns took place in 2018:

i) Sustainable Commission Awards (28/05) and Sustainable@work Week (28/05-01/06)

The Sustainable@work Week got off to a flying start with the 2nd edition of the Sustainable Commission Awards. Seven initiatives from four services were rewarded, including:

- a building refurbishment using cutting-edge techniques (JRC Ispra)
- the first 'passive' building in the Commission portfolio in Brussels (Office for Infrastructures and Logistics in Brussels, OIB),
- replacing all diesel technical service vehicles with electric ones in Brussels (OIB)
- reducing plastic waste from coffee cups and plastic bottles from the vending machines, and successful communication campaigns and collaborative platforms.
- setting-up successful communication campaigns (DG Research and Innovation (RTD),
- setting-up on-line collaborative platforms for the EMAS Network (DG Translation, DGT).

The week's initiatives included workshops, debates and information stands on topics such as sustainable events and mobility, food choices, waste reduction, buying 'green', and how to organise volunteers. In total nearly 500 participants took part and were able to exchange best practice. Three information fairs and discussion-tables were organised with the support EC volunteers (Sustainable@work Supporters, EC-staff for Sustainable Food Group, and EC-trainees Sustainability Sub-committee). Local NGOs and environmental associations also participated and vegan and plant-based delicacies and local organic beverages were available to sample.

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41 In VeloMai 2018 participated 6 EU institutions (the Commission, the Parliament, the Council, the European Economic and Social Committee, the Commitee of the Regions and the Court of Auditors) and several Commission Agencies.

The EC-trainees Sustainability Sub-committee also or impact of single-use items, with the help of children from the Commission's kindergartens.

Other Commission sites also planned activities during the week, especially in relation to VéloMai. These included a cycling picnic and a bike repair café at JRC Ispra, a mobility day at JRC Karlsruhe, an inter-institutional green day in Luxembourg, a free bike repair lottery and a breakfast for cyclists at JRC Geel and a breakfast and a repair café at JRC Petten, as well as rides on electric bikes and presentations.

ii) Waste Reduction Campaign: Less Waste, More Action (November to December 2018)

This campaign's flagship initiative, timed to coincide with the European Week for Waste Reduction, was the reduction of single-use items. It focussed on four topics, a) fewer single-use items and packaging, b) reducing paper consumption, c) reducing organic waste and making sustainable food choices, and d) promoting tap water. Commission's senior managers from DGs MARE, SCIC, GROW, DEVCO, CLIMA and from OIB promoted the topics in a series of short videos.

In addition, several *less waste, more action* workshops which attracted nearly 100 participants were organised by the "nearly zero waste" EMAS Correspondents in DG Research (RTD), DG Maritime Affairs and Fisheries (MARE), DG Competition (COMP) and Legal Service (SJ) on the themes of reducing waste in shopping, at the office, at home, and on cooking with leftovers.

In addition to the two main corporate communication campaigns, two further corporate waste reduction competitions ran in November with the award ceremonies for both in the Berlaymont on 7th December. Senior Management was present including Director Generals Florika Fink-Hooijer (DG SCIC), and João Aguiar Machado (DG MARE), and Deputy Director General Bernard Magenhann (DG HR).

The first competition sought the most innovative local best practice on waste reduction on each of the four campaign topics. The winners were JRC-Ispra, DG MARE and DG ENV. In addition a Corporate Achievement Special Prize was awarded to OIB while the Research Executive Agency received a special mention.

Among the winning initiatives were:

- the setting up of stocks of reusable crockery and cutlery,
- collection and washing up schemes for cups,
- banning the use of plastic water bottles,
- the gradual suppression of single-use items and packaging during meetings,
- making water fountains available in cafeterias and including unsold food or food scraps in the organic waste cycle,
- as well as 'bring your own mug' campaigns.

The second competition was limited to Brussels, and sought to award the buildings achieving the the highest reduction in unsorted (residual) and paper/packaging waste in November 2018 compared with November 2017. Prizes were awarded to:

- Rue Montoyer 15 (MO15) occupied by DG DIGIT for a 58% reduction,
- Rue Joseph II 70 (J-70) occupied mainly by DG EAC for a 39% reduction, and
- Avenue du Bourget 3 (DAV1) occupied by (OIB) for a 32% reduction.

At the same time EMAS Correspondents' volunteer groups, local environmental NGOs and associations organised a Sustainable Christmas Fair that provided tips on eco-conscious presents and packaging, organising sustainable food lunches and dinners, and setting up low or even zero waste gatherings and events. A performance by DG MARE's Choir contributed to the festive Christmas feeling.

The EC-trainees Sustainability Sub-committee started a funding campaign to reforest bare Belgium land. They collaborated with the Flemish NGO BOS+ and launched their social media campaign in mid-November, inviting people to purchase a tree with their name-tag or to support the campaign anonymously. Feedback was positive, and by the end of January, the trainees donated almost 8 000 € to BOS+. The trees were planted in December/January and name-tags added in February.

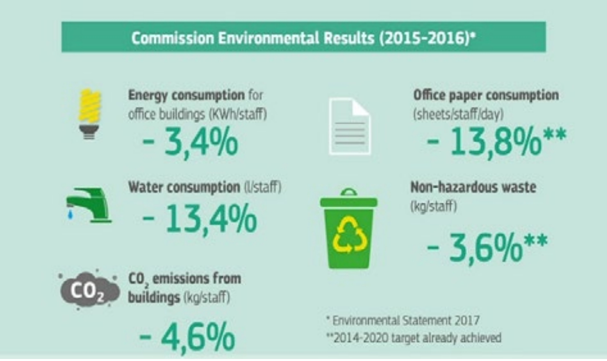
b) Additional activities in support of corporate campaigns, including:

- To support EU Mobility week (16-22/09), EMAS Site Coordination teams organised **Sustainable Mobility campaigns** as described in site annexes. DG COMM has offered service bikes to interested EU Representations since January 2019 with around 76 in use to date, with 50% reimbursement of public transport costs.

- **The first inter-institutional VéloMai challenge** (May 2018): More than 2 700 colleagues from all the participating institutions took part in this year's challenge, 65% more than in 2017. Half the increase was due to the other institutions participating (the European Economic and Social Committee and Committee of the Regions, the European Parliament, the Council, the Court of Auditors and several agencies).

There were around 75 000 cycle rides, saving over 52 tonnes of CO_2 emissions. Parallel, activities were organised in several DGs, such as lunchtime picnic bike rides and a cycling fair in the Beaulieu neighbourhood of Brussels. Several local events were organised by the EMAS Site Coordination Teams (see site Annexes). The action required collaboration among several actors including HR units, the fit@work programme, EMAS Site Coordinators and EU Cyclists' Group (EUCG). VéloMai has promoted greater awareness of environmental issues and traffic safety.

- The formal publication of the **Environmental Statement 2018** (data 2017) was accompanied by the production for the first time of an A5 promotional flyer highlighting some important results such as the Commission already having met three of its 2014-20 targets gets[42] (for paper, water consumption and non-hazardous waste generation).



- In July 2018 the EMAS Steering Committee adopted **new Guidelines on organising sustainable EC-meetings and events**, and in September transmitted it to all Commission Directors General and Heads of Services for internal use. These should help reduce or end single use plastics in Commission meetings and events. It is a practical tool for event planners, containing a summary checklist, and is available onlineline[43]. It includes seven steps covering all aspects of the organisation, with minimum requirements and more advanced options for each.

- HR.D2 also promoted the **Inter-institutional Green Public Procurement (GPP) helpdesk**, that is coordinated by the European Parliament but accessible to 7 other EU Institutions. It can answer general GPP inquiries, or provide customised support for example in developing green tender specifications, helping with market research, or providing information in new sustainable products and services. It provides access to best-practice, that are grouped in an inter-institutional database and offers presentations to EU staff on the greening purchases of goods and services.

Three GPP Helpdesk conferences have attracted a total of about 100 participants:

- on 26 February 2018 on eco-friendly ICT equipment;
- on 18 June 2018 on Food and catering; and
- on 15 October 2018 on Circular Economy in practice: waste management.

In addition, articles were published on the electronic newsletter of the RUF Network[44]:

In 2019, the Commission will continue to use the GPP Helpdesk and organise local staff awareness workshops at the main EC-sites.

42 Tougher targets were introduced as a result in the Global Annual Action Plan (GAAP) of 2019.
43 http://ec.europa.eu/environment/emas/pdf/other/EC_Guide_Sustainable_Meetings_and_Events.pdf
44 Network of Commission's Financial Officers and Procurers, managed by DG Budget (BUDG)

c) Other corporate communication

In addition, HR.D2:

- Published five articles in the Commission's on-line news portal "Commission en Direct";
- Made several announcements on the Commission's intranet and electronic noticeboards (flat-screens);
- Revised the overall structure and further improved the internal EMAS webpages; and
- Hosted an EMAS stand during the information day for EC Newcomers and their families at Berlaymont Piazza on 14th March that was attended by more than 600 people.

d) Communication actions initiated by the EMAS Correspondents

EMAS Correspondents organised local environmental actions in the following DGs: Agriculture (AGRI), Budget (BUDG), Climate Action (CLIMA), Communication (COMM), Competition (COMP), International Cooperation and Development (DEVCO), Translation (DGT), Energy (ENER), Mobility and Transport (MOVE), Internal Market, Industry, Entrepreneurship and SMEs (GROW), Maritime Affairs and Fisheries (MARE), Research and Innovation (RTD), and Interpretation (SCIC).

EMAS Correspondents also organised actions in the European Personnel Selection Office (EPSO), the Legal Service (SJ) and Secretariat General (SG).

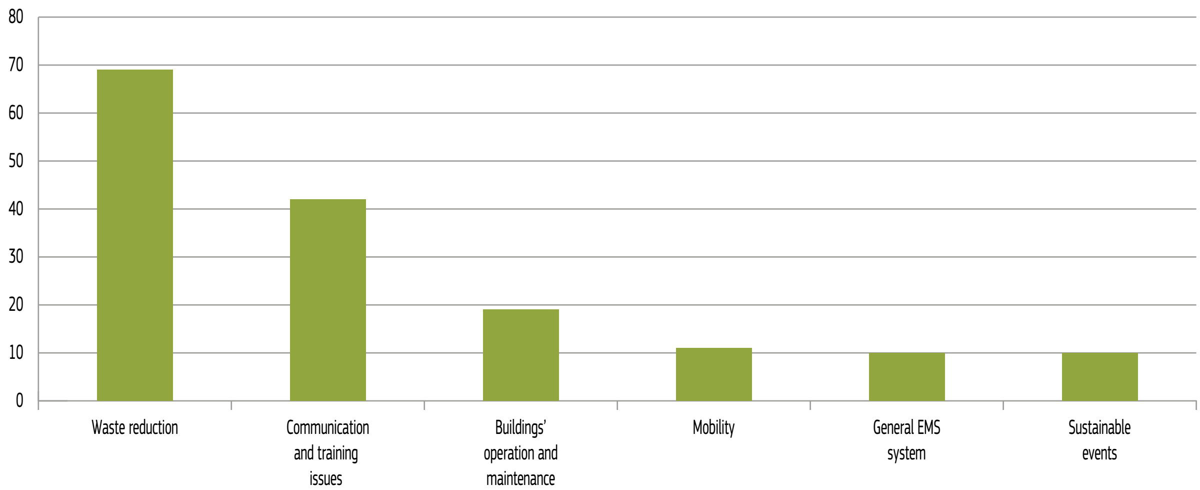
In 2019, the Commission will focus its priorities on the promotion of the actions on the gradual suppression of single-use items in EC-premises.

2.11.3 Dialogue with internal stakeholders

The Commission has a corporate register of internal questions and suggestions submitted via the EMAS in EC functional mail-box and other staff fora. 185 entries were recorded in 2018 (compared to 188 entries in 2017 and an average of 40-60 entries during the last years), all of which received responses.

The significant increase since 2016 is due in large part to greater staff interest in current initiatives on reducing single-use plastics and suggestion on improvements to the catering contracts. The distribution by category is shown below:

Figure 2.26 The main topics of interest of internal stakeholders' enquiries/suggestions in 2018.



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 June 2017. Due to internal reorganisation and budgetary constraints, the analysis of results were available in 2018. The response rate of 31,5 % (+12% more than 2015) was significantly higher than average internal EC staff surveys, demonstrated the increased interested of EC-staff's on environmental matters.

The most important results may be summarised as follows:

- 81% of staff feel (reasonably) well informed about actions they can take, a percentage that has been rather stable since 2011, while somewhat there is higher awareness in JRC sites.
- 97% take actions to reduce the environmental impact of their behaviour at work.
- 20% increase in staff numbers that take regular action.
- Among the staff who take no action, 57% do not know what additional actions they can take.
- There were 733 suggestions - the majority concerning buildings' operation and maintenance, waste management, mobility and EMAS communication and training.

Overall, the survey found a significant increase in the number of staff who take environmental actions regularly, although staff awareness of what additional actions are possible continues to decrease slightly. Actions to reduce environmental impact are increasingly considered 'regular', and not always associated with EMAS. (Thus it is important to maintain communication activities and outreach). Lastly the survey suggests that more attention can be paid to inform what the EC itself does to reduce environmental impacts, and how staff can further contribute to this (preferably through online tools).

In 2019, we will conduct an EMAS Staff Survey across EMAS sites to observe the overall trends on environmental awareness and behaviour and adjust the communication campaigns accordingly.

2.11.4 Communication among EMAS Correspondents and Site Coordinators

As shown in the table below the annual surveys have recently demonstrated an improvement following declines in performance over the past years. Overall, 21 out of 39 EMAS teams (EMAS Correspondents (ECORs) and EMAS Site Coordinators in the same service) demonstrated a performance above or equal to average (in relation to 15 in 2017). This is mainly because there are more volunteer groups (currently active in 9 services), resulting in the organisation of multiple local environmental events and actions in 18 services.

Table 2.18 Evolution of average scores for EMAS Correspondents

Survey year[45]	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Average ECOR score	5.3	5.5	4.4	4.3	3.6	4.6

In 2018, there were 4 services without an assigned ECOR[46]. HR.D.2 planned several steps to strengthen the ECOR role. These included: (i) a note to management encouraging ECORs to be identified on a voluntary basis through internal calls of interest, (ii) providing additional hands-on training and practical toolboxes, and (iii) creating a corporate group of environmental volunteers across the Commission to support the ECORs in the framework of the *sustainable@work* campaign, and promoting additional synergies among ECORs.

In 2019, HR.D2 will work to improve the EMAS network's efficiency via synergies with the local Logistics Proximity teams[47], the Account Management Centres (AMCs)[48], as well as local groups of environmental volunteers and eco-teams.

2.11.5 Training

Corporate level EMAS training organised during 2018 included:

a) 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.

45 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.

46 In early 2019, the situation has already been greatly improved with only two services without an EMAS Correspondent.

47 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).

48 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.

During 2018, there were total 8 sessions with 269 participants (4 sessions with 219 participants in Brussels and 4 sessions with 49 participants in Luxembourg), in relation to 302 in 2017. The sessions received very positive feedback and participants regularly make useful environmental suggestions.

In addition, a 10-15 minute presentation is included in the introductory program for Commission newcomers in the JRC-sites and Grange[49] and in some other DGs/services e.g. DG Energy (ENER) and DG Mobility and Transport (MOVE) and Eurostat (ESTAT).

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 2019 there will be more frequent *"EMAS basics"* sessions, aiming to attract at least 500 participants. It will also be promoted as a refresher to all staff.

b) EMS Training

There have been two sessions for ECORs, i) on 20th February 2018 (12 participants), attended also via videoconference by the new members of the EMAS team in OIL coordination team and, ii) on 2nd October 2018 (9 participants).

Following the suggestion of the EMAS Site Coordinators, there have were two EMAS Site Coordinators' workshops during 2018, i) on 8-9/March in Grange-Ireland focussing on EMS improvements and ii) on 12-13 November in Brussels focussing mainly on EMAS communication.

These gatherings of EMAS site coordinators from all the sites are essential to ensure mutual learning and to harmonise local EMAS implementation. A novelty in 2018 was the trial of real-time voting to acquire feed-back on the design and implementation of the future campaigns and long-term priorities/objectives.

In 2019, HR.D2 will also host two EMAS site coordinators' workshops.

c) 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. HR.D2 does not organise these training sessions.

HR.D2, 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 2018, the majority of the EMAS Site Coordinators updated this register.

2.12 External communication

2.12.1 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 [50].

Additional "EMAS in EC" webpages have been created at:

- The homepage of DG HR on Europa under: "About us" / "Services, standards and principles" / "Environmental impact" at: http://ec.europa.eu/civil_service/admin/green/index_en.htm;
- The homepage of DG ENV on Europa: http://ec.europa.eu/dgs/environment/index_en.htm

49 The periodicity of the newcomers' presentations depends on the number of new colleagues. Information relevant to JRC and Grange newcomers' trainings are provided in the relevant annexes.

50 http://ec.europa.eu/environment/emas/emas_registrations/emas_in_the_european_institutions_en.htm)

In 2018, the "EMAS in EU Institutions" section at the official EMAS website was updated to include overall environmental results, best-practice and success stories by the 11 EMAS-registered EU Institutions and bodies[51], as part of an interinstitutional communication project in the framework of the Interinstitutional Group on Environmental Management (GIME), see also in paragraph 2.12.4. The newly created EMAS in EU Institutions webpage on Europa received approx. 2 500 hits during 2018.

2.12.2 Press announcements

The new Guidelines on organising sustainable EC events[52], as well as the highlights of the Commission's environmental performance[53] were promoted on the news section and the EMAS in EU Institutions section of the official EMAS website on Europa managed by DG ENV.

2.12.3 Parliamentary questions

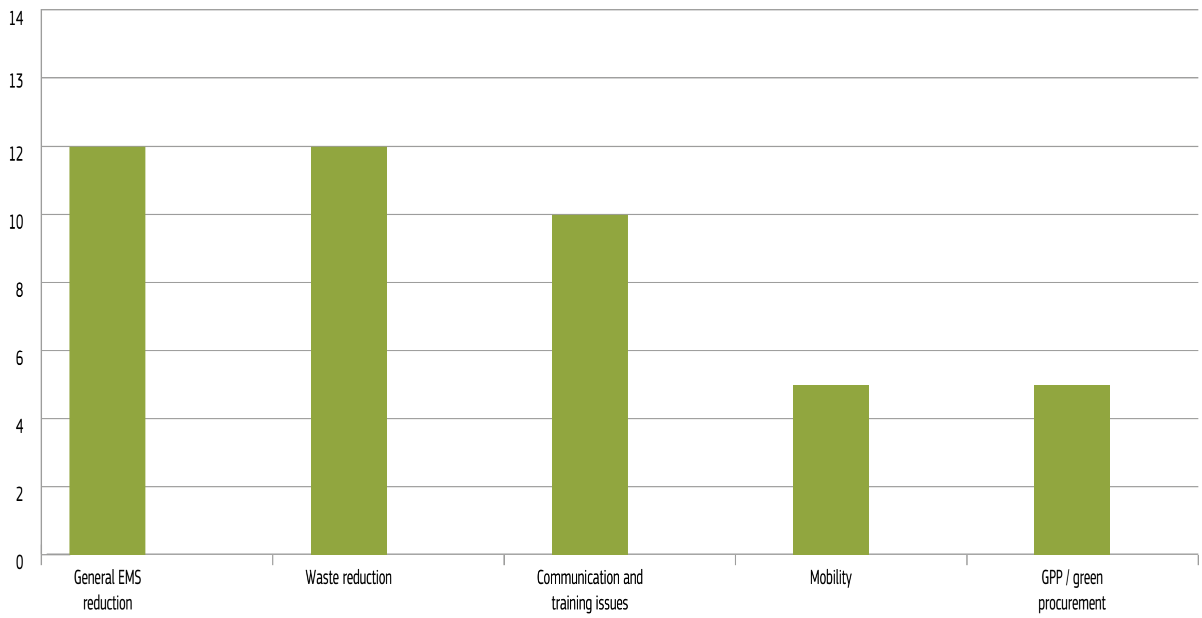
The EMAS Coordination Team responded to one parliamentary question in 2018. The question addressed the issue of food waste by the Commission.

2.12.4 Communication with external stakeholders

HR.D2 responded to all 45 external queries recorded during 2018 (compared with 30 in 2017 and 8 in 2016), largely as a result of the Commission's leading role among other EU Institutions and bodies as Chair of the *Group Interinstitutionnel de Management Environnemental* (GIME).

Inter-institutional collaboration involves EU or international organisations most notably 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.

Figure 2.27 The main topics of interest of external stakeholders' inquiries/suggestions in 2018



[51] In December 2018, the European Investment Bank Group completed a successful EMAS verification exercise, adding the number of EMAS-registered EU Institutions and bodies to 12.

[52] http://ec.europa.eu/environment/emas/emas_for_you/news/news84_en.htm

[53] http://ec.europa.eu/environment/emas/emas_for_you/news/news76_en.htm

The main topics of interest for external stakeholders have been the operational procedures and documentation, waste reduction practises (particularly with regard to suppression of single-use items) and communication/training related to specific Commission actions.

The 26th edition of the EU Institutions' Open Day on 5th May 2018 in the Berlaymont presented the main EU policies, and highlighted the European Year for cultural Heritage 2018. The 'EMAS in the EC' was one of the 27 stands providing visitors with an interactive experience, highlighting the Commission's impressive environmental results. Outdoor activities on the Esplanade included a full musical, dance and show programme, together with circus performers ready to entertain all of the 10 000 visitors.

During 2018 the following initiatives were organised within the framework of the GIME:

a) *as part of the global Earth Hour movement, a common announcement on 24th of March by 34 EU Institutions and bodies (up from 23 in 2017).*

b) *meetings of the GIME network on 28 June and 30 November of the GIME Network led to the following outcomes:*

    - the Commission presented updated results of two surveys of the EU institutions and bodies on (a) the current state of environmental management systems' (EMS) implementation and (b) the current state of GHG emissions' calculation and compensation;
    - shared feed-back of the first inter institutional VéloMai event;
    - shared best practices concerning
        - concerning catering services and suppression of single use items;
        - EMAS Regulation requirements (Environmental Review and Significant aspects' methodology, legal compliance, stakeholders' needs and expectations); and
        - shared best practices concerning setting GHG emissions' compensation goals and reporting relevant to compliance with UN's Sustainable Development Goals (SDGs).

c) *HR.D2 made a presentation at the Inter-agency Greening Network meeting during 8-9 October in Florence on the latest update of the GIME surveys on EMS implementation and GHG emissions' calculation and compensation among EU Institutions and bodies.*

In 2019, 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).

2.12.5 Information for suppliers and sub-contractors

The Register on EMAS information sessions for EC suppliers and sub-contractors has been considered obsolete and suppressed, 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 2019, the Commission will continue to promoting and supporting the interinstitutional Green Public Procurement Helpdesk coordinated by the European Parliament.

2.13 EMAS costs and savings

The Commission has reported on the estimated costs of implementing EMAS and savings that can be associated with reduced resource consumption since 2012. The availability of data varies from site to site and by year.

2.13.1 Costs of staff and contracts for implementing EMAS

Table 2.19 summarises the estimated direct cost of human resources of Commission staff[54] along with those of consultancy, and other contracts directly linked with coordinating EMAS implementation.

[54] Using standard average cost of administrators published by DG BUDG for the Financial units, 138 000 EUR in 2017.

Table 2.19 Direct cost of implementing EMAS (total and per person (EUR)) for each site

Site	2014	2015	2016	2017	2018	Change in 2017-8	Per person costs in:					Change in 2017-8
							2014	2015	2016	2017	2018	
HR.D2+ECOR network[1]	1 007 252	1 021 252	1 021 252	1 049 252	1 036 000	– 13 252	30.7	30.8	30.8	31.3	29.8	-1.6
Brussels	132 000	134 000	134 000	138 000	148 000	10 000	4.82	4.95	4.94	5.05	5.21	0.2
Luxembourg	462 000	469 000	469 000	483 000	370 000	– 113 000	114	100.5	100.8	100.9	73.8	-27.2
JRC Petten	66 000	67 000	67 000	69 000	74 000	5 000	234	241	243	262	298	36.0
JRC Geel	66 000	67 000	67 000	69 000	74 000	5 000	191	204	226	260	286	25.3
JRC Karlsruhe[1]	71 000	72 000	72 000	74 000	79 000	5 000	222	224	222	230	249	19.4
JRC Sevilla	132 000	134 000	134 000	138 000	148 000	10 000	457	473	447	429	433	4.2
JRC Ispra[1]	383 760	368 168	446 200	486 945	491 928	4 983	164	160	198	214	215	1.4
Grange[1]	47 400	47 900	48 356	49 356	51 856	2 500	265	266	255	263	290	27.2
Commission	**2 367 411**	**2 380 319**	**2 458 808**	**2 556 553**	**2 472 784**	**– 83 769**	**67.3**	**67.2**	**69.4**	**71.5**	**66.7**	**-4.8**
of which % contracts	10.2	9.4	12.3	13.1	9.6							

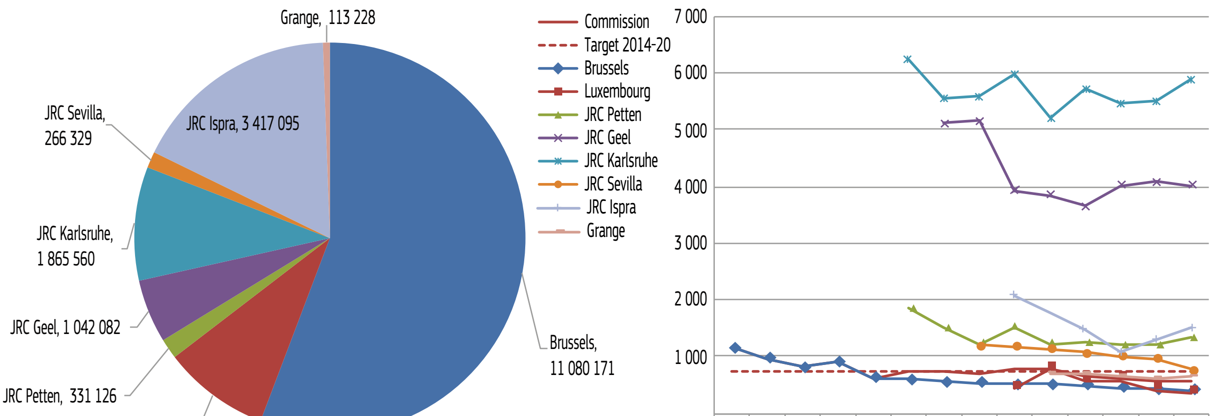
Note: Includes all staff at Luxembourg and Brussels sites, based on sites participating in verification
1 - Cost include contracts

Per capita costs of implementing the management system reduced slightly to 67 EUR. The teams supporting the EMAS system have remained relatively stable. Contract costs typically represent just over 10% of the total although in 2017 this increased slightly owing to additional contractor costs at Ispra.

2.13.2 Savings from reduced energy consumption in buildings

Reducing buildings' energy consumption provides far greater financial savings than other reductions in resource use. Figure 2.28 shows energy costs in 2018 along with the evolution of per capita expenditure.

Figure 2.28 Building energy costs in 2018 (EUR) and evolution of per capita costs (EUR/p)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commission	1 168	961	815	924	611	722	733	684	771	788	664	602	561	547
Target 2014-20	752	752	752	752	752	752	752	752	752	752	752	752	752	752
Brussels	1 168	961	815	924	611	600	557	530	521	519	500	455	419	400
Luxembourg									434	765	549	578	404	349
JRC Petten						1 858	1 510	1 221	1 520	1 225	1 237	1 199	1 208	1 335
JRC Geel							5 122	5 171	3 930	3 857	3 656	4 027	4 091	4 023
JRC Karlsruhe						6 263	5 572	5 583	5 981	5 210	5 711	5 461	5 528	5 885
JRC Sevilla								1 211	1 177	1 142	1 062	1 014	956	779
JRC Ispra									2 093	1 775	1 474	1 079	1 294	1 495
Grange										709	690	639	619	633

Per capita costs vary widely with Brussels and Luxembourg both below 500 EUR/p in 2017 and 2018 and on a downwards trend. JRC sites with their more energy intensive experimental and/or nuclear activities have far higher costs - JRCs Geel and Karlsruhe over 5.0 and 5.9 k EUR/p respectively. Luxembourg's costs nearly doubled in 2014 because two data centres were included in EMAS reporting but have since fallen because the site now reports operational data for the whole site. The Commission has met its target 2014-20 target for reducing costs.

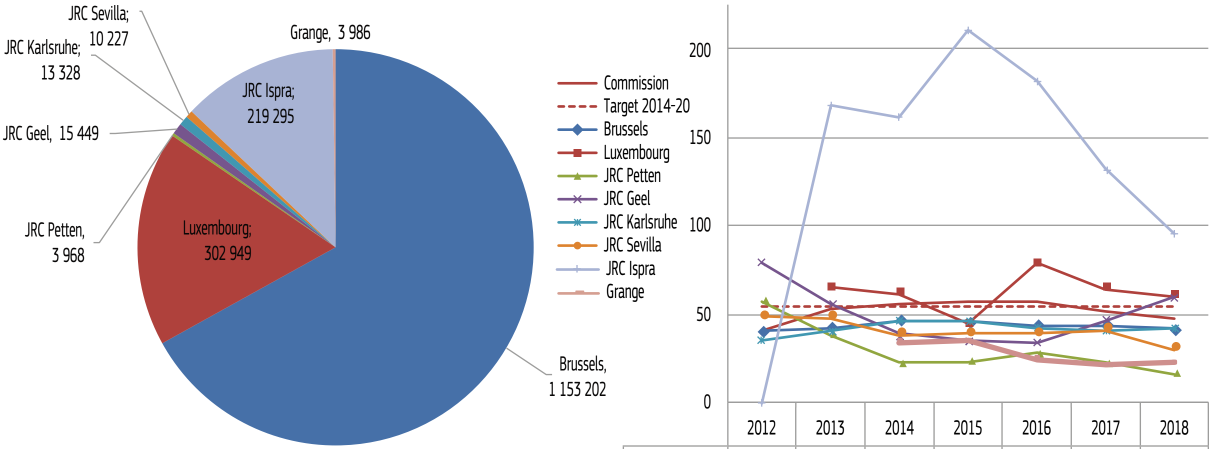
Brussels has reduced its per capita energy costs by nearly two thirds since its first EMAS registration in 2005. Annex A presents a simple[55] estimation of the resulting cumulative savings since 2005. Total expenditure in 2005 would have been nearly 25 Million EUR[56], which has reduced to 11,4 Million EUR in 2018 with cumulative savings over this period of 121 Million EUR[57].

Luxembourg has recorded the greatest proportional per capita savings (36 %) since 2015, due in large part to vacating the PMO building.

2.13.3 Water use costs

Per capita water use data (Figure 2.29) indicate broadly similar costs across the EMAS sites, other than Ispra, of 20 and 50 EUR. Overall Commission per capita costs decreased for the second consecutive year, to 47 EUR. The Commission target for 2014-20 has been met.

Figure 2.29 Water use costs in 2018 (EUR), and evolution of per capita costs (EUR/p)



	2012	2013	2014	2015	2016	2017	2018
Commission	41.1	52.5	55.7	56.6	57.2	52.2	47.4
Target 2014-20	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Brussels	40	42	47	46	44	44	42
Luxembourg		65	62	45	79	65	60
JRC Petten	57	39	22	23	28	22	16
JRC Geel	80	56	39	36	33	47	60
JRC Karlsruhe	35	40	46	46	42	41	42
JRC Sevilla	49	48	38	39	39	41	30
JRC Ispra	0	169	162	211	183	132	96
Grange			34	35	24	21	22

Ispra's per capita costs are higher than the other sites but it faces the additional expense of maintaining infrastructure including pumping and filter stations, and a wastewater treatment plant. Its costs therefore include routine and unscheduled maintenance of these structures. The per capita consumption however is also far higher than elsewhere, owing to the water requirements of the cooling circuits. It also has extensive cooling networks related to the technical facilities, a fire station and mains. Brussels, Luxembourg, and JRCs Sevilla and Ispra all reduced per capita costs in 2018, with the latter both achieving a 27% reduction.

2.13.4 Savings from reduced office paper consumption

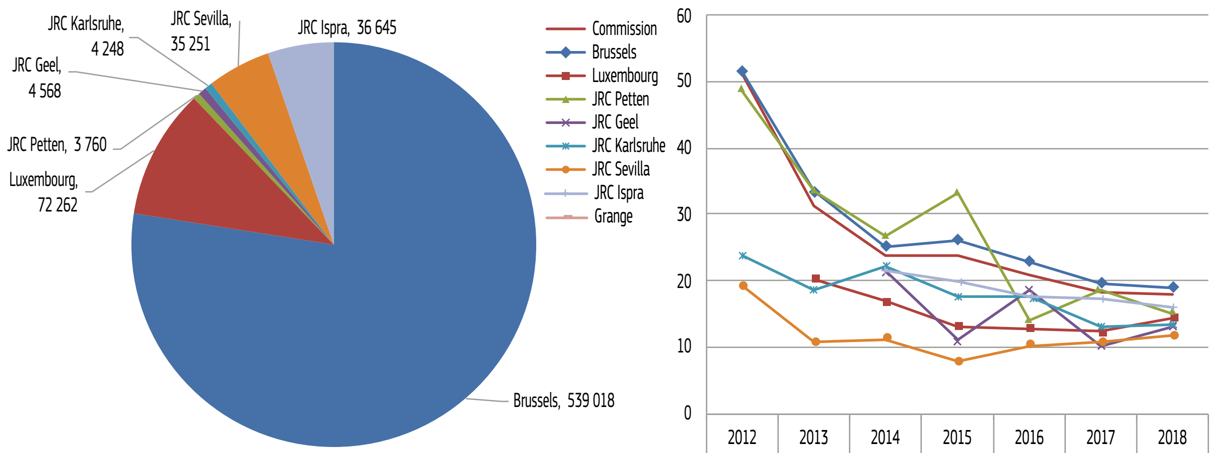
Figure 2.30 shows that Brussels accounts for over 75% of paper use, with other sites' with Luxembourg and JRC Seville contributing over 5% of the total spend (679 756 EUR).

[55] Unadjusted costs, not taking into account inflation etc

[56] Assuming that in 2005 per capita consumption within the EMAS perimeter was similar to that outside the EMAS perimeter.

[57] Not adjusted for inflation, actual savings in real terms would be less

Figure 2.30 Office paper cost in 2018 (EUR), and evolution of per capita costs (EUR/p)



	2012	2013	2014	2015	2016	2017	2018
Commission	51.0	31.4	23.8	23.7	21.0	18.3	18.0
Brussels	52	33	25	26	23	20	19
Luxembourg		20	17	13	13	12	14
JRC Petten	49	33	27	33	14	18	15
JRC Geel			21	11	19	10	13
JRC Karlsruhe	24	19	22	18	17	13	13
JRC Sevilla	19	11	11	8	10	11	12
JRC Ispra			21	20	18	17	16
Grange							

The trend at most sites is towards reduced per capita paper consumption costs, reflected by a sharp decline in overall Commission per capita cost which in 2018 was just over one third its value in 2012.

2.13.5 Reducing costs of waste disposal

Some sites have reported waste disposal costs in recent years as shown in Table 2.20.

Table 2.20 Non-hazardous and hazardous waste costs, 2014-18 (EUR/person)

Site	Non-hazardous waste					Hazardous waste				
	2014	**2015**	**2016**	**2017**	**2018**	**2014**	**2015**	**2016**	**2017**	**2018**
Brussels	36.19	34.02	35.33	33.29	30.45	4.32	3.80	6.61	11.02	12.65
Luxembourg	35.07	66.23	75.86	57.49	52.55	4.58	4.01	10.29	1.51	2.13
JRC Petten	9.43	9.00	10.50	12.28	10.31	2.55	4.12	4.12	4.12	4.12
JRC Geel							1.00	2.00	3.00	4.00
JRC Karlsruhe										
JRC Sevilla			13.75	12.81	12.06	0.00	0.00	0.05	0.02	0.05
JRC Ispra	114.63	134.83	132.64	148.61	119.07	36.40	32.87	62.26	65.63	64.57
Grange										
Commission	**41.71**	**45.64**	**48.05**	**45.10**	**40.26**	**6.64**	**14.22**	**17.47**	**13.54**	**14.57**

JRC Seville hazardous waste includes medical waste only

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.

Hazardous waste costs were sharply up in 2015. These costs can fluctuate significantly from year to year as some stockpiling occurs with specialist disposal organised relatively infrequently.

2.14 Benchmarking with the European Parliament and European Council

It is difficult to directly compare results in one category between institutions, particularly energy consumption, because the basis of the calculations can be quite different. For example the European Parliament takes into account visitors. However more informative are the broad trends in performance which are demonstrated in Table 2.21.

Table 2.21 Benchmarking[(1)] the Commission[(2)] against other institutions (% change since 2013)

	European Parliament				SG of Council of EU				Commission (Brussels)			
	2014	2015	2016	2017	2014	2015	2016	2017	2014	2015	2016	2017
Buildings energy consumption [(3)]	– 6.3	– 9.0	– 12.1	– 11.3	– 2.6	– 3.2	– 6.7	– 6.2	– 4.3	2.8	– 0.6	– 3.4
Paper consumption	– 18.4	– 40.9	– 35.6	– 41.4	– 10.6	– 38.3	– 21.3	– 40.4	– 24.8	– 25.6	– 36.3	– 46.5
Water use [(4)]	– 2.2	– 2.8	– 6.6	– 14.9	– 12.6	– 10.4	– 16.2	– 16.0	7.7	6.3	0.9	0.0
Waste generation [(5)]	– 14.0	– 15.4	– 15.5	– 3.5	– 6.8	– 12.2	– 16.5	– 15.2	5.8	– 0.5	3.3	– 2.7

Notes: (1) - Based on information from Environmental Statements reporting for 2018 (results up to 2017)
(2) - Based on EC annual per capita consumption of energy, paper, water and non-hazardous waste generation
(3) - EP and Council report primary energy, EC reports metered energy
(4) - Council reports litres/person/day, rather than m^3/p
(5) - EP reports for office and kitchen waste, EC for per capita non-hazardous waste

Broadly, there has been improvement in parameters in at the European Parliament, the Council and the Commission in Brussels, although reducing per capita water consumption and waste generation has proved more difficult for the latter.

2.15 Constants and conversion factors used in reporting for 2018

We have tried to ensure that the EMAS sites use, where possible, the same constants and conversion factors, and these are described in each site annex. Table 2.22 shows proposed (default) factors for 2018 and sources.

Table 2.22 Summary of main factors used in 2018 reporting

No	Factor/constant (description)	Factor/constant (value)	Comment
1	Working days in a year	211	Supplied by DG.HR.A3 and used since 2014 in calculations including emissions from staff commuting and paper consumption (sheets/person/day) – Email El Bourrai –Rourke on 13/03/2014
2	Yearly cost of one FTE staff	148 000 EUR	The average value for administrator staff according to the last communication of the RUF (Reseau d'unité financières) before the reporting year in question, provided by DG BUDG
3 [(a)]	Energy in kWh produced by burning 1 litre of different fuels	Petrol 9,4; diesel 11,1; gasoil 11,4; fuel oil 12,2	Average figures based on gross calorific value reported in A Beginner's Guide to Energy, Neil Packer, 2011.
4 [(a)]	Kg CO_2e from 1 kWh natural gas PCI	0,24	Total value including 0,039 (upstream) and 0,205 (combustion), Europe average from ADEME, Base Carbone 2017
5 [(a)]	Kg CO_2e from 1 kWh gas oil	0,33	Total value including 0,058 (upstream) and 0,266 (combustion), Europe average from ADEME, Base Carbone 2017
6 [(a)]	Kg CO_2e from 1 litre diesel (vehicle fleet)	3,16	Total value including 0,658 (upstream) and 2,5 (combustion), France value from ADEME, Base Carbone 2017
7 [(a)]	Kg CO_2e from 1 litre petrol (vehicle fleet)	2,81	Total value including 0,528 (upstream) and 2,28 (combustion), France value ADEME, Base Carbone 2017
8 [(a)]	GWP as kgCO_2e/kg for Kyoto protocol gases	R410A (1920), R134A (1300), R404A (3940), R407C (1620), R507A (2450), R422D (2470), R23 (12400) R427A (2020), R508B (13396), SF_6 (23500), R227A (2640)	IPCC 5th Assessment Report (2014, from p 731 on) https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf, As referenced by ADEME, Base Carbon 2017 (100 year GWP values)
9 [(a)]	GWP as kgCO_2e/kg for Non Kyoto protocol gases	R22 (1760), NAF SIII (1497)	100 year GWP from Commercial sources or calculated.

No	Factor/constant (description)	Factor/constant (value)	Comment
10[(b)]	Factors for estimating emissions associated with fixed assets	Multiple factors for buildings construction	**Factors in kgCO_2/m^2 for the following construction types:** i) Not specified - offices ii) Steel - industrial building iii) Steel - parking underground iv) Steel - restaurants v) Concrete - industrial buildings vi) Concrete - parking underground vii) Construction type concrete - restaurants Initial recommended design life 25 years (c)
11[(b)]	Factors for estimating emissions associated with fixed assets	Multiple factors for production of IT items	**Factors in kgCO_2/unit for the following items:** i) PC desktop; ii) CRT screen; iii) Flat screen; iv) Laptop; v) Individual printers; vi) Network printers & copiers, vii) Fax machines; viii) Scanners; ix) Telephones (simple); x) Telephones (smartphone and Iphones); xi) Telephones (fixe); xii), Servers, switches, routers; xiii) Projectors; xiv) Videoconference installations; xv) Televisions; xvi) Other small IT devices Initial recommended design life 4 years (c)
11[(b)]	Factors for estimating emissions from goods and services contracts	Service contracts and food 13 categories of which 7 relate to catering	**Factors (and units) for the following categories:** Security contract (FTE); ii) Cleaning contract (FTE); iii) Other service contracts - consultants (kEUR); iv) Other service contracts - translators (kEUR); v) Other service contracts - (kEUR); vi) Purchased paper, used or new (tonnes); vii) Catering - beef (tonnes); viii) Catering - pork (tonnes); ix) Catering - fish (tonnes); x) Catering - chicken (tonnes); xi) Catering - milk (tonnes); xii) Catering - Other dairy products (average yoghurt and butter) (tonnes); xiii) Catering – coffee (tonnes)
11[(b)]	Factors for estimating emissions from own waste disposal	Eleven possible categories	**Categories for the following factors (in tonnes)** i) Incinerated waste – domestic waste; ii) incinerated waste - food; iii) methanisation - food; iv) Recycled/reused - paper; v) Recycled/reused - cardboard; vi) Recycled/reused – wood; vii) Recycled/reused - glass; viii) Recycled/reused - plastic PMC; ix) Recycled/reused - others;x) Hazardous waste - all types; xi) Landfill (probably mostly projects)

Notes:
(a) Approach and default coefficients as recommended by Commission's Internal EMAS Auditor[58]
(b) Factors recommended by Commission's Internal Auditor, based on BASE CARBONE of ADEME (or through calculation)

[58] Internal Audit Report : Carbon Footprint of the European Commission (May 30, 2018), ARCADIS

3 Lessons learned and the way forward

This report summarises the Commission's overall performance using data from the eight largest Commission sites in Europe. It represents consolidation of an EMAS system that started with Brussels in 2005, incorporated Luxembourg in 2012, and then the five JRC sites and DG SANTE at Grange.

3.1 Conclusions

New developments in reporting for 2018

1. Having previously taken into account the requirements of the updated annexes I to III to the EMAS Regulation that were mandatory since September 2018, we have followed up on important aspects of this – establishing stakeholders' needs and expectations at corporate level. Two more notable actions arising from this were:
   - DG CLIMA's proposal to conduct a study to explore potential long-term targets for carbon emissions reduction (including the option of carbon neutrality),
   - High profile campaign and initiatives to reduce single use plastic, with 49 reported actions reported to the EMAS Steering Committee, as a follow up to the Commission pledge made at the Our Ocean Conference in Malta, 2017.
2. The EMAS audit cycle reverted to verification audits in the first semester (June) with internal audits in the second semester (October and November) enabling the results and performance to be communicated earlier.
3. Following expert advice, the carbon footprint evaluation was expanded to take into account scope 3 (indirect) emissions for:
   - upstream energy use,
   - delivering fixed assets (buildings and IT),
   - emissions from goods and services contracts, and
   - waste disposal.
4. To encourage Green Public Procurement (GPP), and following consultation with Commission services, the EMAS Coordination team published a guide on "greening" events.
5. As a complementary measure, we also provide a more detailed classification of efforts made to include GPP principles in their tenders. The approach was recommended by the European Court of Auditors, and should make it easier to measure improvements.
6. A mid-term evaluation of progress towards the Commission's 2014-20 performance targets for core indicators resulted in more ambitious ones being adopted by the Steering Committee in January 2019 for water use, paper consumption, non hazardous waste generation, and Commission vehicle fleet emissions.
7. The Commission worked with other EU Institutions and Bodies to organise the first Inter-institutional Velomai event.

Significant impacts and Commission performance for core parameters (2014-20)

8. The environmental factors that could give rise to significant environmental impact vary from site to site, but common to most sites are:
   - resource consumption (particularly energy for buildings, water consumption);
   - carbon dioxide (or equivalent) emissions from buildings energy consumption and mobility; and
   - waste management and disposal, especially at nuclear sites such as Karlsruhe and Ispra

9. The Commission's performance up to 2018 for core indicators in relation to its 2014-20 targets, was as follows:
   - **Ahead of target for:**
     - buildings' energy consumption (per capita),
     - water use (per capita),
     - non-hazardous waste generation (per capita),
     - renewable energy use in buildings (%),
     - CO2 emissions due to buildings energy consumption
   - **Close to, or on trend for:**
     - office paper consumption,
     - vehicle fleet emissions
   - **Below trend for:**
     - buildings energy consumption (per sq. m),
     - water use (per sq. m),
     - hazardous waste generation,
     - separated waste (%)
10. By far the largest contributors to the Commission's Carbon Footprint as evaluated using 2018 data, each accounting for over one tonne per person are emissions from:
    - Missions (air travel)
    - Energy use in buildings;
    - Fixed assets (buildings construction)

    Commission 2014-20 targets apply to emissions from energy use in buildings.

3.2 Going forward

Reporting for 2018 suggests the following courses of action in 2019 in order to continue to improve environmental performance, and to meet stakeholder expectations.

Improving the Carbon footprint calculation

11. The calculation for 2018 was expanded to include new categories, but the data requirements are extensive. Further review will be necessary to help build on this 'learning' experience. The information collected should however:
    - inform the study into long-term objectives for emissions reduction.
    - inform debate as to whether and how we develop further emissions reductions (targets in the medium term).

Expanding the Commission's EMAS registration

12. The Commission will seek to fully include Executive Agencies in Brussels and Luxembourg whose premises are managed by its services by in the first instance inviting the management and extending the ECOR network to those agencies;

Consolidating the EMAS system and fully incorporating new requirements

13. Owing to the more onerous data and reporting requirements, we will seek to develop IT tools to facilitate reporting that is currently based on spreadsheets.

14. The Commission will incorporate the new Annex IV (Reporting requirements) to the EMAS Regulation into its Corporate procedures.
15. Initiate discussions on likely longer term objectives, for example 2030 in line with the Sustainable Development Goals.

Communication

16. Explore how to enhance the EMAS Correspondents' network and to achieve greater participation in communication events.
17. Explore the potential for greater collaboration with the Inter-Institutional Environment Group (GIME).

GLOSSARY OF TERMS

ADEME	French Agency for Environment and Energy Management
CO	Carbon monoxide
CO_2	Carbon dioxide: A colourless, odourless, incombustible gas, formed during respiration, combustion and organic decomposition and used in food refrigeration, carbonated beverages, inert atmospheres, fire extinguishers, and aerosols
DG	Directorate-General and including:BUDG (Budget);CLIMA (Climate Action); DIGIT (IT); DGT (Translation); ENER (Energy)
EC	European Commission
ECF	Elementally chlorine-free
ECOR	EMAS correspondent in the DGs and departments
EC Site	A geographical settlement per country, under a common infrastructure management, it is different from the notion of site in the EMAS regulation
EMAS	Eco-Management and Audit Scheme
EMS	Environmental management system
EMS-SOP	Standard operational procedures relating to the management of environmental aspects at the European Commission Environmental management system
ENV	Environment
ESSOR	Essais Orgel
EU	European Union 28 Member States (in 2018)
GAAP	Global Annual Action Plan for EMAS
GELINA	Geel Electron Linear Accelerator
GIME	Inter-insitutional group on Environmental Management (GIME for French equivalent)
GPP	Green Public Procurement - Procuring works, goods or services such that the negative impact on the environment reduced beyond that which would be achieved under standard procurement procedures
GWP	Global Warming Potential - a number expressing the potential of a gas to contribute to global warming based on CO_2 having a value of 1
HCFC	Hydrochlorofluorocarbon
HDD (CDD)	Hot degree days, a measure of the temperature conditions in winter, describes the amount of time below a reference temperature and for which heating is therefore required. CDD applies to summer, and reflects the amount of time above the reference temperature when cooling may be necessary
HR	Human Resources and Security
HRCOORD	Team co-ordinating implementation of EMAS in the European Commission, located in DG.HR D.2
HVAC	Heating, ventilation and air conditioning
IBGE	Institut bruxellois pour la gestion de l'environnement (Brussels Institute for Environmental Management)
ICT	Information and communication technologies
ISO 14001	Internationally-agreed standard for environmental management
JRC	Joint Research Centre
KIT	Karlsruhe Institute of Technology
MOVE	Mobility and Transport
NO_x	Nitrous oxides, gases released to the atmosphere as a result of combustion of fossil fuels
OIB	Office for Infrastructure and Logistics in Brussels, Reports to DG HR
OIL	Office for Infrastructure and Logistics in Luxembourg, Reports to DG HR
OP (OPOCE)	Office for Official Publications of the European Communities
OXFAM	Development, relief and campaigning organisation that works to find solutions to poverty around the world

PC	Personal computer
PMC	Paper, metal and cartons (for drinks) = packaging
PM	Particulate matter, usually referring to particles released to the atmosphere as the result of combustion of fossil fuels, especially diesel
RFI	Radiative Forcing Index: A factor applied to CO_2 emissions to take into account their greater impact at higher atmospheric levels
R22	Hydrochlorofluorocarbon (HCFC-22), an ozone depleting gas used as a refrigerant. It has a smaller ozone-depleting potential than CFC-12. It is a temporary replacement for CFC-12 and its use in the EU will be banned in 2015
SMEs	Small and Medium Enterprises
SO_2	Sulphur dioxide, a gas produced by combustion of fossil fuels which can have harmful consequence for the environment by forming acid rain
STIB	Société des Transports Intercommunaux de Bruxelles (Intercommunal Transport Company in Brussels)
TCF	Totally chlorine-fee
VOC	Volatile Organic Compounds: Produced by combustion of fossil fuels but also through other chemical processes are air pollutants

European Commission

Environmental Statement 2019

2018 results

Annex A: Brussels

EMAS
Verified environmental management

Prepared by the EMAS Site Coordination Team for Brussels:
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Cover illustration: L-86/84 building new facade

Environmental Statement 2019

2018 results

Annex A: Brussels

For further information on environmental performance in Brussels please contact:
Functional mailbox: OIB RE3 EMAS; or visit
Or see EMAS page on My Intracomm (internal)

Foreword

The mission of OIB- ensuring that the Commission staff works in functional, safe and comfortable facilities, as well as providing quality support and well-being services, based on a client-oriented approach in an environmentally friendly and cost-effective way - remains the driver behind the actions aiming at reducing the environmental impact of its activities. The OIB, as manager of the Commission's headquarters in Brussels, plays a fundamental role in the implementation of the EMAS corporate policy.

This approach has allowed OIB to play a large part in improving improve the Commission's environmental performance in Brussels, as highlighted in this annex to the Environmental Statement in which the results in 2018 are illustrated, with strong achievements in reduction in energy, water and office paper consumption, CO_2 emissions, as well as further improvements in waste sorting.

Difficult challenges lie ahead, such as those presented by climate change, which will require strong actions to be taken and difficult decisions to be made, insofar real estate policy, energy saving investments and Commission staff behaviour are concerned.

In a future of environmental changes, OIB will continue to strive hard to cope with these new objectives through the implementation of the Commission policies aiming at the improvement of the environmental performance and the sustainability of the European Union as a whole.

Signed
Marc Mouligneau
Director
Office of Infrastructures in Brussels (OIB)

-

Contents

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 27 000 staff members, spread across over 1 000 000 m^2 of mostly office space.

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 2018 are shown in Table A1, along with performance trend, and targets where applicable for 2020.

Table A1: Historical data, performance and targets for core indicators for Commission level reporting

Physical indicators:	**Historic data values**					**Performance trend (%) since:**				**Target**	
(Number, desciption and unit)	2005 [1]	**2014**	2016	2017	2018	2005	2014	2016	2017	2020*	
										Δ % [2,3]	value [2, 3]
1a) Energy bldgs (MWh/p)	19.06	**6.99**	7.26	7.05	6.68	**– 65.0**	– 4.4	**– 8.0**	**– 5.3**	– 5.0	6.636
1a) Energy bldgs (KWh/m²)	373	**167**	179	175	177	**– 52.4**	**6.4**	– 0.8	1.2	– 5.0	158
1c) Non ren. energy use (bldgs) %		**41.0**	43.9	43.8	43.1		**5.1**	– 1.8	– 1.6	0.0	41.0
1d) Water (m³/p)	28.44	**12.57**	11.77	11.66	11.05	**– 61.2**	**– 12.1**	**– 6.1**	**– 5.3**	– 8.0	11.56
1d) Water (L/m²)	556	**300**	290	290	294	**– 47.2**	– 2.1	1.2	1.3	– 4.0	288
1e) Office paper (Tonnes/p)	0.081	**0.033**	0.028	0.023	0.022	**– 72.4**	**– 31.1**	**– 18.6**	– 3.2	– 35.0	0.021
1e) Office paper (Sheets/p/day)	77	**33**	28	24	23	**– 70.6**	**– 31.1**	**– 18.6**	– 3.2	– 35.0	21
2a) CO_2 buildings (Tonnes/p)	4.77	**0.72**	0.71	0.69	0.64	**– 86.6**	**– 10.9**	**– 10.3**	**– 7.1**	– 5.0	0.683
2b) CO_2 buildings (kg/m²)	93	**17**	18	17	17	**– 81.7**	– 0.8	– 3.3	– 0.7	– 5.0	16.3
2c) CO_2 vehicles (g/km, manu.)	249	**148**	129	118	116	**– 53.3**	**– 21.4**	**– 9.8**	– 1.4	– 25.0	111
2c) CO_2 vehicles (g/km, actual)		**213**	193	205	227		**6.6**	**17.6**	**10.7**	– 5.0	202
3a) Non haz. waste (Tonnes/p)	0.300	**0.222**	0.217	0.204	0.187	**– 37.7**	**– 15.9**	**– 13.8**	**– 8.5**	– 10.0	0.200
3b) Hazardous waste (Tonnes/p)	0.0020	**0.0055**	0.0085	0.0141	0.0162	**701.8**	**193.0**	**91.4**	**14.8**	– 2.0	0.0054
3c) Separated waste (%)	53.9	**59.2**	57.8	59.0	59.3	9.9	**0.1**	**2.4**	**0.5**	5.2	62.2
Economic indicators (Eur/p)											
Energy consumption (bldgs)	1 168	**519**	455	419	400	**– 65.7**	**– 22.8**	**– 12.1**	– 4.6	– 5.0	493
Water consumption		**46.7**	43.8	44.0	41.7		**– 10.9**	– 4.9	**– 5.3**	0.0	46.7
Non haz. waste disposal			35.3	33.3	30.5			**– 13.8**	**– 8.5**	– 2.0	35.5

Since EMAS registration in 2005 consumption for all parameters has reduced considerably. Per capita figures in 2018 show improved environmental performance since 2017 for every parameter except hazardous waste. Vehicles CO_2 emissions per km have also increased. Energy and water consumption and show slight increases (of 1.2%, 1.3% respectively) measured per square metre in relation to 2017, due to a reduction in floor space of 12 027 m² from vacating four buildings. CO_2 emissions in buildings follow the same trend, showing a 7.1% decrease measured per capita and 0.7% measured per m² when compared with 2017 figures. Non-hazardous waste production per capita decreased significantly by 8.5% compared to the previous year and the ratio of separated waste improved slightly by 0.5%. Hazardous waste production increased in 2018 although at a lower rate than the previous exercise (14.8%). Office paper consumption per person dropped an extra 3.2%.

Overall progress towards the targets set for 2020 is quite positive is most areas – these having already been met for water and office paper consumption and for non hazardous waste generation, while for vehicle fleet CO_2 emissions the target has almost been achieved as well. Buildings energy consumption and, as a consequence, associated CO_2 emissions, reflect relatively harsh weather conditions compared to 2014 (reference year), which was quite mild. The evolution of the EMAS system in Brussels is as shown below:

Table A2: EMAS baseline parameters

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Population: staff in EMAS perimeter	4 033	5 238	5 702	10 393	13 014	15 527	17 586	20 663	26 336	25 667	25 698	26 361	26 448	27 687
Population: total staff	21 203	22 635	23 760	24 936	24 937	25 750	26 305	28 681	26 499	27 392	27 089	27 143	27 325	28 410
No. buildings for EMAS registration	8	13	15	23	32	42	48	54	59	62	62	62	62	58
Total no. operational buildings									59	62	62	64	64	61
Useful surface area in EMAS perimeter, (m²)	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	1 069 482	1 063 935	1 042 037
Useful surface area for all buildings, (m²)									1 051 557	1 075 372	1 069 673	1 082 033	1 090 075	1 079 786

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. 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. Three buildings are not registered under EMAS in 2018: PALM, which will undergo major refurbishment, MERO and MO15, recently occupied by the Commission in Brussels. The buildings AN88, B100, HTWG and SC27/31 are no longer part of the EC buildings portfolio.

A2 Description of Brussels activities[1], context and key stakeholders

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. The distribution of buildings is shown on page A8. Table A14 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) around 29% of the electricity consumption and 24,4% of the gas consumption.

A2.2 Context – risks, and opportunities

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 south east of the city, in the "Beaulieu" area. A further few buildings are

[1] 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.

located outside the centre to the north and the south of Brussels including a sports centre at Overijse, a warehouse in Neder-over-Heembeek,three office buildings, printing and central mail facilities in the Commune of Evere and historical archives in Kortenberg.

External issues and circumstances affecting Brussel's environmental performance

These have been analysed using PESTLE [2] criteria, and both risks and opportunities identified, and reference to actions are presented below for the three most important points (the different criteria were validated after analysis performed in early 2019):

1. Economic – Budget variations influence possible investments to reduce resource consumption. Through more fine tuning for more effective actions there is an opportunity to increase energy savings.
2. 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.
3. Legal – There is a growing number of environmental regulations and regional legal framework to apply to the large portfolio of buildings in Brussels. The requirements may become more complex to comply with. A close collaboration with local authorities and regulatory bodies help improve the environmental performance whilst ensuring legal compliance.

Internal issues and circumstances affecting Brussel's environmental performance

These have been analysed using ASCPF[3] criteria, with consideration of both risks and opportunities, the two most important are as follows:

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 an wide scope of actions.
2. Culture & employees – OIB has a client oriented culture and the needs of its clients have to be addressed. Sometimes, political and operational realities are difficult to combine and there might also be a divergence beteween clients' needs and environmental priorities.

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

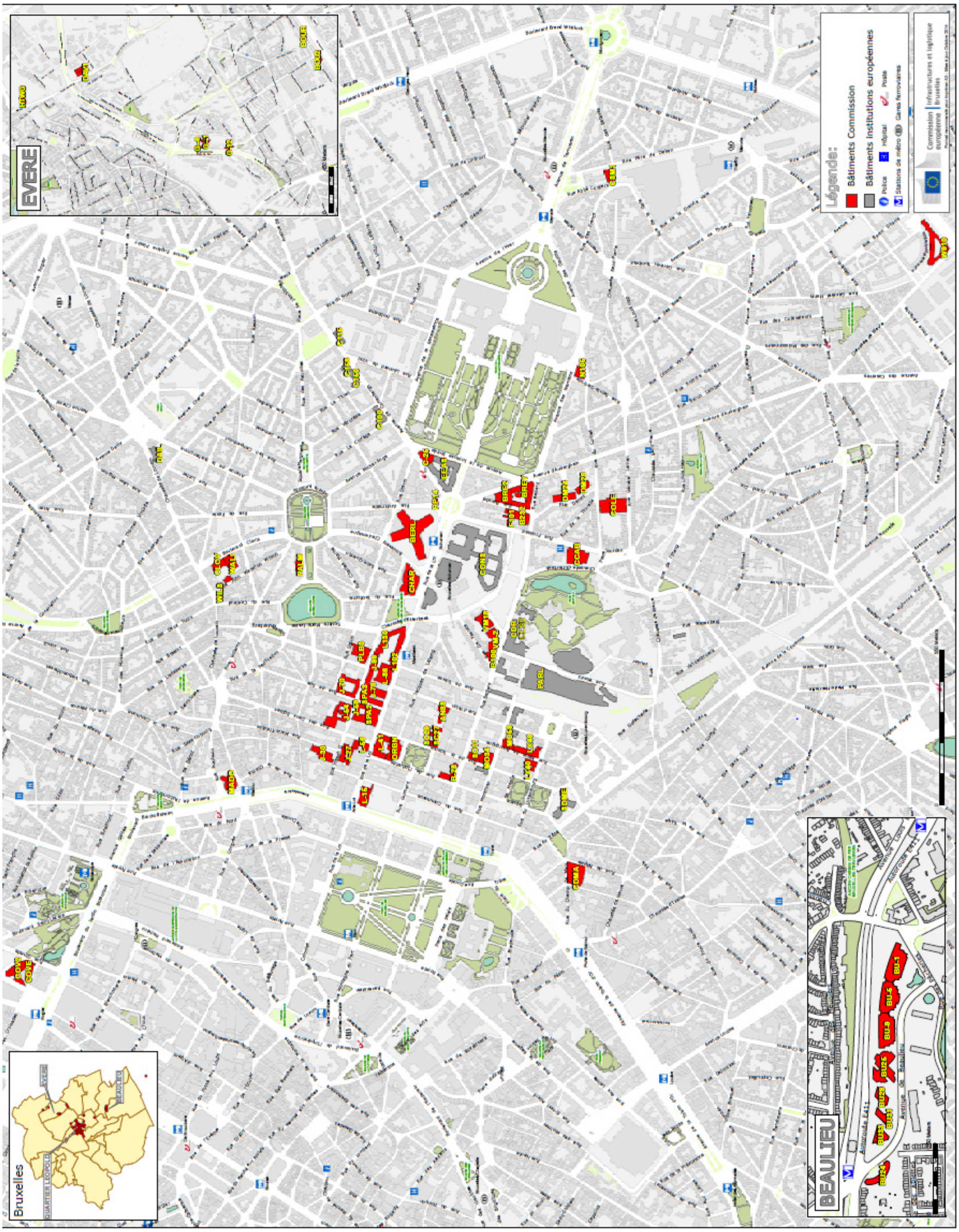
The table below summarises the main OIB stakeholders. Those have been grouped in "clusters" due to their large number, especially in terms of contractors and suppliers.

2 PESTLE criteria– Political, Economic, Social, Technological, Legal, Environmental

3 ASCPF criteria – Activities, Strategic direction, Culture and employees, Processes and systems, Financial

Table A.3: Summary of main stakeholders' requirements to be addressed in the management system as obligations

Stakeholder Group	Stakeholder 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 legal, political and budgetary constraints.
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.
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).


EVERE
BEAULIEU
Bruxelles
QUARTIER LEOPOLD
Légende:
Bâtiments Commission
Bâtiments Institutions européennes
Hôpital
Poste
Police
Stations de métro
Gares ferroviaires
Commission européenne
Infrastructures et logistique Bruxelles

A3 Environmental impact of Brussels activities

The Commission fully updated its assessment of environmental aspects for the Brussels site in 2018, the results of which are summarised in the table below. The next update is due in 2021, according to the three year EMAS cycle.

Table A4 – 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 VOC_s.	Resources depletion, air emissions, global warming, acid rain	Heating 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 VOC_s.	Resources depletion, air emissions, global warming, acid rain	Fleet use	T/year	Less performant vehicles increase fuel consumption, emissions and resources depletion	Green criteria 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	Ingredient origin and use	Ressources depletion, loss of biodiversity, land degradation	Procurement	Green criteria	Potential impact on price	Impulse for sustainable catering/canteens
4) Life cycle	Contruction/ Renovation	Resources depletion, air emissions, soil-water contamination, transport	Real Estate Planning	BREEAM	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/person	Less performant installations increase electrical consumption, emissions and resources depletion	Environmental performance improved by renewed installations and better regulation
	Electricity	Resources 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	m^3/y/person	Less performant installations increase electrical 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

Aspect group	Environmental Aspect	Environmental impact	Activity, Product or Service	Indicators	Risk	Opportunity
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	Complying with 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.

A4 More efficient use of natural resources

A4.1 Energy consumption

Buildings energy consumption data should be considered in the context of climatic conditions. Analysis of degree data suggests that climatic conditions were significantly warmer over the summer 2018 compared to previous years, and thus more cooling was necessary.

Table A5: Indicative climate conditions

Indicative climate conditions (1)	2012	2013	2014	2015	2016	2017	2018
Heating degree days, heating required	2 184	2 397	1 722	1 986	2 111	1 991	1 989
Cooling degree days, cooling required	325	360	345	365	409	415	584
Total degree days	2 509	2 757	2 067	2 351	2 520	2 406	2 573
kWh/person/degree day (2)	**3.08**	**2.65**	**3.38**	**3.19**	**2.88**	**2.93**	**2.59**

(1) www.degreedays.net; monthly data for EBBR station (15.5 C reference temperature)

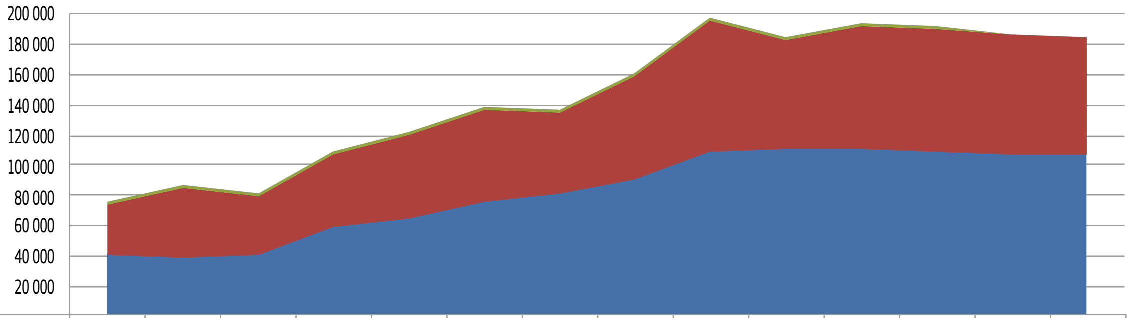
(2) using buildings energy consumption data for Brussels site

a) Buildings

Figure A1 shows the evolution of total annual energy consumption in the EMAS while Table A14 provides indicative data for individual buildings.. The total has increased over time until 2013, as more and more buildings were registered under EMAS each year. Since 2014 the EMAS registration includes almost all buildings. Electricity[4] represented 53% of the total in 2005, peaked at 62% in 2014 (a mild year) and was 57% in 2018, as the year before.

[4] Solar PV data is theoretical.

Figure A1 Annual buildings energy consumption (MWh) in the EMAS perimeter[5] (indicator 1a)

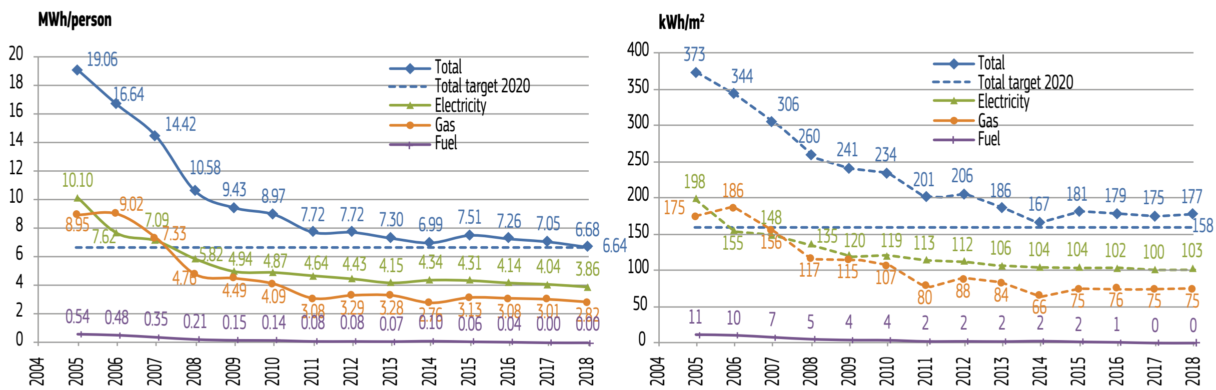


	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	76 856	87 169	82 220	109 920	122 669	139 218	135 761	159 499	192 242	179 291	192 909	191 317	186 418	184 863
solar PV								43.4	17.4	17.4	17.4	17.4	17.4	17.4
diesel	2 176	2 506	1 969	2 166	2 011	2 240	1 471	1 737	1 933	2 570	1 617	993	0	0
mains supplied gas	33 931	44 754	39 824	47 309	56 410	61 311	52 633	66 264	86 501	70 881	80 556	81 180	79 510	78 024
electricity	40 749	39 909	40 427	60 445	64 247	75 666	81 656	91 498	109 254	111 392	110 719	109 127	106 891	106 821

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

Per capita and consumption per square metre are presented in figures A2 and A3.

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



Total energy consumption for EMAS buildings (indicator 1a) fell by 65% and 52% per capita and per square metre respectively since the first EMAS registration in 2005. It decreased most rapidly between 2005 and 2009, with smaller and more gradual gains recorded since. The reduction in both indicators follows similar trends. Since heating uses gas (and not fuel oil) in all buildings, fuel consumption is insignificant in comparison to that of electricity and gas, as it is only used for emergency units, and not reported in this data. The overall gas consumption has decreased a further 1.9% even though the last building that was heated with fuel oil had seen its boilers changed to gas in 2016 (L-84/86, thus increasing the scope).

The electricity consumption however has remained constant, despite the consumption reduction efforts, due to the extremely hot months of July and August 2018 (shown in Degree-days A4 table above). This result contributed to a slight reduction in total energy consumption of 0.5%, translated in a 5.0% reduction measured per person and a 1.5% increase measured per square metre (difference due to the reduction of m² linked to vacating buildings AN88, B100 and SC27, corresponding to 10.289m²). The ocurrence of warmer temperatures in the summer, as witnessed in 2018, risks adversely impacting electricity consumption, but is necessary to guarantee a comfortable working environment for staff.

The Annual action plan includes 18 active measures prioritising the reduction of energy consumption, grouped and summarized here below:

- Energy efficiency plans, under the Energy Performance of Buildings (EPB) directive[6] as well as following recommendations from energy audits;

[5] Which has expanded steadily since first registration in 2005.
[6] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings.

- 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;
- Optimization of air flows;
- Launching of call for tender for energy meters; and
- Communicating with building owners on energy saving measures.

b) Vehicles

Table A6: Summary vehicle energy consumption

	2012	2013	2014	2015	2016	2017	2018
Total (MWh/yr)	2 535	2 468	2 292	2 313	2 322	2 177	2 170
MWh/person	0.123	0.094	0.089	0.090	0.088	0.082	0.078
kWh/km (per 1000 kms)				0.47	1.34	0.97	1.09
Diesel used (m^3)	219.4	215.4	201.0	203.9	197.8	177.6	144.1
Petrol used (m^3)	10.63	8.16	6.46	5.33	13.40	21.88	60.68

Total annual vehicle energy consumption illustrated above shows a decrease due to the lower number of kilometres made by the fleet (2 311 311 in 2018 compared to 2 508 253 in 2017).

c) Renewable energy use in buildings and vehicles

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

Table A7: Renewable and non-renewable energy use in buildings (MWh and percentage of total)

Contribuutions to renewable energy	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
i a) electricity contract 1 (% renewables)	60	100	100	100	100	100	100	100	100	100
electricity contract 1 (MWh renewable)	36 621	71 883	77 573	86 923	103 791	105 822	105 183	107 376	104 832	105 243
i b) electricity contract 2 (% renewables)	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
viii) (PV) (% renewable)	100	100	100	100	100	100	100	100	100	100
(MWH renewable)	0	0	0	43.4	17.4	17.4	17.4	17.4	17.4	17.4
Total renewables (MWh)	**36 621**	**71 883**	**77 573**	**86 967**	**103 809**	**105 840**	**105 200**	**107 393**	**104 849**	**105 260**
Total renewables (%)	**29.9**	**51.6**	**57.1**	**54.5**	**54.0**	**59.0**	**54.5**	**56.1**	**56.2**	**56.9**
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**	**79 784**
non ren. energy as part of total, (%)	**70.1**	**48.4**	**42.9**	**45.5**	**46.0**	**41.0**	**45.5**	**43.9**	**43.8**	**43.1**

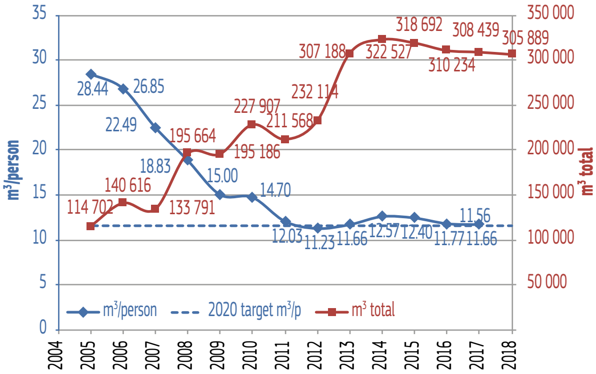
Note: Generation from PV is theoretical value

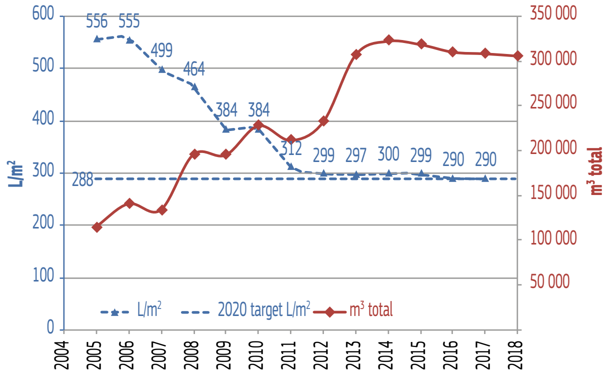
The overall share of renewable energy represented 56,7% of the total buildings energy consumption, and this was achieved by purchasing electricity from renewable sources since August 2009. No additional renewable energy sources were installed on site in 2018.

OIB introduced 10 electric cars in the service vehicle fleet in 2015, and three more were added in 2016 and 2017. In 2018 20 plug-in hybrid vehicles were added to the fleet, replacing mostly diesel engine cars. At the end of 2017, 122 electrical chargers were installed in 12 Commission buildings (B-28, BERL, BU25, CHAR, CSM1, F101, J-79, LX46, MADO, NOHE, ORBN and OVER), aiming at equipping 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).

A4.2 Water consumption

Figures A4 and 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 A4 and A5 show a considerable water consumption reduction since the initial EMAS registration in 2005, with the 2018 value representing only 39.3% and 52.2% 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.

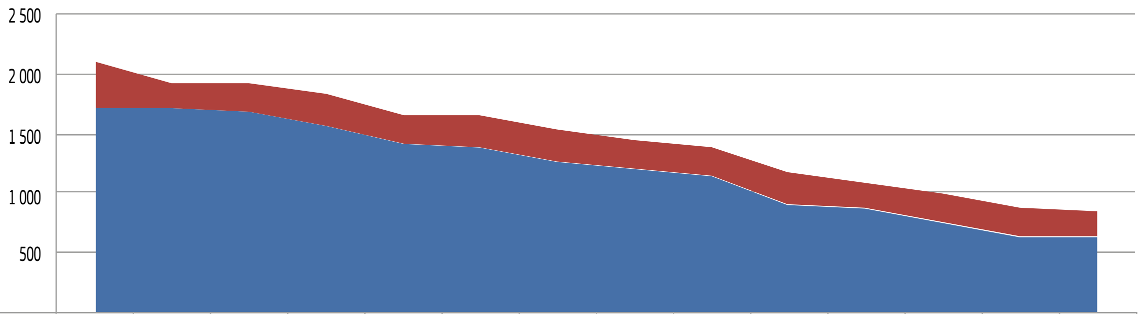
Water consumption has remained relatively stable since 2011. Consumption dropped in 2016 from its 2014 peak, due to water saving measures implemented in several buildings, such as the installation of tap aerators in most buildings, showing another significant reduction in 2018 5.3% measured per capita. When measured per square metre, figures show a slight 1.3% increase. Overall consumption has decreased slightly (-0.8%).

Other initiatives undertaken since 2015 include improved water management, installation of leak detection systems and loss prevention mechanisms. Installation of water saving devices in 10 priority buildings[7] has been also implemented 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.

A4.3 Office and offset paper

Total office and offset paper consumption at Brussels shows a long-term downward trend as shown below.

Figure A6: Evolution of total paper consumption at Brussels



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Office paper (A4 sheet equivalent) x1 Million	346	341	337	312	283	276	255	243	238	191	187	160	136	137
Total paper consumption (tonnes)	2 098	1 921	1 933	1 825	1 660	1 661	1 545	1 436	1 400	1 166	1 100	998	886	845
■ Offset paper (tonnes)	371	218	252	268	248	285	274	224	250	272	225	248	251	206
■ 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

Per capita breakdown is represented below.

7 Action 58 in the EMAS Global Annual Action Plan

Figure A7: Evolution of total paper consumption at Brussels (per capita)

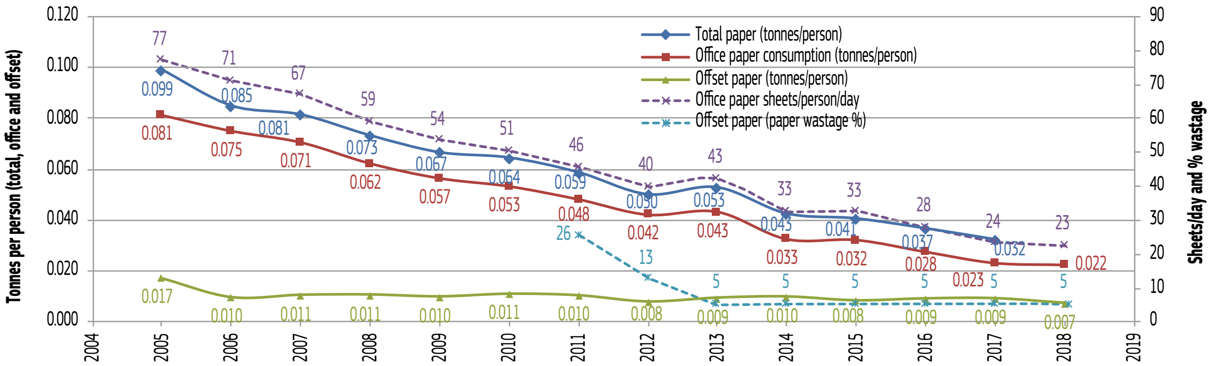


Figure A7 shows that paper consumption[8] (kg/person) reduced by more than 70% since 2005, with a steep reduction in 2014 in office paper use measured in sheets/person/day. 2014 figures represented on its own a 26% reduction.

The office paper consumption stabilised in 2018 (639 tonnes instead of 634 the previous year, corresponding to a 0.01% difference). Behind these figures are continuing efforts aiming at increasing circulation and saving of documents in digital format, use of scanned documents, email and e-signing transfer of documents, replacing paper signataires as well as the use of double sided printing when paper is necessary. Further significant reductions can only be achieved by more widespread use of digitalised procedures, which require heavy investments in technology (on both hardware and software), thus enabling deeper changes in staff printing behaviour.

Consumption of offset paper used in the print shop is largely unchanged since 2006. In 2018 offset paper consumption decreased significantly by 18% to 206 tonnes, which sets a record low consumption since 2005.

The following actions have sought to reduce office paper consumption:

- close monitoring of paper consumption;
- improving electronic processes;
- fostering the use of electronic signature and distribution of documents.

A5 Reducing carbon footprint and air emissions

A5.1 Carbon footprint

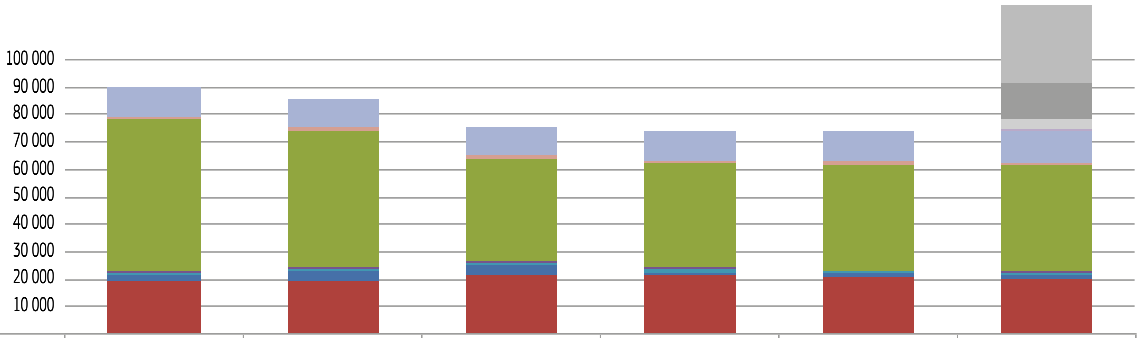
Figures A8 and A9 show the contribution of components[9] of the Commission's carbon footprint measured as equivalent tonnes of CO_2 emissions (T CO_2e) for Brussels[10].

8 Historically reported for total Commission staff.

9 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.

10 Air travel emissions 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 A8: Annual CO_2 (and equivalent) emissions (Tonnes CO_2e)

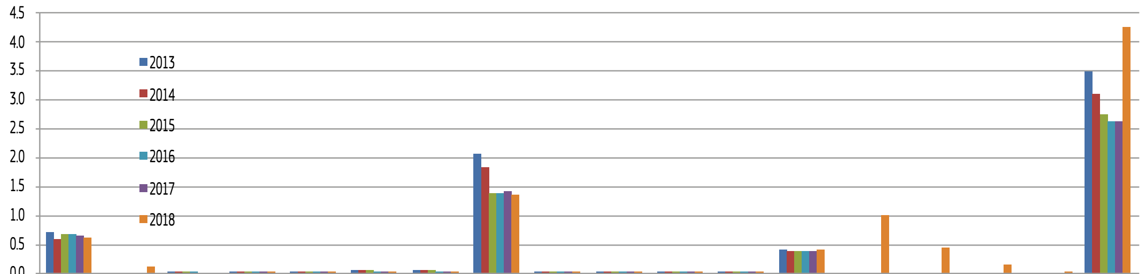


	2013	2014	2015	2016	2017	2018
Sum	90 424	85 965	75 845	74 117	74 212	120 187
Fixed assets - buildings	0	0	0	0	0	28 466
Fixed assets - IT	0	0	0	0	0	13 141
Goods and service contracts	0	0	0	0	0	4 072
Own waste	0	0	0	0	0	461
Staff commuting	10 850	10 672	10 672	10 672	11 046	11 565
Missions (excluding air)	996	947	1 199	1 186	1 087	1 092
Missions (air, RFI 2)	55 358	50 044	37 543	37 719	38 711	38 466
Vehicle fleet - fuel consumption	704	653	659	663	623	626
Buildings - coolant losses	864	821	763	1 315	749	820
Buildings - electricity	1 967	3 537	3 515	1 112	1 307	1 176
Buildings - fuels for heating	19 685	19 291	21 494	21 451	20 688	20 302

Up until 2017, 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 OIB also reports on additional categories of scope 3 emissions[11], such as fixed assets (buildings and IT), contracts for goods and services as well as waste production. As shown in table A8, emissions from buildings, as fixed assets, are estimated at over 28 000 tonnes, representing almost 26% of the total, and thus becoming the second largest source of emissions, underlining the importance of real estate policy.

Gas consumption for buildings heating is the third largest component, slightly higher than emissions estimated from commuting, and less than half of the estimated emissions due to air travel. Emissions due to electricity consumption are very low because 100% of the supply comes from renewable sources.

Figure A9: Carbon footprint elements (tonnes CO_2e/person)



	Scope 1; Fuel for bldgs: mains gas	Scope 3; Fuel for bldgs: mains gas	Scope 1; Fuel for bldgs: diesel	Scope 1; Commission vehicle fleet	Scope 1; Refrigerant leaks	Scope 2; External electricity supply	Scope 3; External electricity supply	Scope 3; Business travel: air	Scope 3; Business travel: rail	Scope 3; Business travel: hire car	Scope 3; Business travel: private car	Scope 3; Business travel: air taxi	Scope 3; Commuting	Scope 3; Fixed assets - buildings	Scope 3; Fixed assets - IT	Scope 3; Service and supply contracts	Scope 3; Own waste	Sum
2013	0.72		0.02	0.03	0.03	0.07	0.1	2.089	0.01	0.01	0.02	0.0	0.41					3.49
2014	0.61		0.03	0.02	0.03	0.08	0.1	1.827	0.00	0.01	0.02	0.0	0.39					3.10
2015	0.69		0.02	0.02	0.03	0.08	0.1	1.386	0.01	0.01	0.02	0.0	0.39					2.74
2016	0.68		0.01	0.02	0.05	0.02	0.0	1.390	0.01	0.01	0.02	0.0	0.39					2.64
2017	0.66		0.00	0.02	0.03	0.03	0.0	1.417	0.01	0.00	0.02	0.0	0.40					2.63
2018	0.62	0.11	0.00	0.02	0.03	0.02	0.03	1.35	0.01	0.00	0.02	0.01	0.41	1.00	0.46	0.14	0.02	4.25

11 Reporting for buildings and fleet energy use also includes upstream emissions

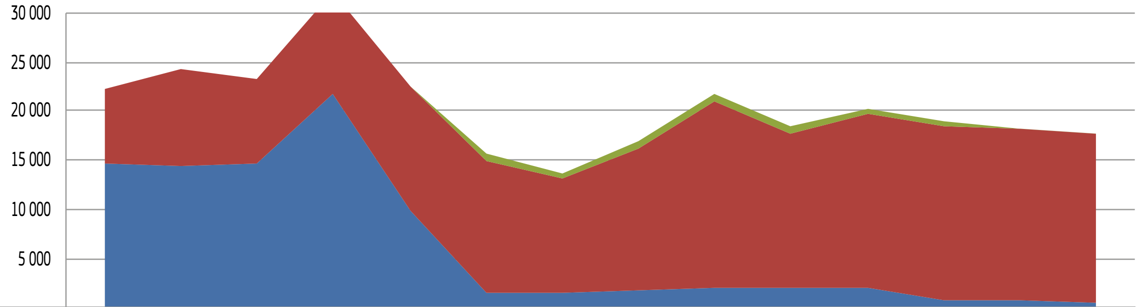
The data in Figure A9 show the carbon footprint per person, with 2018 representing a significant increase due to the inclusion of the above-mentioned additional scope 3 data (3.79 tonnes CO_2e/person instead of 2.63).

A5.2 CO_2 emissions from buildings

a) Buildings (energy consumption)

The evolution of total emissions from buildings energy consumption is shown in Figure A10, followed by per capita and per square metre in Figure A11. These follow broadly the same trend as energy consumption. Emissions due to electricity consumption reduced considerably in 2009, when green electricity was purchased accounting currently for 95% of the total consumption. As of 2018, fuel consumption is insignificant, following the installation of the boilers using gas in the last building that was heated on fuel (L-84/86).

Figure A10: CO_2 emissions from buildings heating in the EMAS perimeter, (tonnes)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	19 238	20 514	18 897	25 531	21 618	13 364	11 702	15 036	21 652	18 461	20 265	18 834	18 249	17 749
fuel oil						739	486	573	638	848	534	328	0	0
mains gas	7 472	9 855	8 769	10 418	12 421	13 501	11 590	14 591	19 048	15 608	17 738	17 876	17 508	17 181
electricity	14 670	14 367	14 554	21 760	9 945	1 362	1 470	1 647	1 967	2 005	1 993	630	741	568

Figure A11: CO_2 emissions from buildings heating in the EMAS perimeter, (tonnes per person and kg per square metre)

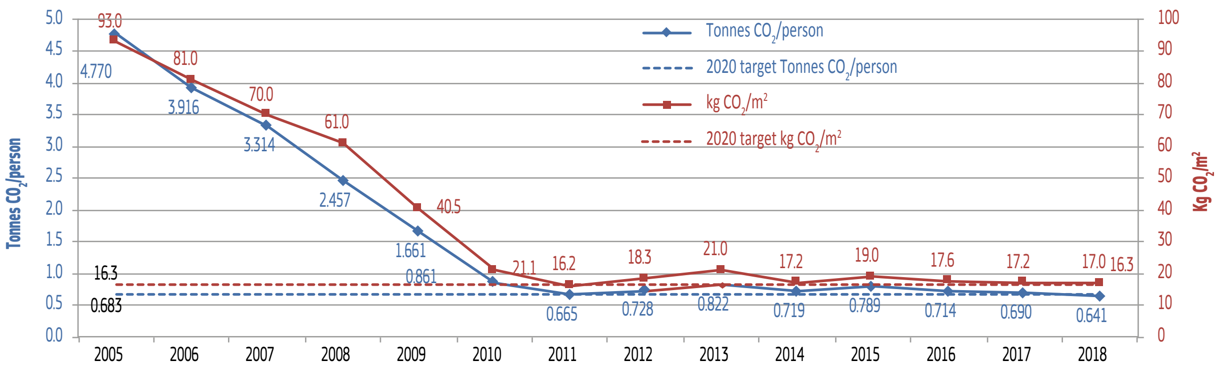
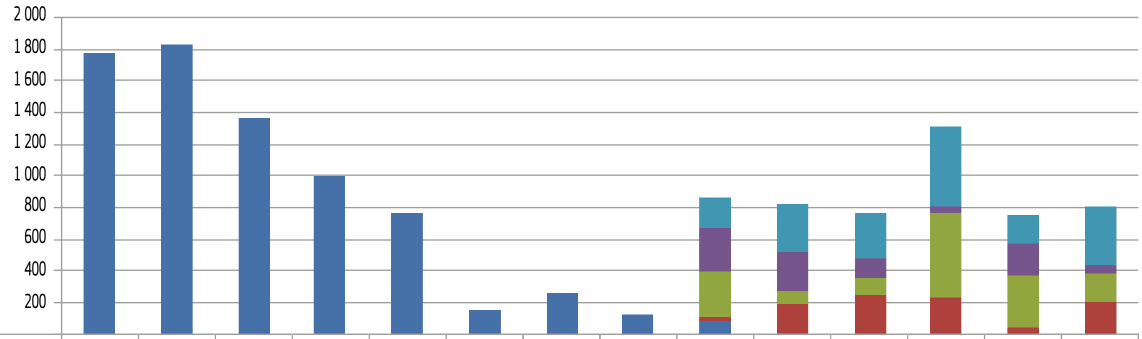


Figure A11 shows that CO_2 emissions have reduced considerably since initial EMAS registration in 2005, with a large drop since purchasing around all electricity from 100% renewable sources in August 2009 (and assuming that renewable electricity does not generate CO_2 emissions). However since 2011, emissions are largely unchanged 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.

b) Buildings -other greenhouse gases (refrigerants)

A **refrigerant** is a substance, commonly a fluid, used in refrigeration cycles. In previous years special attention was given to fluorocarbons, particularly R22 gas, which in compliance with the legislation on ozone depletion had to be phased out. A large-scale operation was launched in 2014-2015 either replaced installations containing R22 by new ones using a different gas (operation "lift & drop"), or by removing R22 and recharging with a new gas (operation "retrofit"). Additional refrigerants have been monitored since 2013.

Figure A12: Losses of refrigerants in Brussels EMAS perimeter, (tCO_2e)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total (TCO_2 e)	1 777	1 822	1 370	995	771	154	261	127	864	821	763	1 315	749	820
R407C									188	293	285	501	175	366
R404A									274	253	126	43	197	52
R134A									296	85	104	529	330	189
R410A									24	190	248	241	47	202
R22A	1 777	1 822	1 370	995	771	154	261	124	82					

Table A8: Emissions of equivalent CO_2 emissions (tonnes) from cooling installations

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total (TCO_2 e)	1777	1822	1370	995	771	154	261	127	864	821	763	1315	749	820
tonnes CO_2 equiv/person	0.084	0.081	0.058	0.040	0.031	0.006	0.010	0.004	0.033	0.030	0.028	0.048	0.027	0.029
kg CO_2 equiv/m^2	0.009	0.007	0.005	0.002	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001

OIB has monitored the total quantity of refrigerants in technical installations (excluding catering), and losses since 2005. Figure A12 shows that total losses have increased 9.5% in 2018 from 749 to 820 tonnes of CO_2 equivalent, due to several maintenance operations leading to the compulsory replacement of the fluids (in particular R407C) back to 2014 levels. Each kilogram of refrigerant lost may be equivalent to between 1 000 and 5 000 kg of CO_2 e.

Actions were undertaken since 2011 to phase out certain HFC and HCFC installations, such as the removal of R22 in 2014. The phasing out and substitution of refrigerants type R404a, R507 or R134a, used in kitchen cooling equipments, and R407c, R410a, used in HVAC installations, is scheduled for 2020, 2025 or 2030, following the applicable legislations, which are closely monitored.

A5.3 CO_2 emissions from vehicles

a) Commission vehicle fleet

Table A9: Fleet vehicle characteristics and tailpipe CO_2 emissions

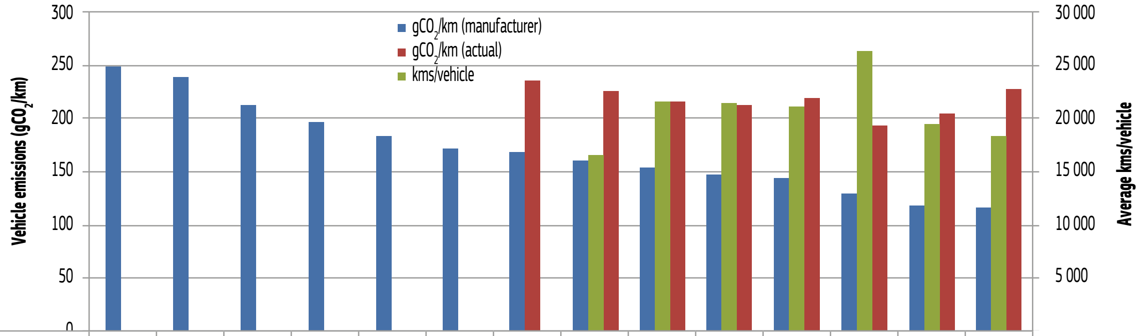
	2012	2013	2014	2015	2016	2017	2018
Number of vehicles (avg. fleet size)	160	120	114	117	107	129	126
of which electric/ hybrid engine				10	10	13	33
of which Euro 6 engine				56	74	98	93
of which Euro 5 engine				51	23	18	0
Internal fleet efficiency (litres/100km)	8.7	8.6	8.4	8.4	7.5	8.0	8.9
CO_2 emissions							
i) from diesel (tonnes)	693	681	635	644	625	561	455
ii) from petrol (tonnes)	29.9	22.9	18.1	15.0	37.7	61.5	170.5
Total vehicle tailpipe emissions	595	704	653	659	663	623	626

Brussels operates a vehicle fleet of 126 leased cars, a number that has reduced considerably in recent years as indicated in Table A9. In 2018, both the number and the proportion of cars with Euro 6 engines increased. Furthermore, 20 new hybrid engine vehicles were added to the fleet.

The CO_2 emissions have steadily reduced since 2013. Table A9 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 overall emissions, in 2018 they represented only 73%.

Figure A13 shows how vehicle emissions (per km) and average vehicle use have evolved.

Figure A13: Emissions per km and distance travelled per vehicle



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
gCO_2/km (manufacturer)	249	240	213	196	184	173	169	160	155	148	145	129	118	116
gCO_2/km (actual)	0	0	0	0	0	0	236	227	217	213	219	193	205	227
kms/vehicle	0	0	0	0	0	0	0	16 494	21 694	21 547	21 172	26 446	19 444	18 344

Initiatives undertaken since 2015 include systematic replacement of vehicles having reached the end of their economic life-cycle with more environmentally friendly models, with features such as lower engine capacity, hybrid technology or electric motors (as it was in 2018 the case for 20 new hybrid engine vehicles, adding to the 13 electrically powered vehicles in place). The Commission also provides drivers with 'eco-driving' training. Since 2015, OIB includes the "ecoscore" label for cars, advised by the Brussels Capital Region, in its car fleet management.

b) Missions and local work based travel (excluding Commission vehicle fleet)

There were no specific site level targets since 2014 or management approved action plans to reduce CO_2 emissions from missions. Ongoing initiatives undertaken at corporate level in 2015 to encourage staff to consider less energy intensive alternatives for mission travel included:

i) the evaluating of the use of videoconferencing within the Commission;

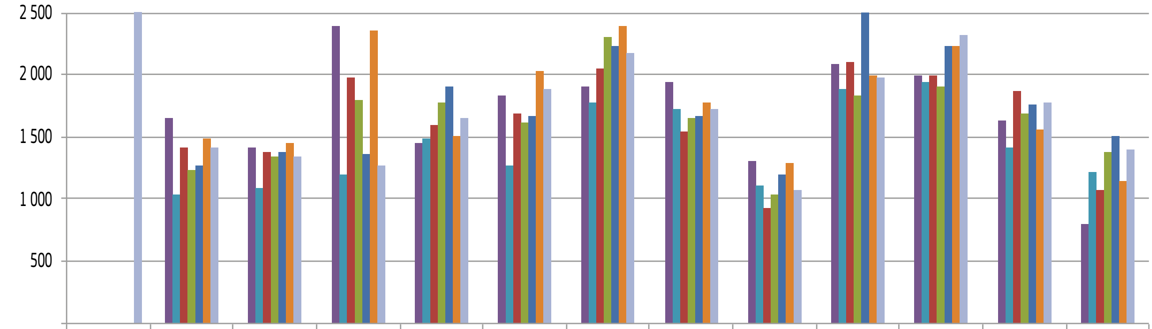
ii) promoting videoconferencing in DGs and using monthly utilisation reports;

iii) continuing to promote the use of service bicycles; and

iv) continuing to distribute tickets for journeys on public transport within Brussels.

Figure A14 shows the number of trips undertaken using service bicycles to attend internal or external meetings or events in Brussels.

Figure A14: Trips made by Commission bicycle



	Annual total	January	February	March	April	May	June	July	August	September	October	November	December
2012	20 434	1 650	1 414	2 401	1 455	1 838	1 909	1 938	1 303	2 086	1 999	1 637	804
2013	17 139	1 026	1 087	1 206	1 485	1 266	1 787	1 729	1 099	1 885	1 935	1 422	1 212
2014	19 636	1 424	1 384	1 974	1 598	1 684	2 056	1 539	924	2 111	1 995	1 869	1 078
2015	19 577	1 235	1 350	1 801	1 779	1 617	2 305	1 651	1 032	1 824	1 906	1 694	1 383
2016	20 814	1 267	1 387	1 359	1 911	1 673	2 229	1 663	1 190	2 645	2 231	1 753	1 506
2017	21 224	1 491	1 443	2 357	1 504	2 030	2 403	1 770	1 297	1 998	2 235	1 556	1 140
2018	20 013	1 423	1 345	1 273	1 657	1 884	2 168	1 727	1 071	1 975	2 323	1 774	1 393

Overall, each year around 20 000 trips are made using Commission bikes. Figures for 2018 show a small decrease in bike trips, including the ones using the 35 electrical bikes (out of 280) introduced to the fleet in the last two years.

c) Commuting

Initiatives undertaken in 2018 concerning commuting included:

i) continued financial support for public transport season tickets for staff who give up the right to permanent access to a parking space;

ii) installing additional bicycle parking and showers in Commission buildings;

iii) promoting the “Bike to Work” and “Bike Experience” schemes of external organisations;

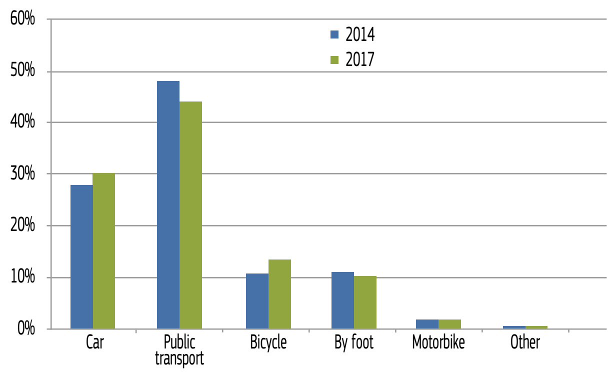
iv) promoting car-pooling, and assisting staff in finding car-pooling partners via a dedicated Intranet site;

v) exploring options for joint schemes with local bike partners such as “Villo”; and

vi) drafting the new multi-annual Mobility Plan.

The graph below shows the split between the main commuting modes used by the EC staff in Brussels in 2018, compared with 2014 figures (date of the previous triannual Mobility Survey). Public transport is consistently the preferred means of transport, followed by private car and bycicle, as main commuting mode.[12]

Figure A14a: Commuting modes for EC Staff in Brussels



[12] Source: 2017 Mobility Survey

A5.4 Total air emissions of other air pollutants (SO_2, NO_2, PM)

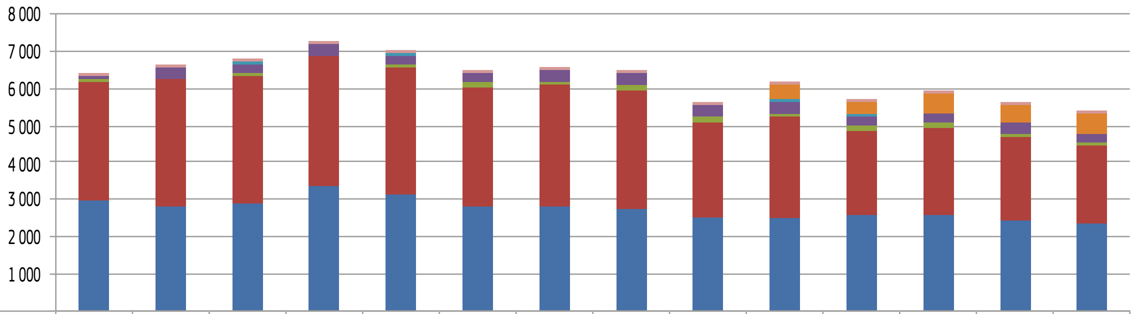
Brussels is one of several European cities experiencing high levels of airborne pollution. The EC occupies more than 60 buildings with large HVCA (Heating, Ventilation, Cooling and Air Conditioning) installations, and uses a fleet of over 100 predominantly diesel vehicles: the Commission must ensure that it is not unduly contributing to this problem.

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 2016.

A6 Improving waste management and sorting

A6.1 Non hazardous waste

Figure A15: Evolution of total non-hazardous waste in Brussels (tonnes)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	6 359	6 581	6 692	7 230	6 936	6 423	6 529	6 443	5 562	6 081	5 654	5 882	5 580	5 307
Total (tonnes/ person)	0.300	0.291	0.282	0.290	0.278	0.249	0.248	0.225	0.210	0.222	0.209	0.217	0.204	0.187
(Oxfam contract non WEEE)										404.1	348.6	527.7	506.0	500.5
Glass	12.5	15.5	19.1	21.5	27.4	32.5	31.4	37.4	33.3	29.4	26.5	25.6	23.0	27.7
Organics	83.7	293	281	292	273	248	314	313	302	311	289	261	243	213
PMC	46.9	35.8	42.0	49.8	54.5	102	121	127	121	116	123	142	147	144
Paper and card	3 265	3 438	3 420	3 500	3 454	3 238	3 249	3 219	2 590	2 675	2 274	2 349	2 212	2 072
Unsorted waste	2 951	2 799	2 929	3 366	3 127	2 804	2 813	2 747	2 516	2 545	2 594	2 577	2 449	2 351

Figure A15 indicates that waste generated[13] per person has reduced by over 37% since 2005. Unsorted waste and paper/carton make up a large percentage (over 83%). 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. As of mid-2016 and throughout 2017 and 2018, 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).

The 2015 immediate target (not to exceed the 2014 level of non-hazardous waste generation) has been largely attained, with the results showing for 2018 a per capita reduction of 8.3% mainly due to a 6.3% drop in paper and card waste and nearly 4% in unsorted waste. In 2018, all categories (except glass) show reductions, with the highlight going to "paper and card" (less 140 tonnes, following the 137 ton reduction of the previous year, thus corresponding to a significant 11,7% reduction over the 2 years).

It is interesting to note that the quantity of packaging waste (PMC) remains stable (145 tonnes in 2018, compared with 147 the previous year, thus increasing its relative weight in the total figures) which may indicate a better sorting of office waste, possibly as a result of the several awareness campaigns aimed at the Commission staff and improvements in the waste management infrastructure. The overall result is another 4.7% (263 tonnes) reduction.

[13] Historically reported for total Commission staff

Principles of circularity were incorporated into a new waste management contract that came into force in May 2017. OIB has launched other initiatives on waste management since 2015, which are still ongoing, such as:

i) improving the selective sorting of waste using sorting bins in areas and buildings for public use;

ii) exploring ways of reducing transport distances to reduce the environmental impact of vehicles used by staff engaged in waste transport;

iii) promoting the implantation of collaborative working areas which reduces the number of waste containers available and consequently improve waste sorting; and

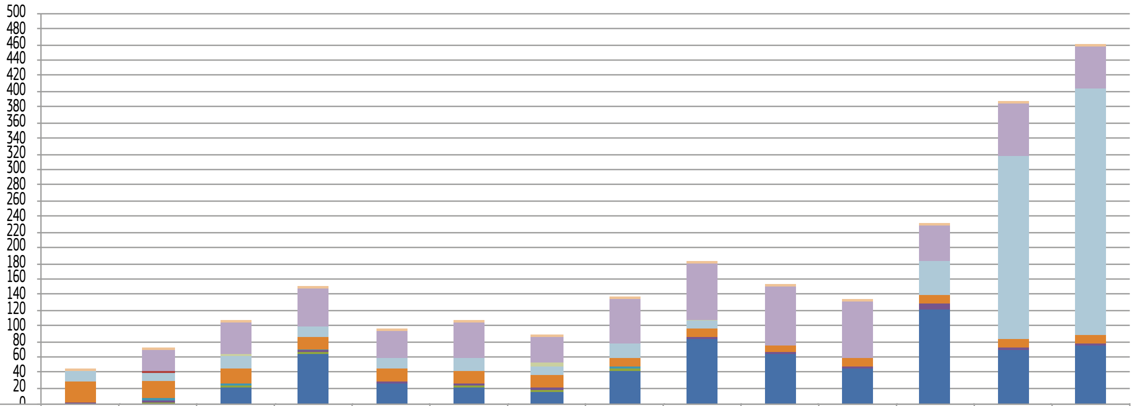
iv) reducing the number of individual bins.

In 2018, the reduction of Single Use Plastic items continued to receive great attention. The OIB has successfully launched a series of initiatives in this regard, namely the full replacement of plastic cups in water fountains and vending machines by recycled and recyclable paper ones and the use of specific bins aimed at this type of waste, spread all over the Commission buildings in Brussels. Plastic stirrers were replaced by wooden ones in cafeterias and restaurants, and were completely abolished from vending machines. In addition, it is no longer possible to order plastic cups for catering services and events. In 2018, this approach was applied to all the restaurants and cafeterias in all buildings in Brussels, where new water fountains were installed.

A6.2 Hazardous waste

Per capita hazardous waste generation represents 7.9% of total waste. For the first time in 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. Regarding the two main contributors, the data for 2018 show an increase in the “oil and fat” category (from 233.6 in 2017 to 315.8 tonnes in 2018, due to several maintenance operations held in Lot A buildings), and a 10% increase in “buildings and lifts” (from 68.2 tonnes in 2017 to 75.6 in 2018).

Figure A16: Evolution of total hazardous waste in Brussels (tonnes)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	42.9	69.2	105	147	93.5	106	86.5	135	180	152	132	230	386	461
Total (tonnes/person)	0.002	0.003	0.004	0.006	0.004	0.004	0.003	0.005	0.007	0.006	0.005	0.008	0.014	0.016
(Oxfam contract WEEE 20 01 35)		26.20	41.49	47.82	35.60	45.81	33.03	57.36	73.32	76.02	72.33	45.00	67.50	55.54
Diverse chemical waste	1.19	0.33	3.04	1.09	0.00	0.00	4.70	0.07	0.14	0.00	0.00	0.00	0.00	0.00
Mineral Oil	0.00	2.12	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oil and fat	13.04	12.12	14.39	11.87	12.55	17.20	12.20	17.82	10.75	1.65	1.12	44.10	233.60	315.76
Cartridges	25.72	21.22	19.23	16.19	15.29	15.62	14.33	12.53	11.10	7.35	10.21	10.54	10.65	10.13
Paint-toner	1.47	2.46	2.51	1.08	0.77	1.37	1.21	1.19	0.27	0.00	0.00	0.00	0.00	0.00
Chemical batteries	1.47	1.59	1.84	1.56	1.91	1.93	2.00	1.75	2.12	2.35	3.24	6.19	4.39	1.81
Chemical-fixer-developing agents	0.00	3.20	1.24	2.38	2.06	1.85	2.45	0.15	0.13	0.00	0.00	0.00	0.00	0.00
Microfiches	0.00	0.00	0.00	0.12	0.00	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance of buildings/lifts	0.00	0.00	21.60	65.00	25.30	20.57	16.59	43.95	82.60	64.23	45.07	121.71	68.24	75.59

A6.3 Waste sorting

OIB seeks to maximise the sorting of waste into potentially useful recycling streams, and minimise the amount of unsorted "general" waste. Table A10 shows the proportion of total waste sorted typically fluctuated between 54 and 58%, with 2018 showing a percentage of over 58%. This result compares favourably against the 53% average of waste sorting in Brussels-based companies[14].

Table A10: Evolution of waste sorting at the Commission in Brussels

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Percentage of waste sorted	53.9	57.9	56.9	54.4	55.5	57.1	57.5	58.2	56.2	59.2	55.2	57.8	59.0	59.3
Percentage of waste not sorted	46.1	42.1	43.1	45.6	44.5	42.9	42.5	41.8	43.8	40.8	44.8	42.2	41.0	40.7

A7 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:

i) integrating and managing several green areas in its buildings;

ii) managing a green park at the Overijse site, with an area of 13 000 m²;

iii) introducing infrastructure measures such as green roofs in building projects such as that at Overijse (roof 1 800 m²);

iv) opting for green procurement of goods and services: (e.g. where possible integrating environmental considerations in the selection of construction materials); and

v) introducing the BREEAM assessment in recent real estate projects (MO15: BREEAM Excellent rating; MERO building: BREEAM Very Good rating, and the future L130 project[15]).

A8 Green Public Procurement

A8.1 Incorporating GPP into procurement contracts

OIB aims to apply "green" public procurement principles into its contracts exceeding 135 000 EUR and has increased the number of contracts including such criteria in the last few years. The target was to incorporate the criteria into all relevant contracts over 135 000 EUR (following the thresholds defined in the EC Financial Regulation), and in 2018 this was achieved in all contracts, increased from 93% in 2017.

In 2016 a new IT programme, PPMT, was introduced, 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. Tenders let in 2018 have been ranked according to their degree of incorporating of sustainable criteria from not green, to green by nature. Of 26 contracts 15 were considered as "green" and 2 as "green by nature", while the remaining 9 had no environmental features.

Action 54 of the Commission's Global Annual action plan has, since 2012, sought to integrate systematically GPP or environmental criteria in call for tenders' terms of reference and technical specifications.

A9 Demonstrating legal compliance and emergency preparedness

A9.1 Management of the legal register

Several services at 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.

[14] Brussels Green Network (www.beci.be) https://activityreport.valipac.be/monitoring-de-la-production-de-dechets-industriels/ (rapport d'activité 2018)

[15] A major new development for office space in the European Quarter, due for completion in the mid 2020s

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 EMAS page in OIB's intranet site invites potential interested services to contact the EMAS team asking for further support on the follow-up of legislative matters.

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, for the Brussels site, the Commission correctly manages legal compliance in its premises and engages in regular dialogue with local authorities on the subject.

A9.2 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 2005 reports issued in 2018, 47% had no remarks, while 39% stated minor and 14% major non-conformities.

None of the major non-conformities recorded in 2018 by integrated inspections at OIB were EMAS related. A major initiative for the 2015-2018 inspection contracts was the implementation of new technical controls from an environmental management system perspective, which included:

i) Testing of boiler installations more than 15 years old – in line with the annex/section/part 6D of energy performance of the building directive, and regional legislation (5 buildings tested)

ii) Periodic control of cogeneration systems and associated air analysis (ref 6G- controls in 4 buildings) and beginning of the tests for air conditioning installations over 15 years old, as required by annex/section/part 6F (17 buildings tested) of the energy performance of building directive,and to be totally implemented;

iii) Periodic control of generators and associated air analysis (ref 6H- controls performed in 51 buildings).

iv) In addition, a number of previous controls have been updated to better meet environmental needs:

- 6A (Boilers and air analysis controls) in 61 buildings
- 6B (Controls on gas supply installations) in 60 buildings
- 7B (Controls of CO levels in parking's and underground levels- in 48h after any IBGE request) in 50 buildings;
- 7C (Controls on fine particles- formerly control of ozone levels) in 57 buildings

A9.3 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 malfunctioning in the buildings (lighting, heating, cooling, water, etc.).

A10 Communication

A10.1 Internal communication

Internal communication may involve Commission staff and contractors. A summary of the actions is included below.

Table A11: Summary of main internal communication actions in 2018

Action description	Organisation	Dates in 2018	Participation at Brussels site level
Annual mobility campaign	Centrally organised (Commission wide)	28/05 to 01/06	A regular annual event with information stands, bike repairing stands and advice, green mobility, guided bike tours with an estimated 500 participants
Annual waste minimisation campaign	Centrally organised (Commission wide)	NOV	Participation in the set-up of the campaigns, production and distribution of posters
Flatscreen communications EMAS results	Centrally organised (Commission wide)	Every two months	
Flatscreen communications	OIB	29/05	EMAS Awards
Flatscreen communications	OIB	21/09	Sustainable Guidelines
Flatscreen communications	OIB	12/09	Water Dispensers
Articles published on OIBNet	OIB	JAN	Closing buildings over Christmas saves 379tonnes of CO_2
Articles published on OIBNet	OIB	MAR	World Water Day 2018
Articles published on OIBNet	OIB	MAR	Earth Hour – Samedi 24 mars
Articles published on OIBNet	OIB	APR	Let's recycle our paper cups
Articles published on OIBNet	OIB	APR	Tri des déchets au CSM1
Articles published on OIBNet	OIB	MAY	L'OIB récompensé pour ses initiatives EMAS
Articles published on OIBNet	OIB	JUL	L'équipe EMAS vient à votre rencontre pour les îlots de tri
Articles published on OIBNet	OIB	NOV	Économies d'énergie pour les fêtes de fin d'année
Articles published on OIBNet	OIB	NOV	Water fountains are available in all cafeterias / Des fontaines d'eau sont à votre disposition dans toutes les cafétérias
VéloMai	Prepared by OIB Mobility	May	Communication and training actions promoting the use of the bicycle

A10.2 External communication and stakeholder management

The main external actions conducted by Brussels in relation to environmental matters:

Table A12: Summary of main external communication actions in 2018

Action description	Organisation and external stakeholders	Dates in 2018	Participation at Brussels site level
Annual Earth hour lights out campaign	Commission wide and with other EU institutions in BXL	19/03	Automatic switch-off of the lights in the EC buildings in Brussels.
Communication with Regional authorities	OIB and IBGE, SIAMU and property owners and managers	Through-out the year	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; frequent contacts with building owners and property managers.
Commission open day	Commission wide organisation for all sites	05/05	Presentation of the EC activities to the general public (approximately 25 000 visitors)
European Union Sustainable Energy Week	All the main players in the energy sector in Europe	08/06	Participation by the EMAS team @OIB

A11 Training

A11.1 Internal training

Table A13: Action plan training

Description	Organisation	Dates in 2018	Participation at Brussels site level	Participants (estimated)
Commission newcomers training	DG.HR in Brussels	Every 2 months	Participative session of 2 hours replacing the traditional 10 min presentation on newcomer's induction day.	1173

A11.2 External training

The EMAS coordination team at OIB followed several training sessions during 2018:

- EBP works (refresh)
- LCA materials TOTEM
- Energy efficiency and digital transition
- Circular economy
- PLAGE [16]info session
- Workshop on TOTEM SIBELGA presentation on gas
- PLAGE Energy management training
- Conference on LEVEL(s)[17]

16 PLAGE (Programme Local d'Actions pour la Gestion Énergétique) https://environnement.brussels/thematiques/batiment/obligations/plan-local-daction-pour-la-gestion-energetique/un-plage-pour-les

17 LEVEL(s) improving building sustainability performance http://ec.europa.eu/environment/eussd/buildings.htm

Two of the members of the EMAS team at OIB are EPB for public buildings registered certifiers and EPB advisers. Another member of the team started in October 2017 a Master's degree in Environmental Sciences and Management at ULB (Université Libre de Bruxelles). The final dissertation will be linked to his work at OIB.

Starting in October 2018, the EMAS team at OIB welcomed a trainee under the Blue Book Program in the European Commission.

A12 EMAS Costs and saving

For several years, the costs associated with running EMAS in terms of staff time and the cost of supporting contracts and savings have been monitored. The estimated costs associated with parameters such as energy and water consumption and waste generation and disposal have also been estimated. Costs and energy savings are presented in Table A14.

Table A14: EMAS administration and energy costs for buildings in the EMAS area

Parameter	2005 (1)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Staff (EMAS Office Buildings)	4 033	5 238	5 702	10 393	13 014	15 527	17 586	20 663	26 336	25 667	25 698	26 361	26 448	27 687
Total Staff (Commission)	21 203	22 635	23 760	24 936	24 937	25 750	26 305	28 681	26 499	27 392	27 089	27 143	27 325	28 410
EMAS administrative cost (EUR)/staff								**4.60**	**4.98**	**4.82**	**4.95**	**4.94**	**5.05**	**5.21**
Total energy cost for EMAS office buildings (EUR)	4 710 826	5 033 171	4 647 209	9 600 109	7 954 044	9 313 740	9 792 161	10 943 694	13 714 590	13 313 897	12 846 405	12 005 120	11 091 523	11 080 171
Total energy cost for all Commission buildings (3) (EUR)	24 766 587	21 749 389	19 364 323	23 033 610	15 241 278	15 445 921	14 647 038	15 190 248	13 799 473	14 208 683	13 541 764	12 361 025	11 459 312	11 369 511
Total per capita energy cost for EMAS office buildings (EUR/ person)	**1 168**	**961**	**815**	**924**	**611**	**600**	**557**	**530**	**521**	**519**	**500**	**455**	**419**	**400**
Electricity (Eur/person)	845	637	547	701	433	442	430	394	381	399	369	346	328	314
Gas (Eur/person)	307	309	251	214	171	150	122	130	135	113	129	108	92	86
Fuel (Eur/person)	16	14	17	9	8	8	5	5	5	7	3	1	0	0

Notes
1) Unit costs: Assume 2005 same as 2006, 2008 still under review
2) Including, in 2016 Executive Agencies in Commission managed buildings
3) Assuming non EMAS area have similar costs for energy as EMAS area

Energy is by far the largest single resource cost. In 2018 the Commission spent less than 54% of what it spent on energy consumption in 2005. Indeed savings in recent years compared with 2005 have been in the order of 13 Mio EUR per year and energy costs in 2018 represented 44.7% of the amount in 2005.

A13 Conversion factors

Table A15: Conversion factors used in producing data for the Brussels site[18]

Parameter and units	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Assumed output, (% of kWh/p)									20	20	20	20	20	20
kWh from on litre diesel (1)								11.1	11.1	11.1	11.1	11.1	11.1	11.1
KWh from one litre petrol (1)								9.4	9.4	9.4	9.4	9.4	9.4	9.4
Paper Density (g/m^2)	80	80	80	80	80	80	80	80	78	75	75	75	75	75
Kg CO_2e from 1 KWh of electricity (3)	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
Kg CO_2e from 1 KWh natural gas PCI (5)	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
Kg CO_2e from 1 KWh domestic fioul (5)							0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270
GWP of R22 (2)	1 810	1 810	1 810	1 810	1 810	1 810	1 760	1 760	1 760	1 760	1 760	1 760	1 760	1 760
GWP of R410A (2)									1 920	1 920	1 920	1 920	1 920	1 920
GWP of R134A (2)									1 300	1 300	1 300	1 300	1 300	1 300
GWP of R404A (2)									3 940	3 940	3 940	3 940	3 940	3 940
GWP of R407C (2)									1 620	1 620	1 620	1 620	1 620	1 620
Kgs CO_2e from one litre diesel (6)									2.50	2.50	2.50	2.50	2.50	2.50
Kgs CO_2e from one litre petrol (6)									2.28	2.28	2.28	2.28	2.28	2.28
Annual cost of one FTE (4)								132 000	132 000	132 000	134 000	134 000	138 000	148 000
Number of working days in the year (7)									211	211	211	211	211	211

Notes:

(1) Beginner's Guide to Energy and Power, Neil Packer 2011 available at http://studylib.net/download/18346856

(2) IPCC 5th Assessment Report (2014, from p 731 on) https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf

(3) IGBE, 2013

(4) Figure from DG BUDG Finance unit network (RUF) for AD staff and in place at the beginning of reporting year

(5) Base carbone, ADEME, 2017 Europe average, (combustion only, excluding upstream emissions)

(6) Base carbone, ADEME, 2017 value for vehicle fleet, France (combustion only, excluding upstream emissions)

(7) Used for estimating emissions from commuting, source DG HR A.3

18 Source: IPCC 5th Assessment Report (2014, please see from p 731 on) https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf and summarised in Base Carbone, ADEME, 2017

A14 Site breakdown: characteristics of buildings and performance of selected parameters (indicative data)

Building	Address	Occupant	EMAS registration	Useful surface area (PEB in m²)	Staff	Office	Café	Self rest	Creche/ child care	Printing and mail sorting	Medical service	Depot, large storage	Workshop	Sports/ recreation centre	Nuclear lab/experimental	Electricity	Mains gas	Water (m³)	Non hazardous waste (tonnes)	Comment
1) Building essential details 2018:						**2) Building use 2018**										**3) Energy sources and amount (MWh for 2016)**		**4) Water and waste consumption**		
BRUSSELS																				
B232	Rue Breydel 4	SANTE	BXL 2009/016	11 584	456	X										1 224 256	814 065	3 284.4	43.67	
B-28	Rue Belliard 28	DIGIT	BXL 2007/009	14 987	651	X	X									2 200 507	392 194	3 994.3	63.12	
BERL	Rue de la Loi 200	Collège, SG, SJ, COMM, OIB, EPSC, HR	BXL 2005/001	151 410	2 197	X	X	X								21 244 827	11 011 374	25 724.2	386.35	
BRE2	Avenue d'Auderghem 19	HR, BUDG	BXL 2005/002	18 747	535	X	X				X					1 765 849	972 310	4 510.1	66.79	
BREY	Avenue d'Auderghem 45	BUDG, GROW, HR	BXL 2009/015	35 198	818	X	X	X								3 419 923	2 559 016	16 549.8	153.75	Includes HT and LT
BU-1	Avenue Beaulieu 1-3	REGIO	BXL 2008/013	13 911	400	X					X					1 228 472	1 515 328	5 499.7	229.14	Includes figures for waste for buildings BU-5 and BU-9.
BU24	Avenue de Beaulieu 24	CLIMA, EEAS	BXL 2012/043	6 425	206	X										501 706	618 326	1 067.2	23.48	
BU25	Avenue de Beaulieu 25	CNECT	BXL 2012/044	18 130	508	X										1 713 051	1 019 434	2 993.6	129.75	
BU29	Avenue de Beaulieu 29	REGIO	BXL 2011/033	6 131	177	X	X									646 793	357 530	1 577.3	84.25	
BU31	Avenue de Beaulieu 31	CNECT	BXL 2011/034	6 185	115	X										468 504	347 442	1 074.2		Includes figures for waste for BU33.

Building	Address	Occupant	EMAS registration	Useful surface area (PEB in m²)	Staff	Office	Café	Self rest	Creche/ child care	Printing and mail sorting	Medical service	Depot, large storage	Workshop	Sports/ recreation centre	Nuclear lab/experimental	Electricity	Mains gas	Water (m^3)	Non hazardous waste (tonnes)	Comment
1) Building essential details 2018:						**2) Building use 2018**										**3) Energy sources and amount (MWh for 2016)**		**4) Water and waste consumption**		
BU33	Avenue de Beaulieu 33	CNECT	BXL 2011/035	6 843	202	X										839 693	362 955	1 549.6		
BU-5	Avenue de Beaulieu 5-7	ENV, REGIO	BXL 2005/003	11 843	264	X	X	X								1 598 013	1 227 534	5 761.7		Figures for waste included in BU-1.
BU-9	Avenue de Beaulieu 9-11	ENV, OIB	BXL 2005/004	13 040	415	X					X					1 121 208	1 366 654	6 051.4		Figures for waste included in BU-1.
C-25	Avenue de Cortenbergh 25	EPSO, DIGIT		8 574	141	X										1 739 254	683 650	2 540.3	21.65	
CCAB	Rue Froissart 36	SCIC	BXL 2013/049	18 634	552	X	X	X								2 775 621	2 146 076	8 874.4	88.50	
CDMA	Rue du Champ de Mars 21	RTD, JRC	BXL 2009/017	19 096	579	X	X									1 950 652	1 930 988	6 041.0	93.89	
CHAR	Rue de la Loi 170	ECFIN, COMM, TRADE, IAS	BXL 2013/050	55 342	1 357	X	X	X								5 647 620	3 437 886	21 173.3	234.55	
COVE-COV2	Placer Rogier 16	DIGIT, RTD + Agencies	BXL 2014/055	71 430	3 319	X	X	X								6 975 463	6 207 792	28 801.5	235.57	
CSM1	Rue Père de Deken 23	OIB	BXL 2011/026	12 276	419	X	X									843 573	1 029 287	3 136.9	48.32	
DM24	Rue Demot 24	MOVE, ENER, EAS, SANTE, EPSO	BXL 2014/055	15 827	512	X	X									1 393 404	1 052 623	4 516.1	68.03	
DM28	Rue Demot 28	MOVE	BXL 2013/051	11 277	358	X										882 500	1 125 626	3 999.2	46.73	
F101	Rue Froissart 101	SANTE, JUST	BXL 2010/031	8 351	206	X	X									694 368	690 230	2 062.8	55.23	

Building	Address	Occupant	EMAS registration	Useful surface area (PEB in m²)	Staff	Office	Café	Self rest	Creche/ child care	Printing and mail sorting	Medical service	Depot, large storage	Workshop	Sports/ recreation centre	Nuclear lab/experimental	Electricity	Mains gas	Water (m³)	Non hazardous waste (tonnes)	Comment
1) Building essential details 2018:						**2) Building use 2018**										**3) Energy sources and amount (MWh for 2016)**		**4) Water and waste consumption**		
G--1	Avenue de Genève 1	DGT, OIB, AGRI, DIGIT	BXL 2011/037	12 580	236	X			X							1 177 183	533 068	1 655.5	62.17	
G-12	Avenue de Genève 12	DGT	BXL 2011/038	16 946	518	X	X									1 266 921	1 426 943	1 292.9	75.61	
G--6	Avenue de Genève 6	DGT	BXL 2011/039	17 240	469	X	X	X								1 325 052	1 163 663	5 053.1	90.30	
J-27	Rue Joseph II 27	EMPL	BXL 2009/019	13 265	419	X	X									1 100 107	607 728	3 556.5	68.99	
J-30	Rue Joseph II 30	OLAF	BXL 2009/020	18 157	501	X	X									2 791 939	1 242 877	4 253.6	68.08	
J-54	Rue Joseph II 54	DIGIT, DEVCO, EMPL, NEAR	BXL 2007/012	19 739	538	X	X									1 593 396	1 161 737	5 237.6	90.77	
J-59	Rue Joseph II 59	DEVCO	BXL 2010/030	9 396	551	X										849 729	631 931	3 264.4	64.22	
J-70	Rue Joseph II 70	EAC, OSP	BXL 2010/029	20 082	636	X	X									1 578 234	1 597 884	5 238.3	101.69	Electricty in J-70 is exclusively LT.
J-79	Rue Joseph II 79	CDP-OSP , MARE, TAXUD	BXL 2009/021	16 134	425	X	X									1 624 370	802 672	3 652.5	56.20	
J-99	Rue Joseph II 99	MARE	BXL 2014/056	8 281	292	X										616 411	442 842	4 612.4	58.99	
L102	Rue de la Loi 102	AGRI	BXL 2013/052	4 935	132	X										284 540	382 257	1 167.4		
L130	rue de la Loi, 130	AGRI	BXL 2014/057	37 043	1,009	X	X	X								3 528 702	3 538 454	10 272.4	232.56	Includes HT and LT
L-15(3)	Rue de la Loi 15	NEAR	BXL 2013/053	17 482	526	X	X									1 632 731	995 283	2 805.0	108.36	

Building	Address	Occupant	EMAS registration	Useful surface area (PEB in m²)	Staff	Office	Café	Self rest	Creche/ child care	Printing and mail sorting	Medical service	Depot, large storage	Workshop	Sports/ recreation centre	Nuclear lab/experimental	Electricity	Mains gas	Water (m³)	Non hazardous waste (tonnes)	Comment
1) Building essential details 2018:						**2) Building use 2018**										**3) Energy sources and amount (MWh for 2016)**		**4) Water and waste consumption**		
L-41	Rue de la Loi 41	DEVCO	BXL 2009/022	27 864	819	X	X	X								2 773 962	1 681 003	8 677.6	175.76	
L-56	Rue de la Loi 56	COMM ,Galileo	BXL 2012/046	9 666	323	X										878 501	631 526	2 285.1	39.99	
L-86/L-84	Rue de la Loi 86	ECHO	BXL 2011/032	13 355	436	X	X									1 463 465	1 351 885	3 859.3	110.26	L-84/86 waste figures included in L102 figures.
LX40	Rue de Luxembourg 40	TAXUD, JUST	BXL 2013/054	7 803	242	X										591 228	421 398	1 355.9	60.96	
LX46	Rue de Luxembourg 46	HOME, JUST	BXL 2010/023	17 478	508	X										1 688 793	1 712 477	6 159.1	72.08	Includes consumption MO59
MADO	Place Madou, 1	DIGT, COMP,AGRI	BXL 2014/058	40 716	1 044	X	X	X								4 084 301	3 244 296	17 935.0	169.39	
MO34	Rue Montoyer 34	DIGIT, HR	BXL 2005/007	12 820	315	X		X								1 554 049	859 652	3 563.5	110.07	Include waste figures ofr SC11.
MO59	Rue Montoyer 59	JUST	BXL 2010/024	8 671	240	X	X												77.55	Consumption included in LX46.
N105	Avenue des Nerviens 105	GROW	BXL 2010/025	9 546	284	X										938 858	1 168 606	5 377.6	42.08	
ORBN	square Frère Orban, 8	RTD	BXL 2014/059	25 141	736	X	X	X								2 137 557	969 064	3 438.8	77.57	
PLB3	Philippe Le Bon 3	EMPL, HR et Formation	BXL 2015/060	16 584	93	X	X	X								1 842 082	1 674 636	7 704.4	93.65	

Building	Address	Occupant	EMAS registration	Useful surface area (PEB in m²)	Staff	Office	Café	Self rest	Creche/ child care	Printing and mail sorting	Medical service	Depot, large storage	Workshop	Sports/ recreation centre	Nuclear lab/experimental	Electricity	Mains gas	Water (m³)	Non hazardous waste (tonnes)	Comment
1) Building essential details 2018:						**2) Building use 2018**										**3) Energy sources and amount (MWh for 2016)**		**4) Water and waste consumption**		
SC11	Rue de la Science 11	HR	BXL 2005/008	9 002	219	X	X									793 120	726 245	2 541.3		Figures for waste included in MO34.
SPA2	Rue de SPA 2	FISMA	BXL 2012/047	19 567	717	X	X									1 356 135	1 014 750	4 989.7	108.53	
SPA3	Rue de Spa 3	TAXUD, EMPL	BXL 2012/048	12 288	454	X										799 107	689 089	3 848.8	44.18	
VM18	Rue Van Maerlant 18	EAC, SCIC	BXL 2010/028	9 330	117	X	X		X							1 057 721	888 423	1 842.5	86.73	Figures for waste include figures for VM-2.
CLOV (2)	Boulevard Clovis 75	OIB	BXL 2007/010	6 274	20		X	X	X		X					550 971	574 417	6 166.4	71.46	
DAV1 (2)	Avenue de Bourget 1-3	OIB	BXL 2007/011	12 600	115		X			X						1 192 740	952 712	1 115.1	80.05	
WILS (2)	Rue Wilson 16,	OIB	BXL 2007/010	2 544	11				X										21.06	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	1		X	X								1 154 035	1 620 258	4 222.6		Waste figures included in VM18.
COLE (2)	G.Leman 60	OIB	BXL 2011/026	8 850	220		X		X		X					583 260	1 205 419	4 154.2	81.98	

Building	Address	Occupant	EMAS registration	Useful surface area (PEB in m^2)	Staff	Office	Café	Self rest	Creche/ child care	Printing and mail sorting	Medical service	Depot, large storage	Workshop	Sports/ recreation centre	Nuclear lab/experimental	Electricity	Mains gas	Water (m^3)	Non hazardous waste (tonnes)	Comment
1) Building essential details 2018:						**2) Building use 2018**										**3) Energy sources and amount (MWh for 2016)**		**4) Water and waste consumption**		
KORT	Industriepark Gullendelle, Vinkstraat 3 3070 KORTENBERG	OIB.Archives Historiques	VL 2015/002	1 070	6							X				705 413	545 488	1 239.9	39.88	
WALI	Boulevard Clovis 53	OIB	BXL 2015/061	5 679	137		X	X	X		X					268 780	433 865	1 448.7	45.42	
OVER	Dennenboslaan, 54-3090 OVERIJSE	OIB	2015	2 708	7									X		162 248	262 770	1 119.5	45.68	
BRUSSELS TOTALS				1 042 037	27 687											106 820 898	78 023 637	305 890	4805	

European Commission

Environmental Statement 2019

2018 results

Annex B: Luxembourg

EMAS
Verified environmental management
REG.NO. BE-BXL-000003

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Annex B: Luxembourg

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 institution are well carried out. This includes building management, organising removals and space management, transport services for staff and goods for internal purpose, document distribution, administering office supplies as well as welfare facilities for staff (canteens, fit@work spaces...), providing services such as crèches and after-school childminding, ensure compliance and implementation of health and safety requirements in Commission buildings, including the guards contract.

In all aspects of this vast variety of activities, OIL strives to reduce its environmental impact, in accordance with the Commission general policy.

In 2018, the trend is positive for most of the indicators in Luxembourg. Energy consumption in 2018 fell significantly due to the fact that JMO building, built in 1975 with a very poor energy efficiency, has been abandoned and removed from the statistics for the first time.

The main actions taken in 2018 were either of technical nature to reduce the resource consumption or focused on soft mobility.

The Commission focuses many efforts in negotiations with local stakeholders – both public and private – in order to improve the mobility of its staff. Also, OIL has worked with the European Parliament to enable Commission staff to use the shuttle between Luxembourg and Brussels which contributes to the reduction of the total number of missions.

The present document summarizes the environmental performance for Luxembourg and the measures taken to mitigate the impact of our activities. OIL aspires to further improve this performance in the future.

Signed
Marc BECQUET
Director
Office for Infrastructure and logistics Luxembourg (OIL)

Contents

ANNEX B: Luxembourg – Administrative activities

Luxembourg is the European Commission's second largest site and in 2018 hosted 5 016 staff, an increase of 5% over 2017. 11 Commission's Directorates Generals (DG) are present with more than 50 staff members. In total, 18 DG are represents and hosted in 18 buildings[1]. 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.

1 Including Publications Office and Chafea.

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 trend (%) to 2018 (total) since:**				**Target**	
(Number, desciption and unit)	2011 (1)	2014	2016	2017	2018	2011	2014	2016	2017	2014 to 2020	
	EMAS	EMAS	Total	Total	Total					Δ % (2)	value (2)
1a) Energy bldgs (MWh/p)	8.35	17.42	18.43	14.40	11.09	**32.9**	**– 36.3**	**– 39.8**	**– 23.0**	– 5.0	16.55
1a) Energy bldgs (KWh/m²)	229	393	356	286	308	**34.6**	**– 21.7**	**– 13.6**	**7.6**	– 5.0	373
1c) Non ren. energy use (bldgs) %		27.8	53.2	54.8	47.8		**71.6**	**– 10.2**	**– 12.8**	0.0	27.8
1d) Water (m³/p)	12.26	14.48	18.61	15.18	14.21	**15.9**	– 1.9	**– 23.6**	**– 6.4**	0.0	14.48
1d) Water (L/m²)	352	327	359	302	394	**11.9**	**20.7**	**9.7**	**30.7**	0.0	327
1e) Office paper (Tonnes/p)	0.034	0.024	0.017	0.015	0.016	**– 53.2**	**– 33.5**	– 4.5	**8.5**	– 40.0	0.014
1e) Office paper (Sheets/p/day)	32	24	17	15	16	**– 50.1**	**– 33.5**	– 4.5	**8.5**	– 40.0	14.4
2a) CO_2 buildings (Tonnes/p)	0.18	1.61	1.89	1.45	0.99	**453.1**	**– 38.2**	**– 47.7**	**– 31.8**	– 5.0	1.5
2a) CO_2 buildings (kg/m²)	5	36	37	29	27	**459.9**	**– 24.0**	**– 24.8**	– 4.8	– 5.0	34.4
2c) CO_2 vehicles (g/km, manu.)	191	171	161	158	145	**– 24.3**	**– 15.5**	**– 10.4**	**– 8.5**	– 15.0	145
2c) CO_2 vehicles (g/km, actual)	240	260	263	256	251	4.8	– 3.5	– 4.2	– 1.8	– 5.0	247
3a) Non haz. waste (Tonnes/p)	0.245	0.103	0.222	0.179	0.135	**– 45.0**	**31.6**	**– 39.2**	**– 24.6**	0.0	0.103
3b) Hazardous waste (Tonnes/p)	0.0017	0.0015	0.0033	0.0047	0.0055	**213.3**	**274.9**	**66.8**	**15.9**	0.0	0.001
3c) Separated waste (%)	38.2	44.7	61.8	59.3	57.0	**49.3**	**27.6**	**– 7.8**	**– 3.8**	45.0	64.8
Economic indicators (Eur/p)											
Energy consumption (bldgs)		765	578	404	349		**– 54.3**	**– 39.6**	**– 13.5**	0.0	765
Water consumption		61.54	79.09	64.53	60.40		– 1.9	**– 23.6**	**– 6.4**	0.0	61.54
Non haz. waste disposal		35.07	75.86	57.49	52.55		**49.8**	**– 30.7**	**– 8.6**	0.0	35.07

Note: (1) Earliest reported data; (2) compared to 2014, based on percentages identified in the EMAS annual action plan 2019

Table B1a: Historic data values for EMAS buildings only

	2011	2014	2015	2016	2017	2018
	EMAS	**EMAS**	**EMAS**	**EMAS**	**EMAS**	**EMAS**
1a) Energy bldgs (MWh/p)	8.35	17.42	14.40	11.25	12.45	10.73
1a) Energy bldgs (KWh/m^2)	229	395	342	313	346	301
1c) Non ren. energy use (bldgs) %	0.00	27.83	64.6	51.0	53.6	45.5
1d) Water (m^3/p)	12.26	14.48	11.32	13.71	13.48	12.57
1d) Water (L/m^2)	352	329	269	381	375	353
2a) CO_2 buildings (Tonnes/p)	1.19	1.91	2.06	1.50	1.73	0.94
2a) CO_2 buildings (kg/m^2)	32	43	49	42	48	26
3a) Non haz. waste (Tonnes/p)	0.25	0.10	0.20	0.10	0.12	0.12
3b) Hazardous waste (Tonnes/p)	0.002	0.001	0.001	0.002	0.003	0.004
3c) Separated waste (%)	38.2	44.7	73.8	53.0	50.2	55.1

Until 2014, indicators were reported only for buildings included in the EMAS registration. Since 2015, indicators include all Commission buildings of the Luxembourg[2]. Figures prior to 2015 are therefore not really comparable with the ones of the 2015 – 2018 period.

The evolution of indicators for all buildings since 2011 is shown in table B1, for EMAS registered buildings in table B1a.

All staff moved out of the Jean Monnet building (JMO), the Commission's main seat in Luxembourg, by August 2016. However, the JMO remained operational until 1st June 2017, owing to the large amount of equipment and material that had to be removed. 2018 is therefore the first year where JMO data is not included in the data collection, which explains the increase for indicators per square meter.

In 2018, the trend is positive for most of the indicators, except for indicators per square meter for the reason mentioned above. Per capita consumption decreased significantly compared to 2017 for energy (-23%) and somewhat for water (-6,4%). Also non-hazardous waste quantities decreased (-26,8%), but there was an increase for hazardous waste per capita (15,9%) and also the percentage of sorted waste decreased slightly (1,2%), remaining however still rather high (58,3%).

The paper consumption is based on the purchases. It increased by 8,5% - the price of paper was expected to increase in 2018 and due to the low level of paper stock, the Publications Office decided to make a larger than normal purchase in the beginning of 2018.

In 2018, the buildings entering the scope of EMAS are the *Foyer Européen*, Betzdorf data centre and new telecom centre hosted in the Windhof data centre (verified already in 2015). The Foyer européen is the professional and cultural centre for the European institutions in Luxembourg and the main venue for interinstitutional meetings and exchanges. The building dating from 1920s and located in the heart of Luxembourg City houses a restaurant *a la carte*, a lounge bar and several meeting rooms. The cultural centre of EU institutions including handycraft clubs have their base in the building.

Betzdorf data centre is managed by ebrc, European Business Reliance Centre, an entity that manages also Windhof data centre, audited in 2015.

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
Population: staff in EMAS perimeter	759	1 315	1 422	1 492	2 378	3 912	4 059	4 277
Population: total staff	3 999	3 997	4 048	4 043	4 667	4 653	4 786	5 016
No. buildings for EMAS registration	2	3	4	6	7	10	11	14
Total no. operational buildings	13	14	14	14	17	19	19	18
Useful surface area in EMAS perimeter, (m^2)	27 710	53 808	64 703	66 161	100 221	140 479	145 697	152 455
Useful surface area for all buildings, (m^2)	187 912	198 807	198 807	198 807	223 997	241 023	241 023	180 906

[2] 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.

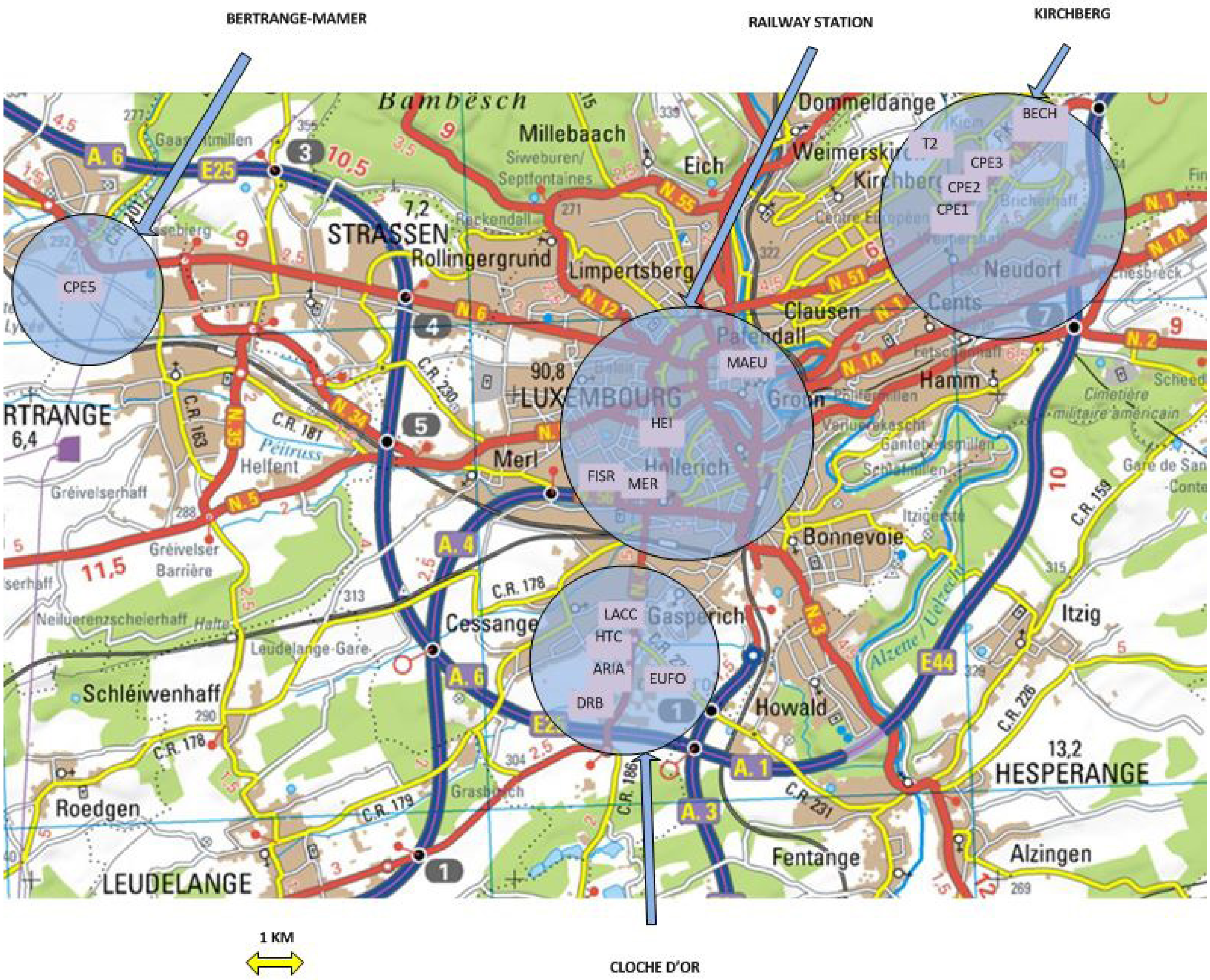
85% of the staff is hosted in EMAS registered buildings.

B2 Description of Luxembourg activities and key stakeholders:

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. Betzdorf data centre is located North-East of Luxembourg City.

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.

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 below.

Table B3: Commission buildings in Luxembourg

EMAS Surface
Non-EMAS Surface

Number	Building	EMAS year	Surface (on the ground, m²)	% of EMAS surface of total surface	Staff **	Year of construction	Year of acquisition or leasing	Occupation type
1	DRB	2012	27 124	14.99	852	2003	B: 2006; A: 2009; D: 2010	Rental
2	HITEC (office)	2012	4 194	2.32	96	1996	2005	Rental
3	EUFO	2013	26 098	14.43	568	1995 and 2003	1995, 2003	Emphyteosis with purchase option
4	CPE 5	2014	10 895	6.02	41	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	0.67	4	2005-2007	2007, 2009	Rental
7	BECH	2016	34 060	18.83	887	1996 and 1999 F4	1998, 2005	Rental
8	ARIANE	2017	13 624	7.53	539	1999	2015	Rental
9	LACCOLITH	2017	11 292	6.24	426	1999	2015	Rental
10	T2	2017	15 342	8.48	496	2016	2016	Rental
11	CPE 3	2018	5 218	2.88	52	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	1 684	0.93	0	2010-2012	2016	Rental
15	FISCHER	2021	3 526	1.95	0	2002?	2005	Rental
16	CPE 1 & 2	Will be replaced	4 370	2.42	37	avant 1984	1984	Rental
17	MERCIER	Will be replaced	19 626	10.85	673	1970, 1984	I: 1973, 1998; II: 1985	Rental
18	Maison de l'Europe - MAEU	Will be replaced	929	0.51	13	avant 1974	2005	Rental
TOTAL			**180 906**	**100.00**	**4.689**			
EMAS TOTAL			**152 455**	**84.27%**	**3.966**			

In red = figures updated compared to previous years

* For data and telecom centres, underground surface is also considered

** Population on 25/01/2019 based on COMREF database

Additional office / workshop / storage surfaces have been incorporated in the DRB building while T2, DC Betzdorf and Mercier surfaces have been slightly adjusted according to their lease contracts.

The main real estate project for the Commission in Luxembourg is the construction of a new seat, the JMO2, in the Kirchberg area. Delivery of this building is scheduled in two phases, end February 2023 and end February 2024.

JMO2 will replace most of the rented office buildings: DRB, HTC, BECH, ARIANE, LACC and T2.

The Mercier building presently hosting the Publications office will be replaced within 3-4 years as it will be destroyed in the medium-term. CPE 1 and 2 buildings will also be replaced by a new building to be built by the Luxembourg authorities. A real estate procedure will probably be launched to find new premises for the "House of Europe", presently hosted at MAEU. For these reasons, these buildings will not be included in the EMAS scope.

Fischer building, located in the railway station area close to the Mercier building is under complete renovation in order to turn it into a training centre for European Commission. As soon as the construction works are finished, the building can be included into EMAS scope.

The major interested parties of the Commission at Luxembourg are:

- Commission Directorates and services
- Other European institutions and bodies
- Policy makers and regulatory authorities
- European Commission staff, including staff representatives
- Children attending CPEs
- In-house and external contractors, consultants, suppliers, landlords
- Others occupants in shared buildings and landlords
- Neighbours with whom we share the same mobility issues
- Media, civil society and general public

OIL stakeholders analysis focuses on two main issues:

Mobility

One of the main specificities of the Luxembourg site is the large number of commuters. 180 000 workers (half from France, a quarter each from Germany and Belgium)[3] commute daily to the country, with a high proportion to Luxembourg City. This is a very high proportion of the country's population (602 000), and exceeds that of the capital city (116 000).

Luxembourg is a very attractive work place located in the so-called "Grande Région" and this influences the real estate prices, including rental. The high prices force many workers, including Commission agents and external workers on lower salaries, to live outside the country.

The population is growing fast with 20% growth seen in 6 years in Luxembourg city. There are commercial and residential construction sites everywhere and there is huge public investment in the transport sector. Luxembourg City has witnessed the inauguration of the tram, two new railway stations and a funicular, all in 2017. In addition, starting from 1 March 2020, the public transport will be free of charge in the whole of Luxembourg country.

In this context, the Commission focuses many efforts in negotiations with local stakeholders – both public and private – in order to improve the mobility of its staff (see B4 below).

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"…) 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.

[3] Figures from 2016 by STATEC, the Luxembourg National Institute of Statistics

B3 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. Below is a summary of the main aspects and measures that were undertaken or ongoing in 2018.

Table B4: Summary of significant environmental aspects and mitigating measures in 2018 for the Luxembourg site

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	◆ Two cold corridors have been installed in the Windhof Data Centre to reduce energy consumption (278). Additional ones to be installed in 2019 ◆ In-depth analysis of energy consumption with regular reports and meetings with teams / contractors in charge of maintenance (34) ◆ In certain buildings, diminishing the temperature during the closing week of the offices at the end of the year (272)
Resource consumption (water)	Water for sanitation and installations, water consumption	Reduced potable water sources potable impact on aquatic diversity	◆ Study of technical measures and studies to reduce water usage in different buildings (different measures already put in place before 2018)
Resource consumption	Office furniture, equipment ans services	Depletion of resources	◆ Implementation of e-signatures for financial transactions (448 - fully implemented in 2019) ◆ 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	◆ Leaking controls on gases according to the regulation ◆ Replacement of petrol cars with two electric cars and two hydrid-cars. Lease of EURO 6 cars. Further replacement of old cars in 2019. ◆ Jobkaart:this transport card, valid in Luxembourg city, is subsidised and distributed free of charge ◆ M-Pass:OIL has obtained an agreement to subsidise this annual transport card, valid throughout the country, from 2019 on ◆ OIL maintains a fleet of service bikes ◆ OIL – in cooperation with DG HR – has organised the VeloMai campaign to promote bike to work. In that scope, free of charge city bikes cards have been distributed ◆ Promotion of carsharing initiatives
Air	Air emissions from the nuclear laboratories	Radioactivity	DG ENER's radiation protection laboratory ISO 17025 accredited since 2016. No specific measure in 2018
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) + OIL.03 control (149) ◆ Since 2017, all restaurants and cafeterias have a centralised organic waste collection (135) ◆ Continuous information of cleaning contractor on the needs for better waste sorting (148) ◆ Info-session to waste sorting / management for EU staff ◆ Donation of dismantled IT equipment (implemented by DIGIT) ◆ Specific instructions for the waste management of the clubs at Le Foyer
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 discharge by DG ENER in 2018, thanks amongst others to the dry cleaning of the premises

()= Number of action included in the Commission's EMAS Global Annual Action Plan (GAAP)

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.

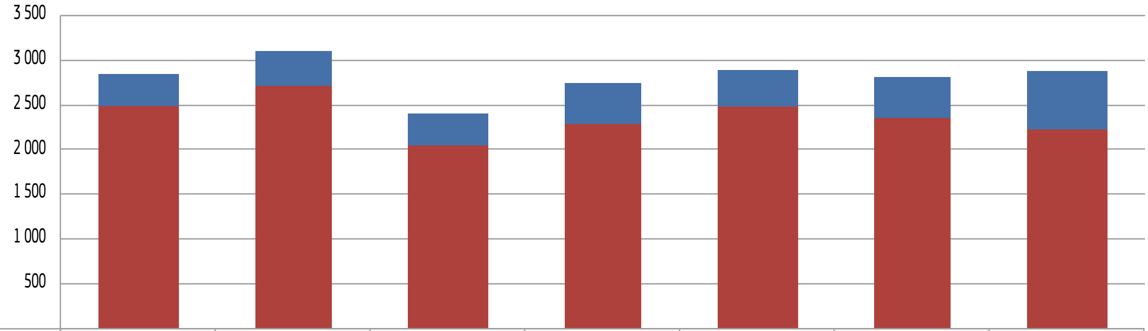
Other real estate projects like the relocation of the Publications Office (to replace the Mercier) or the construction of a new Child Care facility (to replace CPE 1 and 2) also intend to have buildings with a higher environmental performance than the present ones.

B4 More efficient use of natural resources

B4.1 Energy consumption

Buildings energy consumption data should be considered in the context of climatic conditions. With the heat wave in summer 2018, the decrease in heating days (compared to 2017) has been more than compensated by the increase in cooling days.

Figure B2: Total annual degree-days in Luxembourg, 2012-2018



	2012	2013	2014	2015	2016	2017	2018
Total degree days	2 841	3 108	2 395	2 745	2 891	2 799	2 877
Cooling degree days	365	390	357	457	410	454	655
Heating degree days	2 476	2 718	2 038	2 288	2 481	2 345	2 222
kWh/person/ degree day (2)	3.78	3.45	7.27	6.45	6.38	5.15	3.86

(1) www.degreedays.net; monthly data for ELLX station (15.5 C reference temperature)

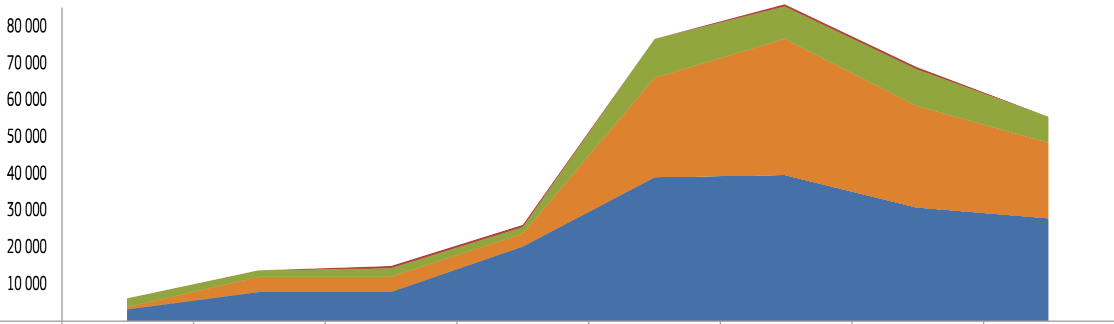
(2) Using buildings energy consumption data for Luxembourg site

a) 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.

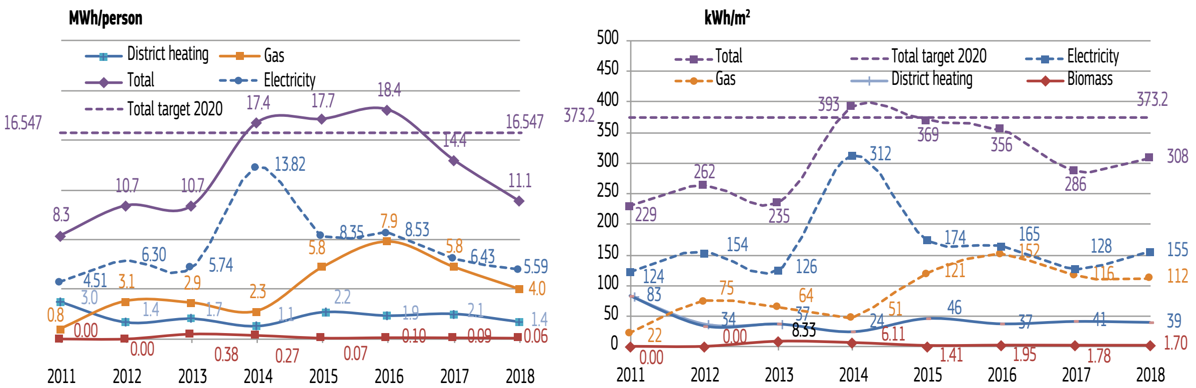
Energy consumption in 2018 fell significantly due to the fact that JMO building, built in 1975 with a very poor energy efficiency, has been removed from the statistics for the first time, therefore the consumption of gas was considerably lower than in 2017.

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
Total energy buildings	6 335	14 124	15 230	25 988	76 681	85 766	68 929	55 647
vii) renewables - biomass			539	404	317	469	429	308
v) district heating	2 292	1 815	2 375	1 603	10 244	8 932	9 867	7 140
ii) mains supplied gas	618	4 020	4 149	3 361	27 161	36 667	27 875	20 174
i) total supplied electricity	3 425	8 289	8 167	20 620	38 958	39 698	30 758	28 025

Figures B4 and B5: Evolution of total annual energy consumption (per capita and per square metre)



Diesel consumption is not included as it represents a very low value.

Emissions concerning gas and district heating/cooling have been recalculated, including for 2016 and 2017, as cooling for BECH is produced with gas and is no more considered as district cooling. As the emissions for gas are lower there is a global reduction of emissions. 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.

The large peak in 2014 in both graphs is due to the inclusion of data centres in the scope. After the removal of JMO statistics in the data collection, the indicator per capita continues to decrease but the indicator for square meter has increased in 2018, however, it remains below the long term target for 2020.

Actions prioritising the reduction of energy consumption (indicator 1a) are included in the annual action plan (see table B4). The majority of actions focus on technical improvements for the heating system where possible, such as changing thermostatic valves, installing "cold corridors" in data centres and measures relating to lightning.

b) Vehicles

At the end of 2018, the Luxembourg site has a fleet of 33 vehicles (including DG ENER vehicles), of which eight are owned and the remainder leased. Two Publications Office vehicles have been included in the fleet in 2018. These include:

- 14 sedans (3 allocated to director generals, and 11 for missions, mostly to Brussels and Strasbourg)
- 11 people carriers (including 3 small vans)
- 6 commercial vehicles for transport of goods and equipment
- 2 refrigerated trucks.

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 36 missions in 2018 for DG ENER transporting equipment to nuclear premises across Europe.

The majority of OIL's missions 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
Total (MWh/yr)	535	560	592	698	645	703
MWh/person	0.38	0.38	0.13	0.15	0.13	0.14
kWh/m²	2.7	2.8	2.6	2.9	2.7	3.9
Diesel used, (m³)	48.5	50.5	53.3	62.8	58.6	61.3
Petrol used, (m³)	0.7	1.0	1.3	1.5	0.7	3.8

In 2018, the per capita consumption of Commission service vehicles increased marginally (0,14 MWh per person). The cars travelled a record of 812 152 km, partially due to the fact that Publications Office vehicles have been incorporated in the fleet as well as the staff increase.

OIL has worked with the European Parliament to enable Commission staff to use the shuttle between Luxembourg and Brussels which contributes to the reduction of the total number of missions. The pilot phase started in October 2018 and has seen growing number of satisfied customers. Commission plans to sign a service level agreement with European Parliament in 2019 in order to officialise the cooperation and advertise the service to a larger audience.

c) 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**
Electricity from renewables (%)	100	100	100	89	97	100	100	100
Electricity from renewables (MWh)	3 425	8 289	8 167	18 352	37 945	39 698	30 758	28 025
Site biomass (% renewable)			100	100	100	100	100	100
Site biomass (MWh)			539	404	317	469	429	308
Renewables (MWh)	**3 425**	**8 289**	**8 706**	**18 756**	**38 262**	**40 167**	**31 187**	**29 069**
Renewables (% of total energy)	**54**	**59**	**57**	**72**	**46**	**47**	**45**	**52**
Electricity from non-renewables (%)				11	3			
Electricity from non-renewables (MWh)				2 268	1 013			
Mains supplied gas (% non renewable)	100	100	100	100	100	100	100	100
Mains supplied gas (MWh)	618	4 020	4 149	3 361	27 161	36 667	27 875	20 174
District heating and cooling (% non renewable)	100	100	100	100	100	100	100	90
District heating and cooling (MWh)	2 292	1 815	2 375	1 603	10 244	8 932	9 867	6 404
Non renewables (MWh)		**5 835**	**6 524**	**7 232**	**44 347**	**45 600**	**37 746**	**26 579**
Non renewables (% of total energy)		**41**	**43**	**28**	**54**	**53**	**55**	**48**

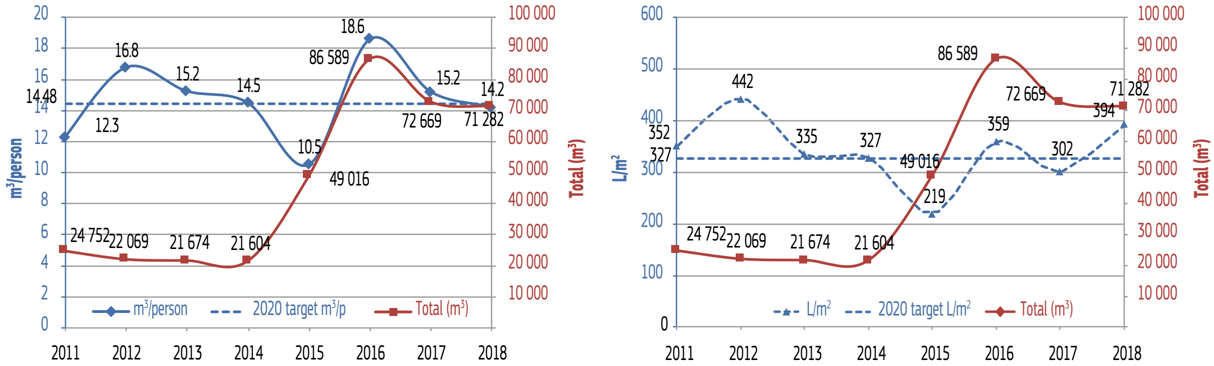
Renewable electricity (indicator 1c) accounted for 100% of total supplied electricity. The Commission has a contract for electricity derived from 100 % renewable sources since 2013. The electricity supply for all data and telecom centres – directly purchased by the property owners to the energy companies – comes also from 100 % renewable sources. The biomass is used in the wood-fuelled boiler at CPE5. The urban heating system in CPE 1&2 also works with biomass energy.

In 2018, the proportion of renewable energy increased from 45% to 52% mainly due to the fact that JMO gas consumption is no longer accounted for. The total electricity and gas consumptions have decreased for the same reasons.

The proportion of renewable energy should increase in future, as district heating and cooling systems will increasingly be supplied by renewable energy sources (bio-waste in Cloche d'Or from 2020 on)).

B4.2 Water consumption

Figures B6 and B7: Evolution of total annual water consumption for buildings (indicator 1d)



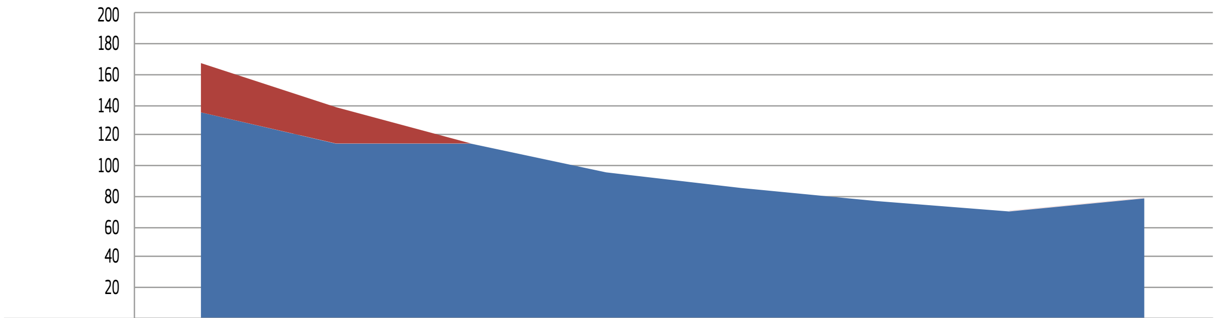
All buildings are considered for the first time in 2015 (only EMAS buildings until then), which explains the increase between 2014 and 2015. In 2015 the staff previously hosted in JMO had to remove to three new rented buildings with a considerable increase in consumption.

The total water consumption shown by the red line of figures B6 and B7 remains stable compared to 2017. The consumption per capita has decreased with 6%. The increase in indicator for square meter is due to the fact that JMO data is no longer included in the statistics and the total surface has been reduced by 1/4.

B4.3 Office and offset paper

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)



	2011	2012	2013	2014	2015	2016	2017	2018
Office (A4 sheet equivalent) x1 000 000	27. 1	23. 1	22. 9	20. 5	18. 3	16. 4	14. 7	16. 8
Total paper consumption (tonnes)	167	138	114	96	86	77	70	79
Offset paper (tonnes)	32	23						
Office paper (tonnes)	135	115	114	96	86	77	70	79

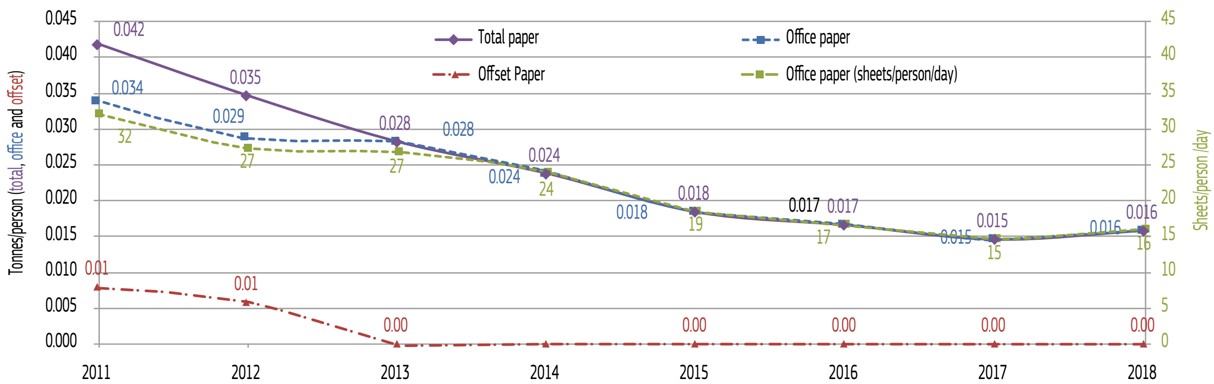


Figure B8 shows how office paper use has reduced over time. However, as there was a purchase done in the beginning of 2018 in order to fill depleted stock and avoid announced price increase, the consumption has increased in 2018 in comparison with 2017.

In 2018, the office paper consumption was around 16,7 million equivalent A4 pages. 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.

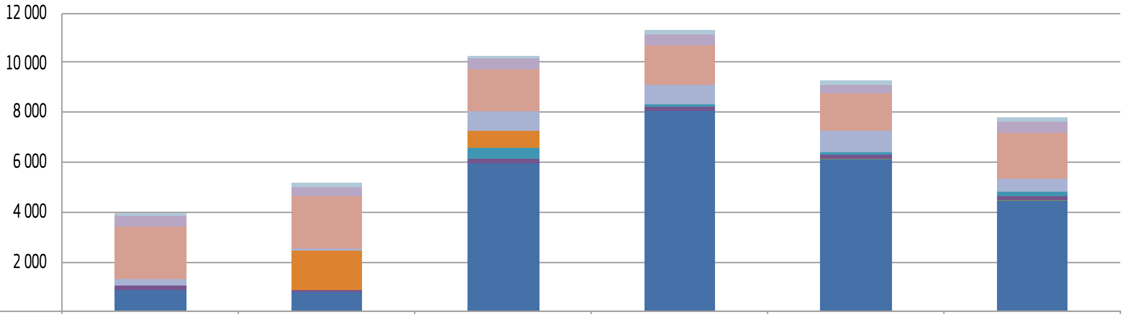
Special paper used by the Publications Office print shop is considered for the total paper consumption in tons but not for the number of office sheets. However it represents a very small proportion of the global tonnage (0.6 / 79.2 tons).

The number of pages per person per day shown in figure B9 increased due to above mentioned reason from 15 to 16. OIL ceased to use offset machines in its print shop in 2013.

B5 Reducing air emissions and carbon footprint

B5.1 Carbon footprint

Figure B10: Carbon footprint contributors for Luxembourg (Tonnes CO_2)



	2013	2014	2015	2016	2017	2018
Sum	3 965	5 149	10 282	11 294	9 297	7 787
Scope 3 - Commuting	0	0	0	0	0	0
Scope 3 - Business travel: air taxi	0	0	0	0	0	0
Scope 3 - Business travel: private car	120	126	133	157	145	158
Scope 3 - Business travel: hire car	419	390	427	470	421	424
Scope 3 - Business travel: rail	11	9	9	6	6	5
Scope 3 - Business travel: air	2 149	2 067	1 624	1 554	1 472	1 830
Scope 2 - District heating (+cooling)	197	133	850	741	819	532
Scope 2 - External electricity supply	0	1 522	680	0	0	0
Scope 1 - Refrigerant leaks	0	0	407	89	108	191
Scope 1 - Commission vehicle fleet	155	163	172	203	187	204
Scope 1 - Fuel for bldgs: diesel	0	0	0	0	1	0
Scope 1 - Fuel for bldgs: tanked gas	0	0	0	0	0	0
Scope 1 - Fuel for bldgs: mains gas	914	740	5 981	8 074	6 138	4 442

Note: RFI 2 used for air travel emissions

As can be seen in figure B10, heating and cooling of buildings is by far the main component of the carbon footprint. As the buildings portfolio evolves each year (two Datacentre incorporated in 2014, one in 2016, three new office buildings in 2015, JMO abandon in 2017), figures are sofar difficult to compare but the situation will be more stable from 2018 on.

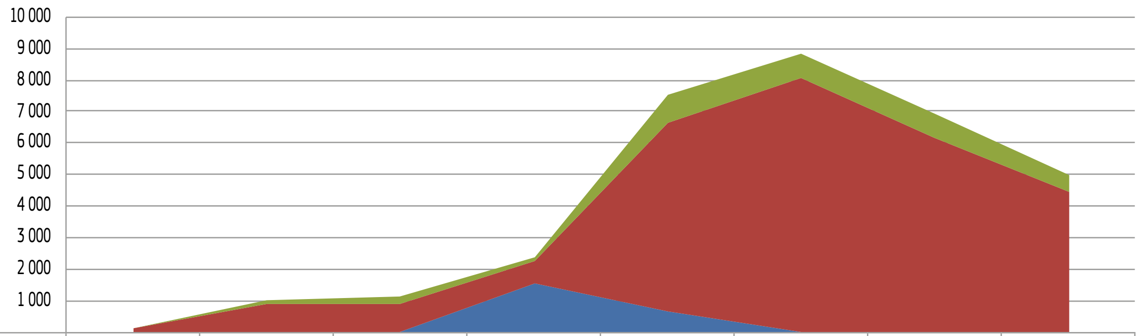
CO_2 emissions due to commuting is not calculated but OIL investigates the possibility to evaluate this in the coming years. OIL has started collecting data about indirect emissions (scope 3) linked to the construction of the buildings EC occupies, to IT equipment, to service contracts (guards, cleaning…) and to food consumption. The results of this data collection will be included in the environmental statement from 2020 on (data 2019).

B5.2 CO_2 emissions from buildings

a) Buildings (energy consumption)

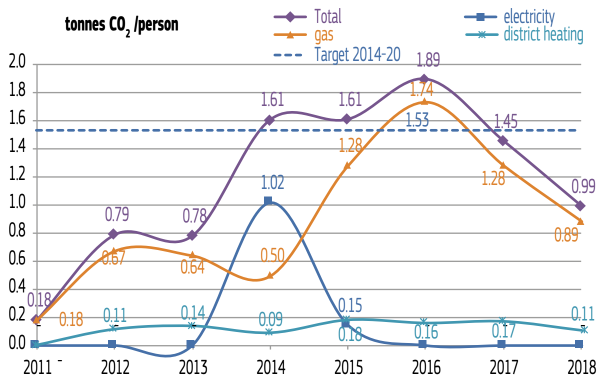
Figures B11, B12, B13: CO_2 emissions from buildings heating, tonnes and tonnes/person, kg/m², (indicator 2a)

B11

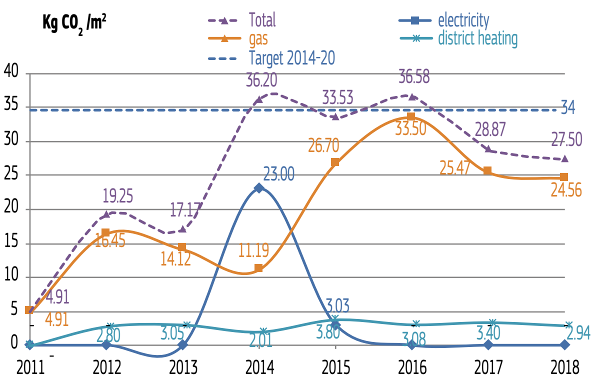


	2011	2012	2013	2014	2015	2016	2017	2018
Total	136	1 036	1 111	2 395	7 511	8 816	6 958	4 974
district heating/ cooling		151	197	133	850	741	819	532
mains gas	136	885	914	740	5 981	8 074	6 138	4 442
electricity	0	0	0	1 522	680	0	0	0

B12



B13



CO_2 emissions per capita have decreased considerably in 2018 compared to 2017 after the removal of JMO data from the statistics. The indicator per square meter has also decreased, although very slightly.

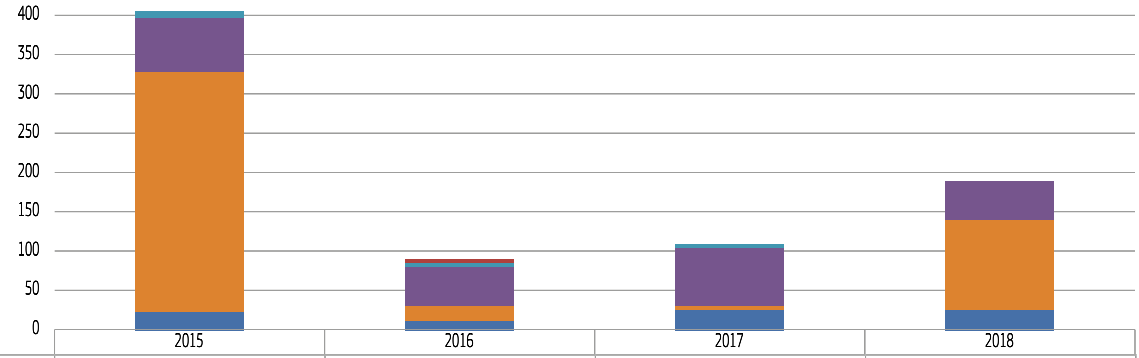
EBRC, which manages Windhof and Betzdorf Data Centre (DC) is ISO 50001 and ISO 14001 certified. EBRC participates in the Code of Conduct for Energy Efficiency in data centres aiming to reduce their energy consumption. Both DC improved their efficiency since 2014. The Commission contributes to this objective when installing cold corridors in the data centres rooms (cf table B4).

CO_2 emissions reductions are generally considered a consequence of actions targeting a reduction in energy consumption. It is likely that more renewable energy sources will be used to provide district heating and cooling generated, therefore probably decreasing CO_2 emissions.

b) Buildings – other greenhouse gases (refrigerants)

The HVAC[4] 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 four types of gases.

Figure B14: Total losses from gases



	2015	2016	2017	2018
TOTAL (as tCO2equiv)	407	89	108	191
R417A	0	4	0	0
R407C	9	4	4	0
R404A	70	50	72	51
R134A	305	19	5	114
R410A	23	22	26	26

All equipments with other HFCs gases like R22 have been decommissioned.

B5.3 CO_2 emissions from vehicles (indicator 2c)

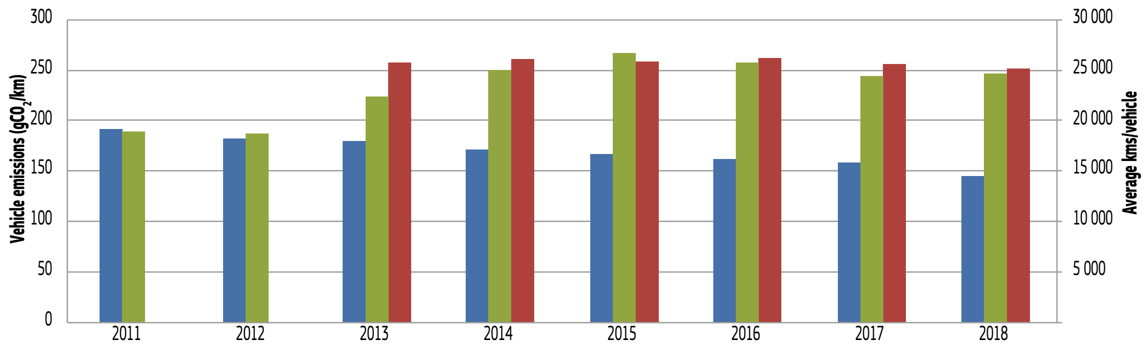
a) Commission vehicle fleet

Table B7: Total emissions from the Luxembourg vehicle fleet

	2013	2014	2015	2016	2017	2018
Site vehicle CO_2 emissions (tonnes)	155	163	172	203	187	204
tonnes CO_2/person	0.038	0.040	0.037	0.044	0.039	0.041
i) from diesel (tonnes)	153	160	168	199	185	194
ii) from petrol	2.0	2.9	3.6	4.1	2.0	10.6

The global increase since 2013 is due to a larger number of vehicles included in the fleet (from 27 to 33) and number of kilometres done (from 603 000 to 812 000 = + 35%) which can mainly be explained by the 24 % staff increase.

Figure B15 Emissions per km and distance travelled per vehicle



	2011	2012	2013	2014	2015	2016	2017	2018
gCO2/km (manufacturer)	191	182	179	171	167	161	158	145
gCO_2/km (actual)			257	260	258	263	256	251
kms/vehicle	18 899	18 626	22 331	24 956	26 640	25 727	24 369	24 611

4 HVAC : Heating Ventilation Air Conditioning

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 Commission in Luxembourg has now 23 cars with EUFO 6 emission standard, up from 18 in 2017.

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.

Actual emissions per km, calculated from fuel consumption, have remained relatively stable since 2013, with a small decrease since 2017. Figures for 2011 and 2012 have been removed has the way they were calculated is considered to be not relevant.

b) Missions and local work based travel (excluding Commission vehicle fleet)

OIL has worked with the European Parliament to enable Commission staff to use the shuttle between Luxembourg and Brussels which contributes to the reduction of the total number of missions. The pilot phase started in October 2018 and has seen growing number of satisfied customers. Commission plans to sign a service level agreement with European Parliament in 2019 in order to officialise the cooperation and advertise the service to a larger audience (no official communication done at the moment).

Moreover, corporate activities related to missions include promoting videoconferencing in order to reduce the number of missions.

c) Commuting

Measures taken in 2018 to promote more environmentally friendly transport means for staff included:

- 3,800 Commission staff benefit from the Jobkaart. This card can be used throughout the public transport networks of Luxembourg City and is subsidised by the Commission and the city.
- Subsidised annual M-Pass card for the transport network within the Grand Duchy of Luxembourg. OIL has continuously worked with other institutions to enlarge the coverage of M-Pass. There are possibilities to combine the M-Pass with regional railway and bus tickets from neighbouring countries. 281 M-Pass have been ordered and distributed in 2018, for Commission staff, but also for staff of the Publications Office, the Translation Centre and the Consumers, Health, Agriculture and Food Executive Agency.
- 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 1.161 service bicycle journeys in 2018, slightly more than in 2017.
- Participating in campaigns to promote public transport use and soft mobility (for more details, please see below).

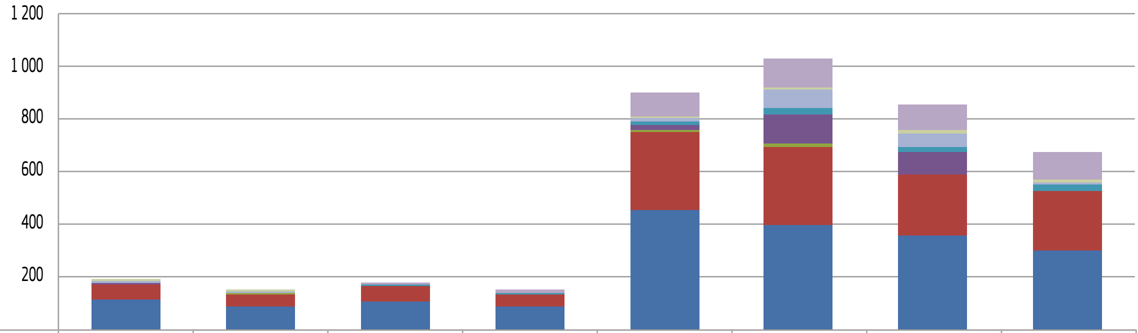
B5.4 Total air emissions of other air pollutants (SO_2, NO_2, PM)

These are currently not evaluated.

B6 Improving waste management and sorting

B6.1 Non-hazardous waste

Figure B16: Evolution of total non-hazardous waste in Luxembourg (tonnes)



	2011	2012	2013	2014	2015	2016	2017	2018
Total	186	145	177	153	904	1032	856	677
Total (tonnes/ person)	0.245	0.110	0.124	0.103	0.194	0.222	0.179	0.135
Kitchen waste	0.0	0.0	1.2	9.5	92	112	94	102
Valorlux	1.2	1.0	2.0	2.5	7.1	6.7	13.7	11.5
Metal drinks cans	0.1	0.2	0.4	0.0	0.0	0.0	0.0	0.0
Wood	3.1	1.5	1.4	0.8	13.8	68	52	7
Storage tins	1.1	0.8	0.6	0.4	0.1	1.5	0.0	0.0
Glass	4.1	3.6	3.4	3.2	10.8	27.3	21.2	25.5
Metals	0.7	0.4	0.5	0.4	19.8	109	84	0
Plastic	3.9	3.1	3.0	1.7	4.2	8.9	1.3	2.1
Paper and card	56.2	48.5	57.6	48.6	301	298	233	226
Unsorted waste	116	86.0	107	85.8	456	400	358	303

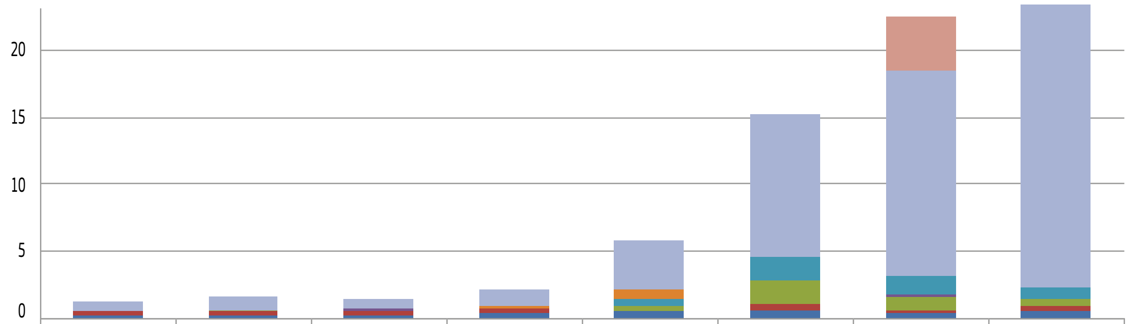
With no more waste recorded in the JMO building for the first time, to total waste quantities have impressively been reduced of 21% compared to 2017.

Waste data collection has become more precise in 2017 but quantities for unsorted waste, which is collected by the City of Luxembourg is estimated from the number of waste containers per building, except in BECH and EUFO where there is a waste compactor and accurate weighing. In order to have more accurate figures in the future, OIL is still considering installing new waste compactors in buildings where there is enough space.

The quantity of non-hazardous waste measured on a per capita basis decreased from 222 kg in 2016 to 179 kg in 2017 and 135 kg in 2018.

B6.2 Hazardous Waste

Figure B17: Evolution of total hazardous waste in Luxembourg (tonnes)



	2011	2012	2013	2014	2015	2016	2017	2018
Total	1.32	1.66	1.48	2.17	5.95	15.22	22.54	27.38
Total (tonnes/person)	0.002	0.001	0.001	0.001	0.001	0.003	0.005	0.005
Other Hazardous waste							4.01	4.04
Oil and fat	0.65	1.07	0.71	1.25	3.67	10.7	15.3	21.0
Electric cables	0.00	0.00	0.00	0.14	0.69	0.00	0.00	0.02
Cartridges	0.00	0.00	0.00	0.00	0.38	1.69	1.31	0.72
Data support	0.00	0.00	0.15	0.00	0.00	0.00	0.27	0.07
Used containers	0.05	0.05	0.00	0.04	0.34	1.78	0.97	0.45
Used batteries	0.28	0.29	0.35	0.36	0.02	0.48	0.12	0.42
Medical waste	0.35	0.26	0.27	0.38	0.70	0.62	0.53	0.63

There was a small increase in the hazardous waste quantities in 2018, however, the overall share remains very low, representing 4% of the total.

B6.3 Waste sorting

Table B8: Percentage of waste sorted at the Commission in Luxembourg

	2011	2012	2013	2014	2015	2016	2017	2018
Percentage of waste sorted	38.2	41.4	40.1	44.7	49.9	61.8	59.3	57.0
Percentage of waste not sorted	61.8	58.6	59.9	55.3	50.1	38.2	40.7	43.0

There has been a slight decrease in the waste recycling rate in 2018 despite the controls on waste sorting in place.

Awareness raising of Commission and contractor staff, especially those in the cleaning and kitchen teams, has been reinforced. Two info-sessions on waste management have been provided for staff of the Child care facilities (CPE). Children attending the CPE are also sensitised by the EC educators on environmental friendly behaviours: thematic visits, workshops on waste sorting, on recycling. These kind of actions will continue in 2019.

In the Laccolith building, the waste management, previously under the owner's responsibility has been brought back under OIL responsibility in order to improve waste sorting rates.

B7 Protecting biodiversity

In the contract for maintenance of lawns, patios and outdoor plantings, the contractor is encouraged to use eco-friendly products. The present contractor is ISO-14001 certified.

The BREEAM Excellent label that OIL and the Luxembourg authorities want to reach for the new JMO2 building also include criterias concerning the biodiversity.

B8 Green Public Procurement (GPP)

B8.1 Incorporating GPP into procurement contracts

OIL aims to integrate environmental criteria into its contracts, with the 5 contracts out of 5 signed in 2018, each worth more than 60 000 euros, including such criteria.

B8.2 Office supplies

Office supplies are delivered by a single provider. Approximately 35% of products in the catalogue carried a “green” designation. The promotion of eco-friendly products has been reinforced, amongst others during the 2018 Green week.

B9 Demonstrating legal compliance and emergency preparedness

The EMAS regulation requires EMAS-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 2018, OIL conducted actions in the following fields:

- Follow-up of legal compliance, including monitoring of controls, analyses of reports, follow-up of remarks received from national administration and implementation of action plans if needed.
- In cooperation with Luxcontrol, assessment of regulartory environmental compliance for buildings occupied by European Commission, improvement of existing procedures and updating permits.
- Continues development of network of contact persons within the various accredited bodies and control offices in Luxembourg.
- Participation at the 3rd annual Conference on Environmental Legislation organised by the Luxembourg Institute of Science and Technology (LIST).
- Participation at the training concerning the new legislation on the Refrigerants.
- Participation at the meeting concerning the presentation of the new Infeurope data base (see point B9.1.)

B9.1 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 to follow up.

DG ENER has its own regulatory monitoring.

B9.2 Prevention, risk management and emergency preparedness

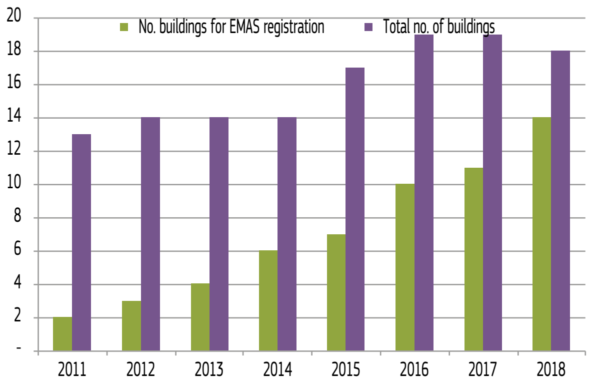
OIL has several measures in place to prevent and manage risks, the most important in 2018 being:

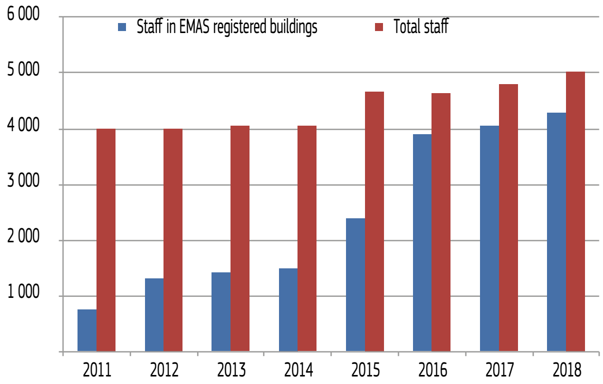
- Regular evacuation exercises: 19 evacuation exercises were organised by OIL.
- Interinstitutional trainings for EPI/ECI[5]: 71 trainings for 371 participants were organised.
- First aid and fire prevention trainings for Commission staff:15 respectively 6 trainings for 146 respectively 91 participants.

[5] Acronyms (in French) : EPI = Equipier de première intervention / ECI = Equipier chef d’intervention

B9.3 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.





The buildings included in the EMAS registration (including the Foyer, DC Betzdorf and TC Windhod) account for 84 % of the surface area - compared to 60% in 2017 still including the huge JMO - and85% of staff in Luxembourg (see tables B2 + B3 and comments for the future evolution).

B9.4 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 2018, continued efforts were made in closing non-conformities. Three minor non-conformities remain open at the end of 2018, compared to six end of 2017.

B9.5 Compliance with environmental and other permits

The Luxembourg authorities issue environmental permits for each Commission building. The Luxembourg authorities issue environmental permits for each Commission building in Luxembourg.

In 2018, improvements were made in the following topics:

- Continued improvements to further review and track permits and legal requirements while managing the new legislation for a good legal monitoring.
- Finalised the file concerning the updating of the operating permit for the Euroforum building. Under an emphyteotic lease contract, OIL is studying the solutions to improve the energy efficiency of the facilities.
- Indept analysis of the HITEC building permit and the new contract for E wing of DROSBACH Building.
- DG ENER has its own operating authorisation issued by the Ministry of Health for nuclear activities in EUROFORUM.

B10 Communication

B10.1 Internal communication

The main communication events and messages during 2018 were the following:

Mobility Days: The mobility days took place on Thursday 18 and 25 January at the Drosbach and Bech buildings. Representatives of the City of Luxembourg, Verkéiersverbond, LuxTram, IMS, CFL and OIL.01 were there to answer staff's questions. With the arrival of the tram in Kirchberg and two new stations, mobility has changed a lot and these two days made it possible to clarify certain points.

Earth Hour 2018: On Saturday, 24 March, the Commission joined the Earth Hour, an initiative of WWF for sustainable development. To mark the Earth Hour in Luxembourg, OIL turned off the lights of the facades of the EUFO and BECH at 20.30-21.30 on Saturday.

VeloMai: participation and promotion of this campaign was organised in Luxembourg by DG HR in cooperation with OIL, to promote the bicycle as a mean to come to work.

Mam Velo OP d'Schaff: Commission promoted also this bike to work campaign organized by the Luxembourg authorities.

Green Day: participation and promotion of this event organised on 31 May at Mercier Building, with the participation of different stakeholders: MyEnergy - Lycée Technique Agricole/Centre for Ecological Learning Luxembourg – Lyreco (achat de fournitures de bureau écologiques) - Emweltberodung Lëtzebuerg asbl – SuperDrecksKëschtVerkéiersverbond, IMS - Luxmobility - Moovee, Lëtzebuerger Vëlos-Initiativ

Green Public Procurement: promotion of the seminar held in European Parliament on 18 June and promotion of "Buying green" practices in food and catering – GPP Helpdesk presentation.

European mobility week: promotion of this event, which takes place every year from 16-22 September.

Green Public Procurement: promotion of the practical aspects of Circular Economy held in Parliament on 15 October.

Energy saving mode in buildings: the temperature in most of the European Commission buildings in Luxembourg has been lowered during end of year's holidays.

In addition to this, OIL provided regular information on transport issues: road and train works, inauguration of the new tram, reorganisation of bus lines, etc.

OIL continues to manage the OIL EMAS and OIL MOBILITY functional mailboxes to respond to staff enquiries on environment and mobility topics.

B10.2 External communication and stakeholder management

The Commission has regular contacts with the Luxembourg authorities, particularly the Ministry of Sustainable Development and Infrastructure and Luxembourg City. In addition, there have been regular contacts with associations playing an important role in the field of waste management, energy efficiency and mobility. These include the following organisations:

- Verkéiersverbond (VKVB) – the body founded by Luxembourgish Ministry of Transport and who is responsible for the bargaining strategy, development of alternative kinds of mobility, coordinated activities of the responsible actors in the public transport sector as well as promotion and development of

alternative transport technologies. The VKVB manages the M-Pass subscriptions and has organised the mobility study in Kirchberg.

- SuperDreckskëscht (SDK) – a body that operates for the Luxembourgish Ministry of Sustainable Development and Infrastructures in fields of information and awareness, regarding issues related to waste management and prevention, and disposal of dangerous substances. SDK delivers a quality label for buildings of bodies respecting their specifications concerning waste management. The Commission is labelled SDK since 2007. In 2018, every building managed by OIL with a waste room have obtained the SDK label.
- Inspiring More Sustainability – the non-profit association that organizes amongst others the positive drive campaigns

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, organises common events (green days), tries to have a common approach towards the local authorities on environmental issues. Four EcoNet meetings were held in 2018.

B11 Training

B11.1 Internal training

Training sessions for newcomers at the Commission, held by DG HR in full cooperation with OIL, have started again in 2018[6]. There were 4 sessions with total of 49 participants. In 2018, two information sessions on waste management took place and 20 people participated at the training. In addition, 2 sessions on safe cycling with 3 participants was organised.

B11.2 External training

13 OIL drivers have benefited from an eco-drive training, organised by an external contractor.

Information sessions of Commission and contractors staff working in the kitchen have been provided in 2018 by the new contractor who is supplying the laundry products.

B12 EMAS Costs and saving

Table B10: EMAS administration and energy costs for buildings in the EMAS area

Parameter	2012	2013	2014	2015	2016	2017	2018
Total Direct EMAS Cost (EUR)	396 000	462 000	462 000	469 000	469 000	483 000	370 000
Total Direct Cost per employee	99	114	114	100	101	101	74
Total buildings energy cost (Eur)		1 755 676	3 091 906	2 559 940	2 691 220	1 932 629	1 751 747
Total buildings energy cost (Eur/person)		434	765	549	578	404	349
Total fuel costs (vehicles) (Eur)		49 328	51 752	54 780	64 574	59 496	65 798
Total energy costs (Eur/person)		12	13	12	14	12	13
Total water costs (Eur)		92 115	91 817	208 318	368 001	308 841	302 949
Water (Eur/person)		65	62	45	79	65	60
Total paper cost (Eur)		82 102	69 120	61 690	59 521	58 784	72 262
Total paper cost (Eur/person)		20	17	13	13	12	14
Waste disposal (general) - unit cost/tonne		335	342	342	342	321	390
Waste disposal (general) - Eur/person		42	35	66	76	57	53

The total direct EMAS coordination costs has decreased due to a reduced team in 2018.

6 A first session took place on April 27, 2018

B13 Conversion factors

Table B11: Conversion factors used in calculations for Luxembourg reporting

Parameter and units	2011	2012	2013	2014	2015	2016	2017	2018
kWh of energy provided by one litre diesel (1)	0	0	10.89	10.89	10.89	10.89	10.89	10.89
kWh of energy provided by one litre petrol (1)	0	0	9.42	9.42	9.42	9.42	9.42	9.42
Paper Density (g/m2)	80	80	78	75	75	75	75	75
Kgs CO_2 from 1 kWh of electricity (2)			0.000	0.671	0.671	0.000	0.000	0.000
Kgs CO_2 from 1 kWh natural gas	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
Kgs CO_2 from 1 kWh tanked gas			0.000	0.000	0.204	0.204	0.204	0.204
Kgs CO_2 from 1 kWh diesel	0.270	0.270	0.270	0.270	0.270	0.270	0.270	0.270
Kgs CO_2 from 1 kWh district heating	0.328	0.328	0.328	0.328	0.328	0.328	0.328	0.328
GWP of R22			1 760	1 760	1 760	1 760	1 760	1 760
GWP of R410A			1 920	1 920	1 920	1 920	1 920	1 920
GWP of R134A			1 300	1 300	1 300	1 300	1 300	1 300
GWP of R404A			3 940	3 940	3 940	3 940	3 940	3 940
GWP of R407C			1 620	1 620	1 620	1 620	1 620	1 620
GWP of 417A					2 346	2 346	2 346	2 346
GWP of R600A					3	3	3	3
Kgs CO_2 from one litre of diesel (car fleet) (3)		2.50	2.50	2.50	2.50	2.50	2.50	2.50
Kgs CO_2 from one litre of petrol (car fleet) (3)		2.28	2.28	2.28	2.28	2.28	2.28	2.28

Notes:

(1) www.carbontrust.com, Conversion factors 2013

(2) 100% electricity from renewable sources, considered to not generate CO_2 emissions;

(3) Combustion only, upstream excluded

Since 2016 conversion factors have been revised and applied retroactively, for diesel and petrol, in order to better reflect upstream emissions.

B14 Characteristics of buildings and performance of 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 (m^3)	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					1,874.81	1,870.70		6,221.86	65.27
BECH	ESTAT	X				X	X					4,246.22	7,247.95		4,049.00	92.29
CPE 1 et 2	OIL			X		X			X			232.74	-	735.99	3,849.00	23.10
CPE 3	OIL			X		X	X		X			399.93	587.57		3,811.00	75.38
CPE 5	OIL			X		X	X		X			43.04	438.93		4,646.00	29.38
DRB	DIGIT PMO ECFIN HR CHAFEA	X			X	X	X	X	X	X	X	3,875.50	-	1,848.55	13,495.90	63.92
EUFO	ENER CNECT	X				X	X					4,596.00	2,005.61		6,005.58	87.75
HEI		X				X	X				X	180.90	225.14		851.00	27.71
HTC	SANTE	X				X						79.43	692.48		898.05	
LACC	DGT	X				X						404.39	5,631.57		10,192.63	51.09
T2	DGT	X				X	X					706.11	1,040.37		3,604.78	34.83
MAEU	COMM	X				X						81.99	185.61		255.00	
MER	OP	X				X	X	X				3,502.85	-	4,555.27	12,858.96	111.50
FISR		X				X						231.99	248.17		543.42	14.44
HTC (DC)	DIGIT		X									195.25	-		-	
WIND (DC)	DIGIT		X									3,507.16	-		-	
WIND - Telecom Centre	DIGIT		X									447.26				
BETZ (DC)	DIGIT		X									3,419.43	-		-	
TOTALS												**28,025.00**	**20,174.10**	**7,139.81**	**71,282.18**	**676.66**

European Commission

Environmental Statement 2019

2018 results

Annex C: JRC-Petten

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Cover illustration: Aerial view of the Petten site

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ANNEX C: JRC-PETTEN – Administrative and research activities

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 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), this 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 2018 are shown in Table C1, along with performance trend and targets where applicable for 2020.

Table C1: Historical data, performance and targets for core indicators for Commission level reporting

Physical indicators:	**Historic data values**					**Performance trend (%) since:**				**Target**	
(Number, desciption and unit)	2010 (1)	**2014**	2016	2017	2018	2010	2014	2016	2017	2020*	
										Δ % (2, 3)	value (2, 3)
1a) Energy bldgs (MWh/p)	37.46	**23.99**	24.00	23.95	26.41	**– 29.5**	**10.1**	**10.1**	**10.3**	– 5.0	22.792
1a) Energy bldgs (KWh/m²)	472	**348**	323	302	328	**– 30.6**	**– 5.8**	1.4	**8.4**	– 5.0	330
1c) Non ren. energy use (bldgs) %		**97.8**	96.5	96.4	52.3		**– 46.5**	**– 45.8**	**– 45.7**	– 5.0	92.9
1d) Water (m³/p)	11.50	**11.14**	14.05	11.22	8.00	**– 30.5**	**– 28.2**	**– 43.0**	**– 28.7**	– 5.0	10.581
1d) Water (L/m²)	145	**161**	189	142	99	**– 31.6**	**– 38.5**	**– 47.5**	**– 29.9**	– 5.0	153
1e) Office paper (Tonnes/p)	0.04	**0.02**	0.01	0.01	0.01	**– 77.5**	**– 43.2**	**8.1**	**– 17.8**	– 9.0	0.015
1e) Office paper (Sheets/p/day)	40	**16**	9	12	10	**– 76.0**	**– 39.4**	**8.1**	**– 17.8**	– 9.0	14.4
2a) CO_2 buildings (Tonnes/p)	14.85	**10.00**	8.88	8.99	3.04	**– 79.5**	**– 69.6**	**– 65.7**	**– 66.2**	– 7.0	9.296
2b) CO_2 buildings (kg/m²)	187	**145**	120	113	38	**– 79.9**	**– 73.9**	**– 68.4**	**– 66.7**	– 7.0	134.7
2c) CO_2 vehicles (g/km, manu.)		**168**	148	148	148		**– 11.7**	0.0	0.0	– 8.0	154.2
2c) CO_2 vehicles (g/km, actual)		**357**	265	266	275		**– 23.1**	3.8	3.2	– 8.0	328.8
3a) Non haz. waste (Tonnes/p)	0.078	**0.105**	0.117	0.136	0.115	**47.8**	**9.3**	– 1.8	**– 16.0**	– 5.0	0.100
3b) Hazardous waste (Tonnes/p)	0.0032	**0.0034**	0.0000	0.0249	0.0036	**15.7**	**7.4**	**NR**	**– 85.4**	– 5.0	0.003
3c) Separated waste (%)	72.9	**61.0**	56.5	55.5	48.7	**– 33.2**	**– 20.2**	**– 13.9**	**– 12.3**	5.0	64.1
Economic indicators (Eur/p)			2016	2017	2018				0.0		
Energy consumption (bldgs)	1 858	**1 225**	1 199	1 208	1 335	**– 28.1**	**9.0**	**11.4**	**10.6**	– 5.0	1 163
Water consumption	23.0	**22.3**	28.1	22.4	16.0	**– 30.5**	**– 28.2**	**– 43.0**	**– 28.7**	– 5.0	21.2
Non haz. waste disposal	7.0	**9.4**	10.5	12.3	10.3	**47.8**	**9.3**	– 1.8	**– 16.0**	– 5.0	9.0

Note: (1) Earliest reported data; (2) compared to 2014; (3) EMAS Annual Action Plan 2019

* Target for %improvement for the period 2014-2020

The core indicators show that since 2010 there has been substantial progress in reducing the environmental impact of building energy usage, with energy consumption by 30%. This reflects efforts from the last eight years to improve energy efficiency; installing insulation, more efficient heating and improved building management. The amount of non-renewable energy in buildings seems on a plateau since 2015, there were no additions in PV panels the last years. Energy consumption increased in line with the 2018 degree days. The decline in staff numbers, decline in usable floor space is not helpful to reach the 2020 target for energy consumption.

Water consumption is monitored per building and has decreased since 2010. The decrease is significant and mainly due to reduced research with steam production and the elimination of tap water for cooling purposes. In all the toilets is sensor controlled sanitary tapware which is used to prevent continuous water flow by stopping the water supply after pre-set time.

Paper consumption decreased in 2018 compared with last year (-2 sheets A4/day per person), but it should be noted that paper consumption is based on purchased paper. The trend is positive, well below the 2020 target for paper consumption. In the last quarter of 2018 there was a replacement of MFP's (Multi-Functional Printers). The new equipment has a batch scanner and registers the user before usage, which gives possibilities to report on organisational level on printing behaviour. The expectation is that we can continue the decline in printing and storing paper in binders.

In January 2018 started the new electricity contract that is negotiated in collaboration with the campus partners, NRG and TNO. We purchase the electricity from a cooperation 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 are included in the contract.

CO_2 emission per kilometre from site service vehicles performance remains stable, 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.

The total amount of waste declined in 2018 with 16% compared to 2017, this can mainly be accounted to no transport of electronic waste and a decline in the paper and household waste category. There is still an elevated level of non-hazardous waste; this is a result of continued effort in clean-up of old cupboards, repurpose of buildings and spaces. The waste contracting is challenging because the pricing of waste streams fluctuates, and can lead to an unwanted end of contract. Hazardous waste amounts are fluctuating year on year due to the transport of site.

In Petten we separate 48,7% of our total waste in 2018, this is 33% less compared to 2010. 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.

The evolution of the EMAS system baseline parameters in JRC-Petten is as shown below.

Table C2: EMAS baseline parameters

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Population: total staff	232	229	266	263	282	278	276	263	248
Total no. operational buildings	14	14	14	14	14	17	16	12	12
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

In 2018 JRC-Petten staff declined with 6%. In 2018 there were no new buildings raised, there was a big project in the re-use of building 310. In this large industrial building was a ship like construction which provided several rooms and experiment spaces in a steel construction. The ship was taken out of building 310 which lead to a decrease of useful surface area of $890m^2$. A creative space is shaped in the large construction hall where in the future collaboration initiatives can be organised.

The total premise of JRC-Petten is 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, a Directorate-General of the European Commission, is under the responsibility of Tibor Navracsics, Commissioner for Education, Culture, Youth and Sport. The JRC employs over 3000 staff, comprising scientists and researchers as well as administrative and support staff coming from all over the EU. Its offices and sites are

located in Brussels (BE), Geel (BE), Ispra (IT), Karlsruhe (DE), Petten (NL) and Seville (ES). The JRC is a key player in supporting successful investment in knowledge and information foreseen by the Horizon 2020 Work Programme; the EU's programme for research and innovation.

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. From DG HR is a smal group as Account Management Centre, AMC8.

While JRC-Petten staff reports to different Directors, the site operates under the responsibility of a single site-Director, Piotr Szymanski. Director of the Directorate for Energy, Transport and Climate.

The scientific activities fall under the responsibility of;

Directorate C unit 00, 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 unit 01, 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.

Directorate C unit 03, the mission of the JRC's Energy Security, Distribution and Markets Unit (C.3) 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 digitilization of energy systems, and the uninterrupted physical availability of energy products and services at an affordable price for all consumers. C3 assesses how different policy options help shape an energy system resilient to shocks, disturbances, and adverse trends, whilst satisfying European society's energy needs.

Directorate C unit 07, knowledge for the Energy Union unit. Our mission is to support EU policies related to the Energy Union through knowledge management.

Directorate G unit 04, G4 mission 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 & standards with the aim to contribute to the safe operation of current and future innovative and advanced nuclear reactor systems.

Directorate G unit 10, the mission of Unit G10 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 unit 02, 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. To provide technical support for the scientific programmes of the site and to develop and maintain the infrastructure of the site.

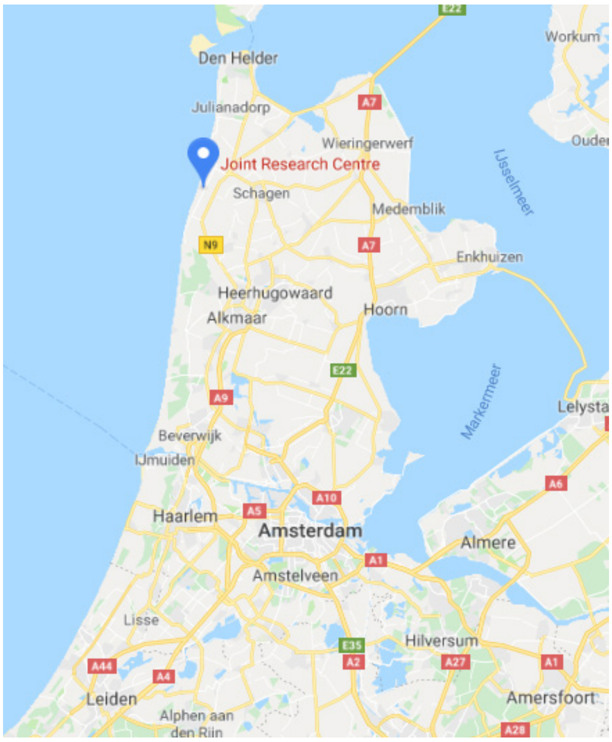
Directorate I unit 05, the mission of Directorate I is to set up and operate Competence Centres which will develop, provide and apply analytical tools, methods and integrated solutions to better support all Commission Services for the conception, implementation and evaluation of EU policies.

Directorate general HR, Unit 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 contains 26 buildings of which three administrative; 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, former 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.

Interested environmental stakeholders with active communication in 2018:

RUD (Regionale Uitvoerings Dienst) is the licencing organization for the municipality. In March 2018 the site was visited for integral control of applicable rules and regulations. During this visit was specific attention for the obligations arising from the “Activiteitenbesluit”. There was one minor finding that was resolved.

National forestry and Flora & Fauna committee, in June we organized a lunch nature walk in the dune area for Petten staff. This was a combined event where there was a presentation given by the former chair of the F&F committee. Later we had a guided tour with the national forestry in the nature-2000 area. Many colleagues were introduced in the diverse nature value of the Petten dunes.

Energy and Health Campus (EHC), The EHC is an initiative of the province of North-Holland. They aim to stimulate the Petten campus as Development Company which stimulates restructuring, innovation projects, research, and marketing for economic development. In a weekly meeting where all stakeholders of the EHC where present we presented the fence renewal proposal. This gave the opportunity to explain the changes and possible impact. The fence project is postponed due to contracting issues; the project will be further developed and presented to the EHC for consent and licensing.

Municipality Schagen, in communication with the municipality about a permit for a fence renewal project they made clear we have to consult the Energy and Health Campus group. This group is developing a new zoning plan for the campus site in Petten.

Stakeholder's 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 JRC-Petten summary of stakeholders.

Figure C3, Stakeholder analysis

	Stakeholder groups
1	European Institutions
2	Policy makers
3	Suppliers / contractors
4	Employees
5	Customers
6	Local communities
7	Regulatory government
8	Media and society
9	Partners
10	NGOs
11	Insurances
12	General Public

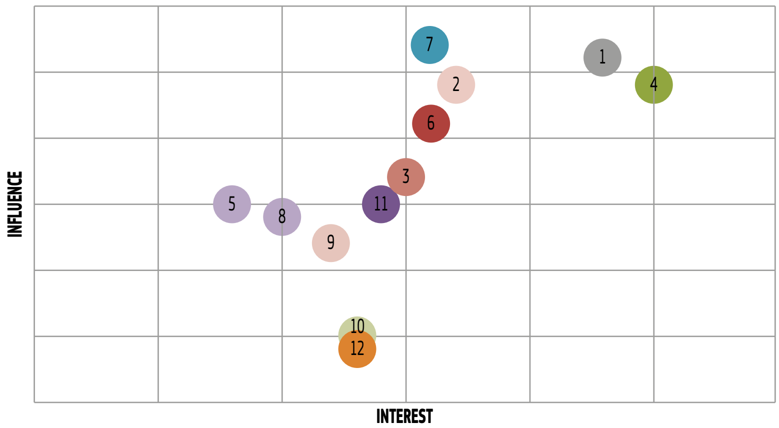
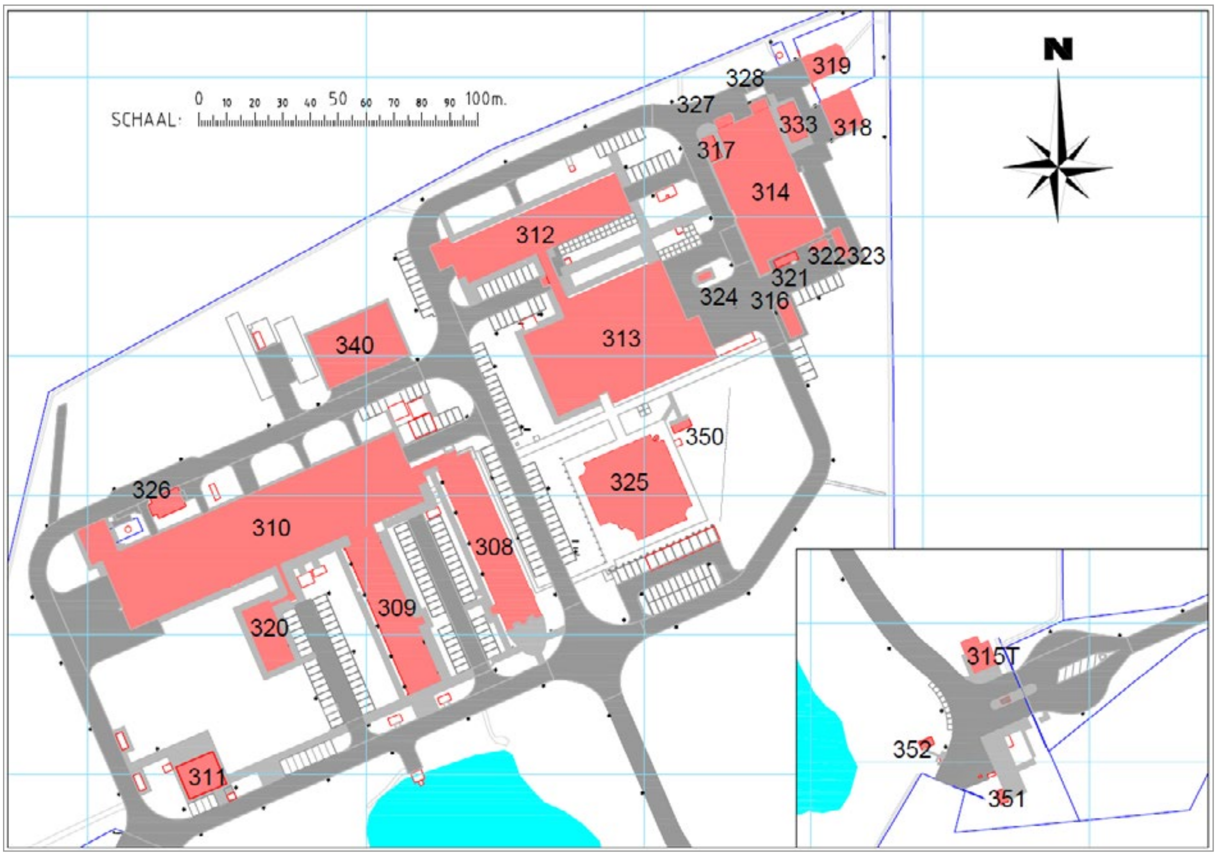


Table C3 JRC-Petten summary of stakeholders

Stakeholder group	Stakeholder identification	Interest, needs and expectations
European Institutions	◆ DG JRC, ◆ EC, ◆ Council & parliament ◆ Member states ◆ Commission panels ◆ EC citizens	◆ Services well responding to DG's demands ◆ Minimal costs on energy/waste/soil ◆ They define the policy ◆ Multi-annual investment plans: they decide on investments: refurbishment, construction,... ◆ Site development plan
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 ◆ EMAS verifiers ◆ Safety region NHN ◆ Inspectie SZW	Compliance with regulations
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 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 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
Local aspects	Noise	Disturbance of neighbourood	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

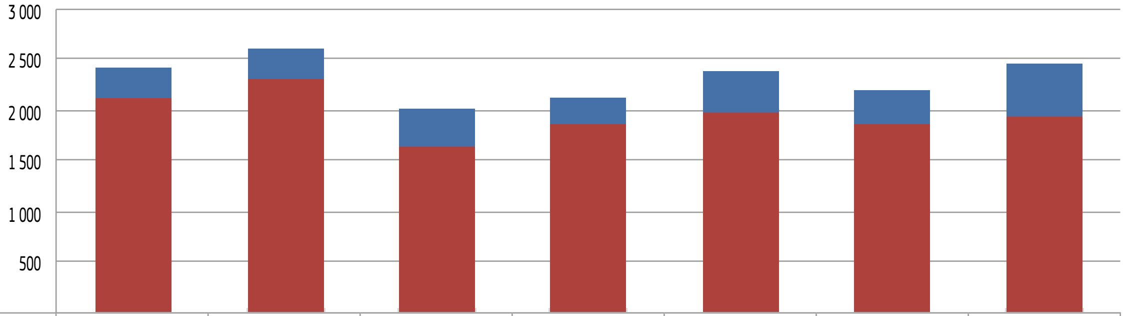
C4 More efficient use of natural resources

C4.1 Energy consumption

Buildings energy consumption data should be considered in the context of climatic conditions. Analysis of degree data[1] show that the energy for building heating and cooling need is 22% bigger than the reference year 2014

[1] Monthly data for INHALKMA1 station (15,5C reference temperature), www.degreedays.net; using buildings energy consumption data for Petten

Figure C5: Total annual degree days at Petten, 2012-2018

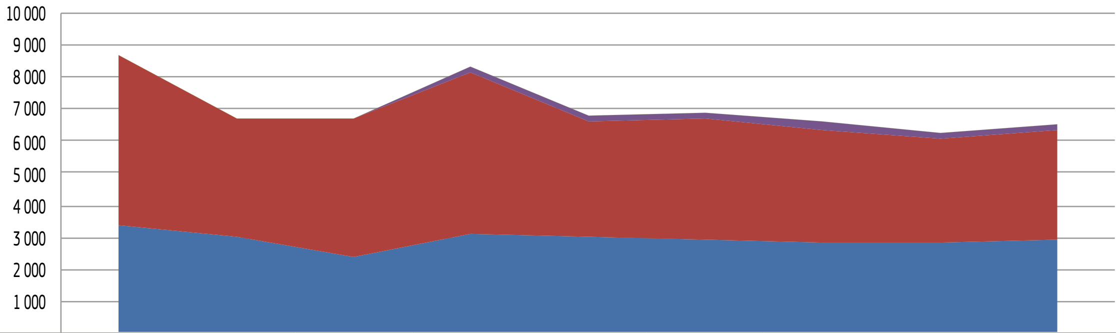


	2012	2013	2014	2015	2016	2017	2018
Total degree days	2 389	2 591	1 983	2 102	2 351	2 190	2 431
Cold degree days, cooling required	272	290	354	250	386	333	494
Hot degree days, heating required	2 117	2 301	1 629	1 852	1 965	1 857	1 937
kWh/person/degree day	10.62	12.29	12.10	11.83	10.21	10.93	10.89

a) Buildings

The evolution of total annual energy consumption is presented in Figure C6, 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)



	2 010	2011	2012	2013	2014	2015	2016	2017	2018
Total	8 690	6 665	6 746	8 373	6 766	6 913	6 623	6 298	6 551
diesel								14	
solar PV	0	0	39	230	148	208	230	227	217
mains supplied gas	5 290	3 675	4 281	5 061	3 598	3 795	3 543	3 255	3 427
electricity	3 400	2 990	2 426	3 082	3 020	2 910	2 850	2 802	2 906

In line with the degree data we see an increase (4%) of energy demand for buildings in 2018.

Figures C7 and C8: Evolution of total annual energy consumption for Petten EMAS buildings

Figure C7

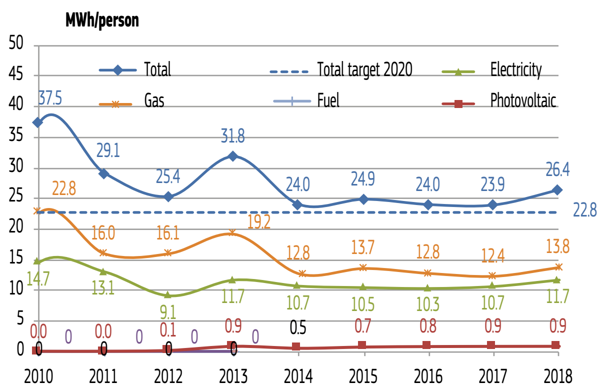
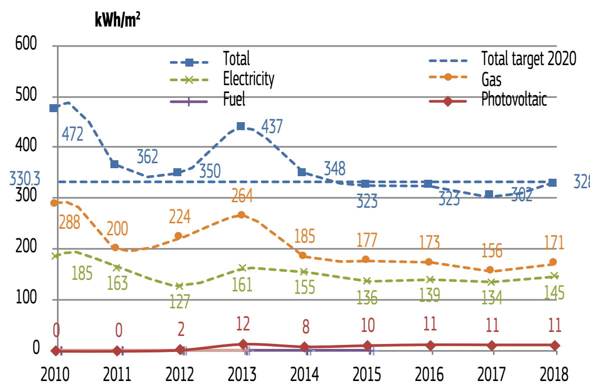


Figure C8



There is a plateau trend in overall energy consumption for buildings. The JRC-Petten EMAS targets for 2020 are within reach. Due to periodical changes we see some changes in the calculation annually in persons and m^2. We expect to decrease in energy consumption and the target of 5% decline in 6 years to be reached. Photovoltaic production shows a small decline, no extension of the installed panels and a small loss in efficiency. The 10 MWh decline in PV electricity production can be explained by metrological conditions.

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, currently being dealt with.

b) Site Vehicles

Table C6: Vehicle energy consumption (indicator 1b)

	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Total (MWh/yr)	6.24	6.12	5.42	29.49	50.05	55.77	53.02
MWh/person	0.023	0.023	0.019	0.106	0.181	0.212	0.214
Diesel used (m^3)	0.400	0.010	0.097	1.499	2.702	3.409	3.243
Petrol used (m^3)	0.200	0.638	0.463	1.398	2.189	1.979	1.879

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 missions, taxi support to Schiphol and Petten. Vehicle efficiency has not changed as there were no changes to the vehicle fleet.

c) Renewable energy use in buildings and vehicles

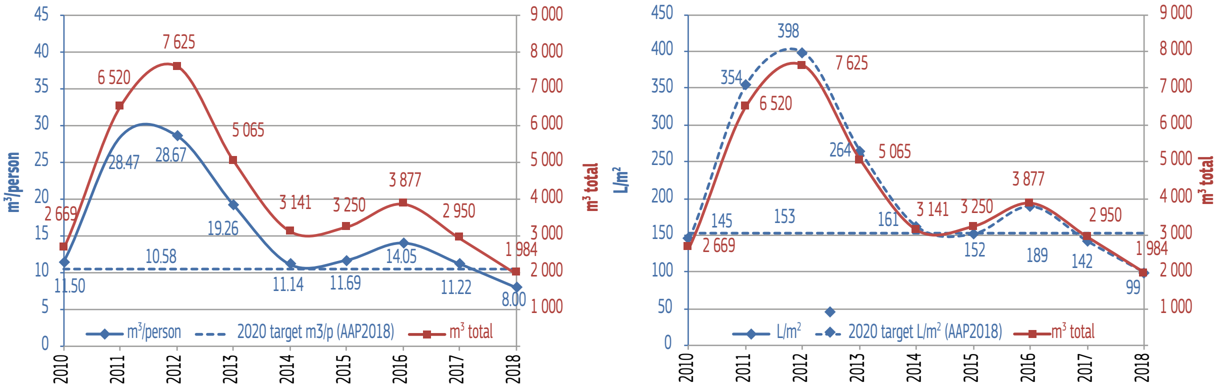
Table C7: Non-renewable energy use in the buildings

Source of energy	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Main supplied electricty (MWh)	3 400	2 990	2 426	3 082	3 020	2 910	2 850	2 802	2 906
from non renewables (%)	100	100	100	100	100	100	100	100	0
Mains supplied gas (MWh)	5 290	3 675	4 281	5 061	3 598	3 795	3 543	3 255	3 427
from non renewables (%)	100	100	100	100	100	100	100	100	100
Site generated PV (MWh)			39	230	148	208	230	227	217
from renewables (%)	100	100	100	100	100	100	100	100	100
Total renewables (MWh)			**39**	**230**	**148**	**208**	**230**	**227**	**3 124**
Total renewables (%)			**0.6**	**2.7**	**2.2**	**3.0**	**3.5**	**3.6**	**47.7**
Total energy use, (MWhr/yr)			6 707	8 143	6 618	6 705	6 393	6 071	3 427
Toal non ren energy as part of total, (%)			99.4	97.3	97.8	97.0	96.5	96.4	52.3

The portion electricity generated by on-site solar panels is significant (6,9%), on sunny days buildings receive all of their electricity from the solar panels. In 2018 we "greened" the mains supplied electricity by purchase of Guaranties of Origin from sustainable resources. The sustainable resource we purchased from is Dutch bio-mass.

C4.2 Water consumption

Figures C9 and C10: Evolution of total annual water consumption for JRC-Petten (indicator 1d)

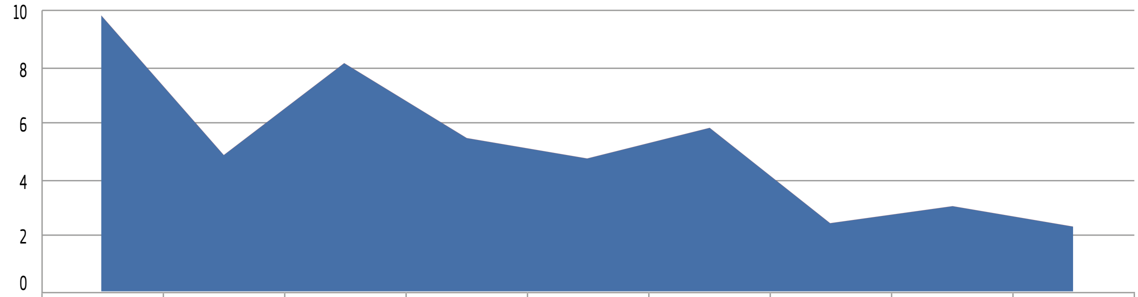


On-site water consumption decreased to a historical low in 2018. Building 310 water consumption is declined by 29% which is substantial. The majority of buildings consume less water than historical values. No specific actions were undertaken in 2018, the result is confirming the trend in place.

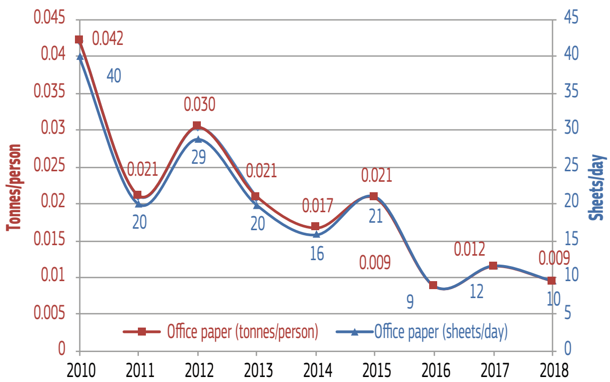
C4.3 Office and offset paper

The evolution of office paper consumption at Petten and per capita breakdown presented below.

Figures C11 and C12: Evolution of paper consumption at Petten (totals, per person)



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Office (A4 sheet equivalent) x1 000 000	1.96	0.97	1.62	1.10	0.94	1.23	0.52	0.65	0.50
Total paper consumption (tonnes)	9.77	4.83	8.07	5.50	4.71	5.76	2.42	3.03	2.35
Offset paper (tonnes)	0	0	0	0	0	0	0	0	0
Office paper (tonnes)	9.77	4.832	8.07	5.503	4.707	5.762	2.42	3.03	2.35

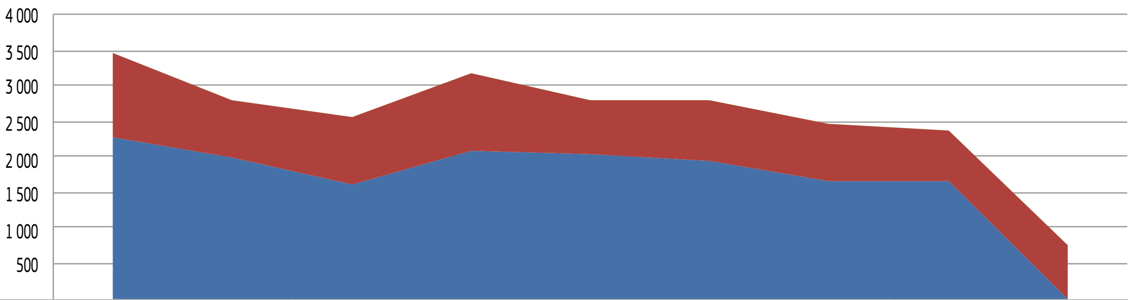


Paper use at Petten site has a long term downward trend. In 2018 there was no purchase of A3 paper, there was sufficient on stock. The numbers reported are the numbers from the purchase of A4 paper. In 2018 the multifunctional printers are replaced by new machines that have a badge reader and only can be used after positive identification. As added value that we can report in 2019 per organisational unit the amount of paper printed.

C5 Reducing air emissions and carbon footprint

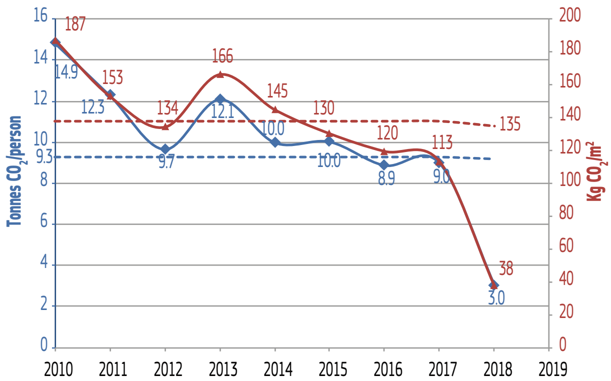
C5.1 CO_2 emissions from buildings a) Buildings (energy consumption)

Figure C13: Total emissions from buildings' energy consumption, tonnes (indicator 2a)



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	3 446	2 816	2 571	3 182	2 819	2 788	2 451	2 364	755
diesel								5	
mains gas	1 165	809	943	1 114	792	836	780	717	755
electricity	2 281	2 006	1 628	2 068	2 026	1 953	1 671	1 643	0

Figure C14: CO_2 Emissions per capita and square metre



Petten CO_2 emissions from buildings has decreased in 2018 by 313% due to purchase of the Guaranties of Origin. The EMAS indicators 2a and 2b where moving in the direction of the set target the last years. The positive trend is showing strong progress in the reduction of CO_2 for buildings. In the total carbon footprint this is significant as can be seen in figures C17 and C18

b) Buildings other greenhouse gases (refrigerants)

Table C8: Emissions of equivalent CO_2 emissions (tonnes) from cooling installations (indicator 2b)

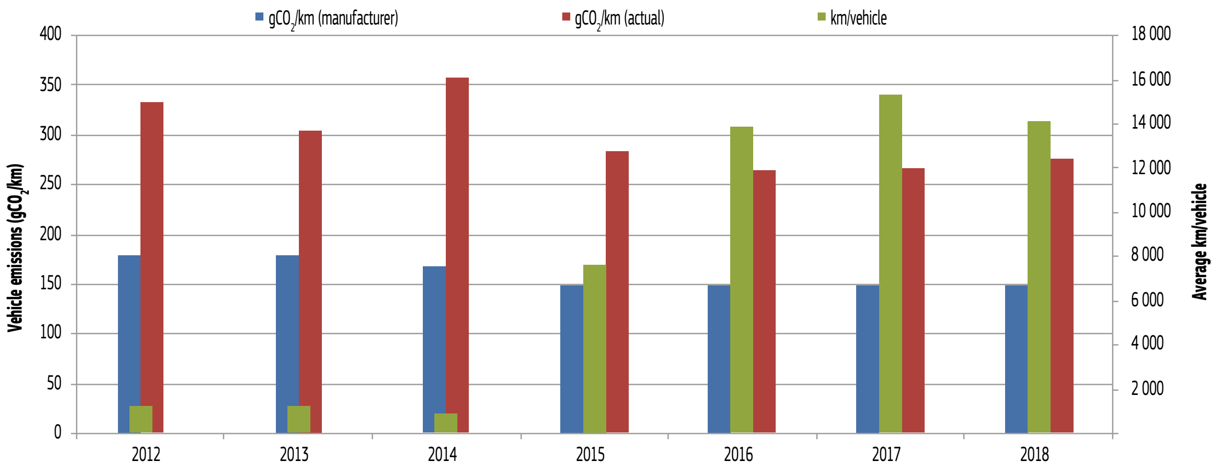
	2012	2013	2014	2015	2016	2017	2018
R410a (t CO_2 e)	2.51	0.00	0.00	0.00	82.56	48.07	0.00
R407C (t CO_2 e)	0.00	5.33	11.98	0.00	5.25	0.00	0.00
R507A (t CO_2 e)	0.00	0.00	0.00	16.50	0.00	55.41	27.95
Total (t CO_2 e)	2.00	5.33	11.98	16.50	87.81	103.48	27.95
Total Tonnes CO_2e /person	0.01	0.02	0.04	0.06	0.32	0.39	0.11
Total Tonnes CO_2e /m²	0.000	0.000	0.001	0.001	0.004	0.005	0.001

In 2018 we have a limited amount of losses from cooling installations. Only some R507A losses are discovered, there were no other installation where we leakages where discovered.

C5.2 CO_2 emissions from vehicles (indicator 2c)

a) Commission vehicle fleet

Figure C15: Fleet CO_2 emissions and fleet usage



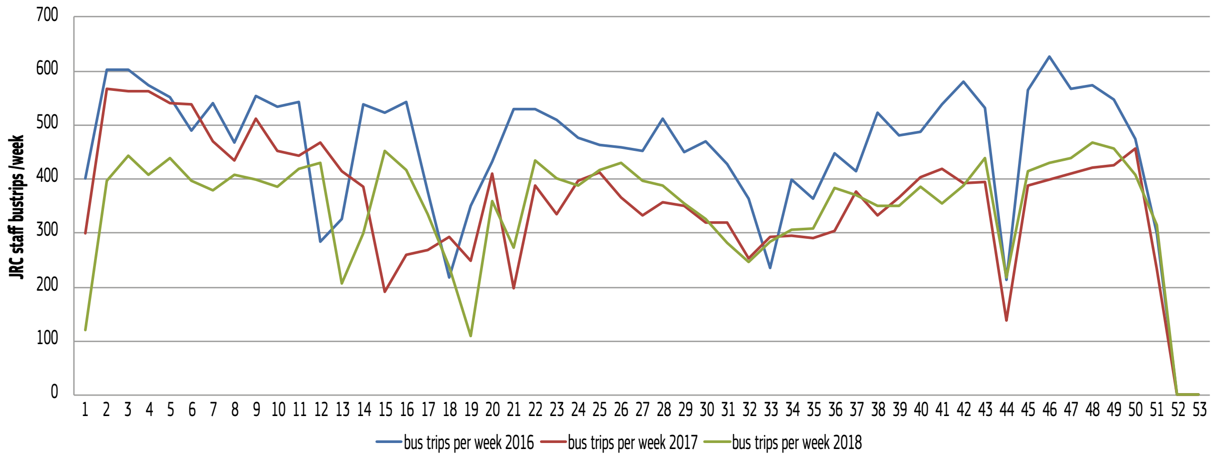
The use of the site vehicle fleet decreased in 2018 to an average of 14 118 km per vehicle. There were no changes in vehicles the last four years. The vehicle manufacturer emissions per km were stable as there were no changes to the four vehicles.

b) Missions and local work based travel (excluding Commission vehicle fleet)

This emission category is under scope 3, these are emissions which occur indirectly at another location as a result of mission and commuting related activities. They include emissions occurring from products procured (e. g. paper production), services provided by subcontractors (railway companies and contractors' vehicles), and emissions generated in the extraction, production, and distribution of energy carriers. Figures C17 and C18 present the emission in total tonnage for the Petten site and the tonnage per person annually.

c) Commuting

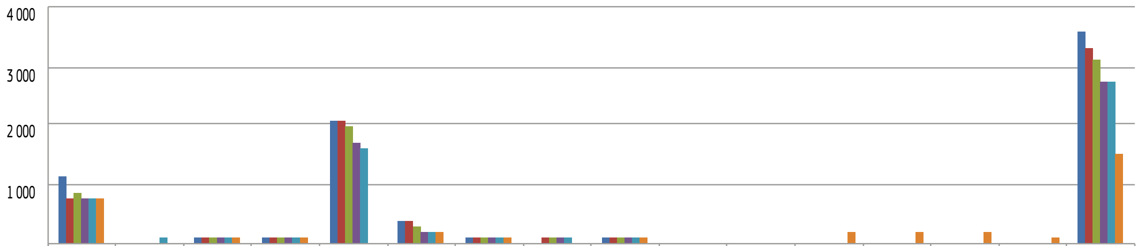
Figure C16: Petten bus service weekly usage



In 2018 is the bus usage by JRC staff declined by 3,3%, in 2017 we lost almost 23% of the commuters by bus. The decline was investigated in 2018 and the result is related to the amount of teleworking, decline in staff numbers and the desire for flexibility in mobility. In Holland we are among the most active tele-workers in the OECD[2].

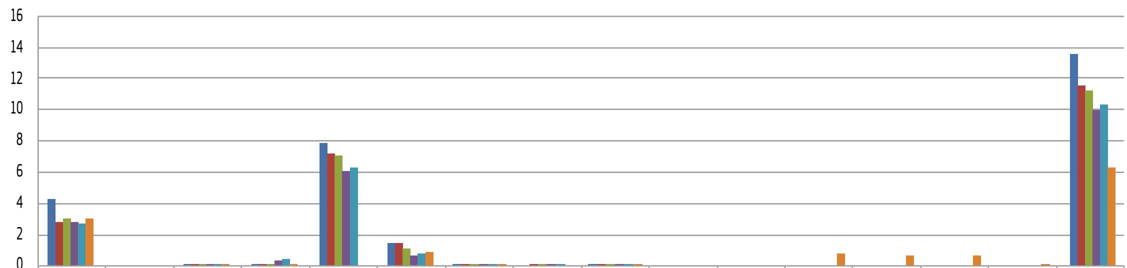
C5.3 Carbon footprint

Figure C17: Carbon footprint elements (Tonnes CO_2)



	Scope 1; Fuel for bldgs: mains gas	Scope 1; Fuel for bldgs: diesel	Scope 1; Commission vehicle fleet	Scope 1; Refrigerant leaks	Scope 2; External electricity supply	Scope 3; Business travel: air	Scope 3; Business travel: rail	Scope 3; Business travel: hire car	Scope 3; Business travel: private car	Scope 3; Business travel: air taxi	Scope 3; Commuting	Scope 3; Fixed assets - buildings	Scope 3; Fixed assets - IT	Scope 3; Service and supply contracts	Scope 3; Own waste	Sum
2013	1 114	0	2	5	2 068	366	1	0	1	0.0	0					3 558
2014	792	0	2	12	2 026	418	1	2	1	0.0	0					3 255
2015	836	0	9	17	1 953	295	3	4	7	0.0	0					3 122
2016	780	0	15	88	1 671	192	1	4	11	0.0	0					2 763
2017	717	5	16	103	1 643	210	1	2	13	0.0	0					2 710
2018	755	0	16	28	0	211	2	0	12	0.0	0	190	169	163	6	1 551

Figure C18: Carbon footprint elements (Tonnes CO_2/Person)



	Scope 1; Fuel for bldgs: mains gas	Scope 1; Fuel for bldgs: diesel	Scope 1; Commission vehicle fleet	Scope 1; Refrigerant leaks	Scope 2; External electricity supply	Scope 3; Business travel: air	Scope 3; Business travel: rail	Scope 3; Business travel: hire car	Scope 3; Business travel: private car	Scope 3; Business travel: air taxi	Scope 3; Commuting	Scope 3; Fixed assets - buildings	Scope 3; Fixed assets - IT	Scope 3; Service and supply contracts	Scope 3; Own waste	Sum
2013	4.24	0	0.01	0.02	7.86	1.393	0	0	0.01	0	0					13.53
2014	2.81	0	0.01	0.04	7.19	1.482	0	0.01	0	0	0					11.541
2015	3.01	0	0.03	0.06	7.02	1.061	0.01	0.01	0.02	0	0					11.229
2016	2.83	0	0.05	0.32	6.06	0.696	0	0.02	0.04	0	0					10.01
2017	2.73	0	0.06	0.39	6.25	0.799	0.01	0.01	0.05	0	0					10.288
2018	3.04	0	0.06	0.11	0	0.852	0.01	0	0.05	0	0	0.77	0.68	0.66	0.03	6.257

2 https://read.oecd-ilibrary.org/science-and-technology/how-s-life-in-the-digital-age_9789264311800-en#page160

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. Supply contracts are the external experts and services like security guards and cleaning.

Table C9: Contributions to carbon footprint (tonnes of CO_2/person and % of total)

	Tonnes CO_2/p						% of total					
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Total measured carbon footprint	**13.53**	**11.54**	**11.23**	**10.01**	**10.29**	**6.26**	**100**	**100**	**100**	**100**	**100**	**100**
of which external electricity supply	7.86	7.19	7.02	6.06	6.25	0.00	58.1	62.3	62.6	60.5	60.7	0.0
of which mains gas for buildings	4.24	2.81	3.01	2.83	2.73	3.04	31.3	24.3	26.8	28.2	26.5	48.6
of which business travel by air	1.39	1.48	1.06	0.70	0.80	0.85	10.3	12.8	9.4	7.0	7.8	13.6
of which fixed assets - buildings						0.77						12.3
of which fixed assets - IT						0.68						10.9
of which service and supply contracts						0.66						10.5
Sum of these components	**13.49**	**11.48**	**11.09**	**9.58**	**9.77**	**6.00**	**99.7**	**99.4**	**98.8**	**95.7**	**95.0**	**95.9**

Note: excludes commuting

Main contribution to the carbon footprint by 42,9% is the mains supplied gas for buildings. Fixed assets, supply contracts and IT equipment are amended in 2018 as source of carbon emissions. They are a significant part of the overall emission calculation now that we have greened the mains supplied electricity. Fixed assets and indirect aspects from contracts are discussed during the environmental review. For some unit's reason to investigate if there is a possible improvement action. During the environmental review became apparent that indirect aspects of IT equipment and the choice of contractor can influence significant.

C5.4 Total air emissions of NO_x

Table C10: NO_x emission

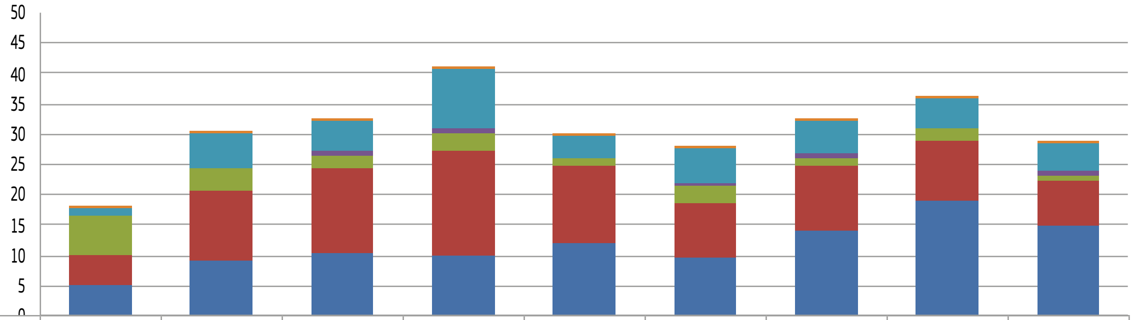
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Total NO_x emission (tonnes)	0.805	0.540	0.685	0.800	0.614	0.748	0.624	0.425	0.448
Change %		– 33	27	17	– 23	22	– 17	– 25	5

NO_x is generated by heating installation as by-product of the combustion, more when the temperatures are high. In 2017 we had a significant decline due to the new low temperature heating installation in building 310. In 2018 a 5% increase due to the increased heating need for the cold winter which lead to the increase. Compared with the reference year 2014, we declined 27% in NO_x emissions.

C6 Improving waste management and sorting

C6.1 Non-hazardous waste

Figure C19: Evolution of total non-hazardous waste in Petten (tonnes)

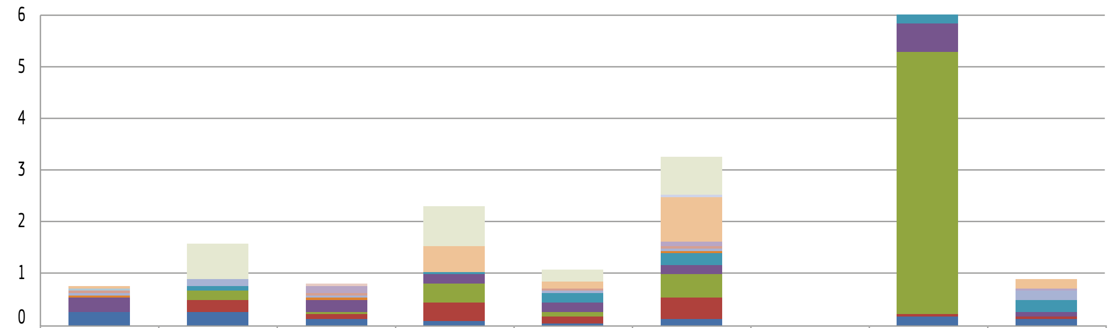


	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	18.0	30.3	32.0	40.8	29.6	27.8	32.2	35.9	28.4
Total (tonnes/ person)	0.08	0.13	0.12	0.16	0.10	0.10	0.12	0.14	0.11
Metal	1.3	6.0	4.8	10.1	3.7	6.0	5.4	5.1	4.5
Glass	0.2	0.0	0.6	0.5	0.0	0.3	0.9	0.0	0.7
Wood	6.5	3.6	2.1	2.9	1.1	3.1	1.2	1.7	1.0
Paper and cardboard	4.9	11.6	13.9	17.1	12.9	8.7	10.7	10.2	7.1
Household waste	5.1	9.1	10.6	10.2	11.9	9.7	14.0	18.9	15.0

In 2018 is the total amount of non-hazardous waste below the 2014 value on most categories we score lower than the last years. In line with paper consumption we see the amount of paper decline as waste stream.

C6.2 Controlled waste

Figure C20: Evolution of total hazardous waste in Petten (tonnes)



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	0.73	1.35	0.72	1.93	0.96	2.89	0.00	6.55	0.90
Total (tonnes/person)	0.003	0.006	0.003	0.007	0.003	0.010	0.000	0.025	0.004
Developer	0.00	0.67	0.00	0.77	0.20	0.74	0.00	0.24	0.00
Asbestos material	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.00
Mercury containing objects	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00
Lead-acid battery	0.02	0.00	0.03	0.48	0.13	0.90	0.00	0.11	0.17
Fire extinguisher	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flourescent lamps	0.00	0.00	0.13	0.00	0.00	0.06	0.00	0.09	0.05
Medical waste	0.01	0.01	0.01	0.01	0.00	0.04	0.00	0.01	0.03
Spray cans	0.01	0.00	0.01	0.00	0.04	0.01	0.00	0.00	0.01
Solvent	0.06	0.14	0.07	0.00	0.05	0.08	0.00	0.03	0.17
Paint	0.06	0.00	0.02	0.01	0.01	0.03	0.00	0.00	0.01
Metal containing waste	0.01	0.06	0.02	0.04	0.16	0.23	0.00	0.21	0.20
Waste oil	0.24	0.00	0.21	0.21	0.20	0.20	0.00	0.57	0.09
Electrical equipment (WEEE)	0.00	0.22	0.08	0.37	0.10	0.41	0.00	5.05	0.00
Laboratory mixed waste	0.00	0.22	0.08	0.37	0.10	0.41	0.00	0.06	0.05
Batteries	0.28	0.25	0.11	0.06	0.05	0.14	0.00	0.18	0.13

The amount of disposed hazardous waste is limited in 2018, there was no transport of WEEE(e-waste) which is a big contributor of hazardous waste. We investigate the possibilities for re-use and try to steer towards a use of IT equipment which can be send retour to the manufacturer. From the printer company we had good information how consumable parts of the printer can be disposed. And which can be returned for re-use.

C6.3 Waste sorting

Table C11: Percentage of waste sorted at JRC-Petten

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Percentage of waste sorted	72.9	71.2	67.5	76.1	61.0	68.3	56.5	55.5	48.7
Percentage of waste not sorted	27.1	28.8	32.5	23.9	39.0	31.7	43.5	44.5	51.3

The target of separating 62.6 % of the waste on site in 2018 was not met. Since 2015 is the separation rate in decline, more waste is disposed together in the category Household waste. Initiatives to break the trend and curb the separation rate have not materialized. Waste bins for plastic are postponed; the renewal of the waste contract is foreseen in 2019.

C7 Protecting biodiversity

Table C12: Built surface / total surface of the site

	2011	2012	2013	2014	2015	2016	2017	2018
Built up area (square metres)	13 365	13 365	13 365	13 248	14 545	13 526	13 526	13 526
Total site area, (square metres)	305 554	305 554	305 554	305 554	305 554	305 554	305 555	305 556
Built up area (%)	4.37	4.37	4.37	4.34	4.76	4.43	4.43	4.43

Figure C21: Nature walk in dunes

The 5th of June we organised a lunch event, a nature walk in the Natura-2000 dune area with guidance of the national forestry. With 50 colleagues we came together and enjoyed a sandwich and a small presentation. The chair of the Flora & Fauna Committee showed the specific species that live in the dune area and how to value their presence. He gave some insight in future development and how we could collaborate with the national forestry in nature management. Then we went out in the dunes in separate groups for an informative walk where we encountered nesting remains of the Northern wheatear. This highly appreciated bird is living in the area, but is under pressure for its habitat. There was explained the bird is living in collaboration with the rabbits; it's using the old rabbit holes for nesting. The foresters where impressed by the nature value of the JRC area, the ground was almost untouched by humans.

C8 Green Public Procurement

C8.1 Incorporating GPP into procurement contracts

No specific actions have been undertaken in 2018 but environmental criteria have systematically been considered when defining selection and award criteria in procurement.

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. 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.

C9.2 Prevention and risk management

The 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 are currently being revised based on 44 identified emergency scenarios. They are based on risk management methodologies and also cover environmental risks. In 2018 we exercised an environmental relevant scenario, a possible fire in a battery storage location.

C10 Communication

C10.1 Internal communication

The Petten site is a small site with a limited number of units, making it possible to address environmental issues during unit meetings. In 2018 there where;

- 3 unit presentations on environmental topics during unit meetings, specifically addressing the new environmental license and possible changes for the units.
- 5 newcomer trainings
- 8 Internal environmental communications,
- 2 EMAS corporate poster campaigns.
- 2 Safety and environmental tours

C10.2 External communication and stakeholder management

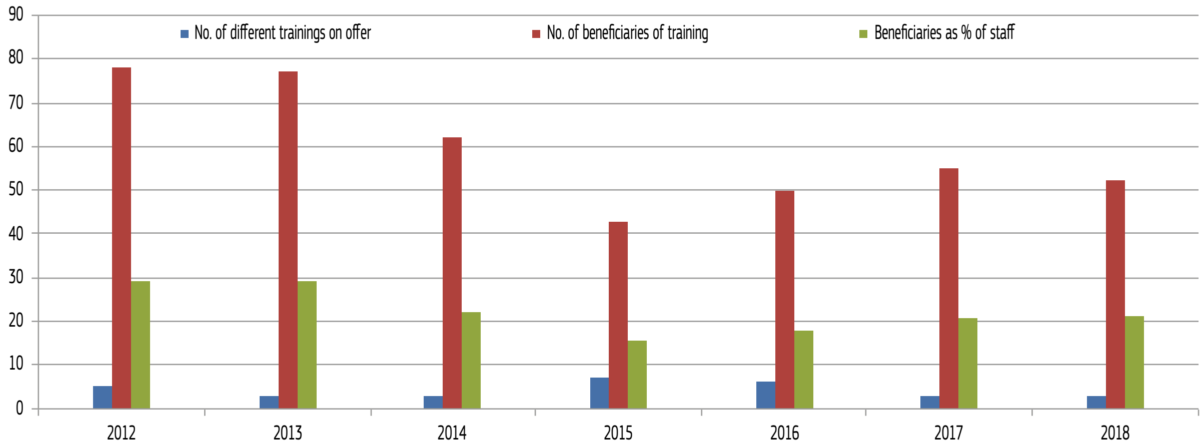
Table C13: External stakeholder communication

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
AMART	Wastewater pollution measurements 'afvalwaterputten'
Flora & Fauna committee	Foster and stimulate bio diversity
Municipality Schagen (RUD)	Check on granted building permit
Energy and Health Campus (EHC)	In the context of the fence and zoning plan of the site
National forestry	Collaboration in nature management, teaching of staff
JRC Ispra	Communication of stakeholders expectations

C11 Training

C11.1 Internal training

Figure C22: Evolution of site based training



In 2018 the Petten site organised five newcomer sessions for a total of 24 staff and we had two specific trainings for units in which 28 staff participated and two meetings with environmental officers. Particular attention was paid to topics such as the explanation of the environmental aspect management and stakeholder analysis.

C11.2 External training

The JRC-Petten Environmental officer participated at two EMAS site coordinators workshops.

- Grange, Ireland, March 7 – 8, 2018.
- Brussel, Belgium, November 12 – 13, 2018

C12 EMAS Costs and saving

Table C14: EMAS administration and energy costs for buildings in the Petten EMAS area

Item	Costs									Change in
	2010	2011	2012	2013	2014	2015	2016	2017	2018	last year
Total Direct EMAS Cost (EUR)	0	0	66 000	66 000	66 000	67 000	67 000	69 000	74 000	2 000
Total Direct Cost per employee	0	0	248	251	234	241	243	262	298	20
Total buildings energy cost (Eur)	430 950	345 762	324 714	399 680	345 359	343 937	330 934	317 598	331 126	- 13 336
Total buildings energy cost (Eur/person)	1 858	1 510	1 221	1 520	1 225	1 237	1 199	1 208	1 335	9
Total fuel costs (vehicles) (Eur)	0	0	820	970	821	4 046	6 796	7 400	7 034	604
Total energy costs (Eur/person)	0	0	3	4	3	15	25	28	28	4
Total water costs (Eur)	5 338	13 040	15 250	10 130	6 282	6 500	7 754	5 901	3 968	- 1 853
Water (Eur/person)	23	57	57	39	22	23	28	22	16	-6
Total paper cost (Eur)	15 632	7 731	12 912	8 805	7 531	9 219	3 872	4 848	3 760	976
Total paper cost (Eur/person)	67	34	49	33	27	33	14	18	15	4
Waste disposal (general) - unit cost/tonne	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	1.78
Waste disposal (hazardous) - unit cost/tonne	750	750	750	750	750	750	750	750	750	0
Waste disposal (hazardous) - Eur/person	2.36	4.41	4.41	2.04	2.55	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
Substance	**Limit mg/m³**						
Chloride (Cl-)	-	210	200	240	120	250	160
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
Cadmium (Cd) - Limit 20mg/m³	20	<0.4	<0.4	<0.4	<0.4	<0.4	0.53
Zinc (Zn)	The sum of 5 metals; 5000	300	120	120	140	180	210
Copper (Cu)		160	180	170	160	220	330
Nickel (Ni)		5	5	5	8.2	7.9	19
Chromium (Cr)		5	5.8	6.3	<5	<5	<5
Lead (Pb)		5	5	0	<5	<5	<5
Arsenic (As)		1.5	1.5	0	<1.5	1.5	1.8
Metals: the sum of the 5 highest values - 5000 mg/m³		475	316	301	308	408	565
EOX (plug monsters) organohalogen compounds -	1 000	<100	<100	<100	<100	<100	NR
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
Wastewater discharge (m³)							
Wastewater from chemical laboratiries in 312 (m³)*	-	not emptied	4	4	4	2.8	2.9
The total discharge of waste water to the sewers (m³)	-	5 567	3 060	3 060	3 150	2 784	2 785

* 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 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 we conduct two separate investigations 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

Parameter and units	2012	2013	2014	2015	2016	2017	2018
kWh of energy provided by one litre diesel	10.89	10.89	10.89	10.89	10.89	10.89	10.89
kWh of energy provided by one litre petrol	9.42	9.42	9.42	9.42	9.42	9.42	9.42
Paper Density (g/m^2)	80.0	80.0	80.0	75.0	75.0	75.0	75.0
Kgs CO_2 from 1 kWh of electricity (if grid average..)	0.671	0.671	0.671	0.671	0.586	0.586	0.586
Kgs CO_2 from 1 kWh natural gas	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Kgs CO_2 from 1 kWh diesel fuel	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Kgs CO_2 from one litre of diesel	3.16	3.16	3.16	3.16	3.16	3.16	3.16
Kgs CO_2 from one litre of petrol	2.81	2.81	2.81	2.81	2.81	2.81	2.81
Annual cost of one FTE (EUR)	132 000	132 000	132 000	134 000	134 000	138 000	138 000

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 (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
JRC-PETTEN																			
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													
321, 322, 323	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

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Annex D: JRC-Geel

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Cover illustration: Save Gaia (Ceramics and original photo)
Elisa DALLE MOLLE, Christophe KORN, Henry KOEKENBERG. European Commission, Joint Research Centre in Geel (JRC-Geel). Winners of the interinstitutional art competition 'Our home, our planet' (June 2017)

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ANNEX D: JRC-GEEL – Scientific Activities

The JRC-Geel was founded in 1957 under the Treaty of Rome (The Treaty establishing the European Atomic Energy Community, Article 8) and started its operations 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 fifty-five years of its existence, the number of facilities on the JRC-Geel site has expanded to host new non-nuclear and nuclear activities. Older facilities and the infrastructure have been gradually renewed. The site is incorporated as a whole into the Commission's EMAS registration.

D1 Overview of core indicators at JRC-Geel since 2011

JRC-Geel has been collecting data on its site core indicators since 2011. The values in 2011 and from 2014 to 2018 are shown in Table D1, along with performance trends and targets where applicable for 2020.

Table D1: Historical data, performance and targets for core indicators proposed for Commission-level reporting

Physical indicators:	**Historic data values**					**Performance trend (%) since:**				**Target**	
(Number, description and unit)	2011 (1)	**2014**	2016	2017	2018	2011	2014	2016	2017	2020*	
										Δ% (2, 3)	value (2)
1a) Energy bldgs (MWh/p)	60.52	**51.19**	53.16	55.76	53.08	**– 12.4**	3.7	– 0.1	– 4.8	– 5.0	48.634
1a) Energy bldgs (KWh/m²)	426	**363**	311	293	272	**– 36.2**	**– 25.0**	**– 12.6**	**– 7.2**	– 5.0	344.7
1c) Non ren. energy use (bldgs) %	0	**99.5**	99.5	99.5	31.7		**– 68.1**	**– 68.1**	**– 68.1**	– 5.0	94.6
1d) Water (m³/p)	79.57	**34.75**	26.86	26.95	28.97	**– 63.6**	**– 16.6**	**7.9**	**7.5**	– 5.0	33.011
1d) Water (L/m²)	560	**246**	157	142	149	**– 73.5**	**– 39.7**	**– 5.5**	4.8	– 5.0	234
1e) Office paper (Tonnes/p)		**0.02**	0.02	0.01	0.01		**– 35.0**	**– 30.3**	**17.5**	– 5.0	0.020
1e) Office paper (Sheets/p/day)		**20**	19	11	13		**– 35.0**	**– 30.3**	**17.5**	– 5.0	19.4
2a) CO_2 buildings (Tonnes/p)	19.77	**16.88**	17.60	18.51	4.40	**– 77.8**	**– 74.0**	**– 75.0**	**– 76.2**	– 5.0	16.039
2b) CO_2 buildings (kg/m²)	139	**120**	103	97	23	**– 83.8**	**– 81.2**	**– 78.1**	**– 76.8**	– 5.0	113.7
2c) CO_2 vehicles (g/km, manufacturer)		**Not avail**	0	0	0					0.0	0
2c) CO_2 vehicles (g/km, actual)		**Not avail**	Not avail	Not avail	Not avail					0.0	N/A
3a) Non haz. waste (Tonnes/p)	0.267	**0.479**	0.364	0.370	0.292	**9.6**	**– 39.0**	**– 19.6**	**– 21.0**	– 5.0	0.455
3b) Hazardous waste (Tonnes/p)	0.075	**0.079**	0.081	0.026	0.067	**– 10.6**	**– 15.8**	**– 17.1**	**156.5**	– 5.0	0.075
3c) Separated waste (%)	83.6	**71.0**	67.7	69.8	71.4	**– 14.6**	0.6	**5.4**	**2.3**	5.2	74.7
Economic indicators (Eur/p)											
Energy consumption (bldgs)	5 120	**3 857**	4 027	4 091	4 023	**– 21.4**	4.3	– 0.1	– 1.7	– 5.0	3 664
Water consumption	84.0	**39.0**	33.5	46.8	59.6	**– 29.0**	**53.0**	**78.3**	**27.5**	– 5.0	37.0
Non haz. waste disposal	0.0	**0.0**	105.5	125.9	156.0			**47.9**	**23.9**	0.0	0.0

Note: (1) Earliest reported data; (2) compared to 2014; (3) EMAS Annual Action Plan 2019 (% values)
* Target for % improvement for the period 2014-2020
(5) total electricity (-1%), total gas (0%), total hot water (0%), total fuel (0%) -> total energy (-0.5%)

The evolution of the EMAS system in JRC-Geel is as shown below.

Table D2: EMAS baseline parameters

	2011	2012	2013	2014	2015	2016	2017	2018
Population: total staff	331	322	341	346	328	296	265	259
Total no. operational buildings	14	14	14	15	16	16	16	16
Useful surface area for all buildings (m^2)	46 996	46 996	46 390	48 815	50 538	50 538	50 382	50 499

Table D2 shows an increase of buildings and used area following major modernisation efforts.

D2 Description of JRC-Geel activities[1] and key stakeholders

D2.1 Activities

The JRC, a Directorate-General of the European Commission, is under the responsibility of Tibor Navracsics, Commissioner for Education, Culture, Youth and Sport. The JRC employs over 3000 staff, comprising scientists and researchers as well as administrative and support staff coming from all over the EU. Its offices and sites are located in Brussels (BE), Geel (BE), Ispra (IT), Karlsruhe (DE), Petten (NL) and Seville (ES). The JRC is a key player in supporting successful investment in knowledge and information foreseen by the Horizon 2020 Work Programme; the EU's programme for research and innovation.

The JRC-Geel site hosts EC staff from seven different Directorates (Directorates A, D, E, F, G, I and R of the JRC and a small group of staff of DG HR) in 16 different buildings.

While JRC-Geel staff reports to different Directors, the site operates under the responsibility of a single Site Director, Elke Anklam, the Director of the Directorate for Health, Consumers and Reference Materials.

The scientific activities fall under the responsibility of

- Directorate E, 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, 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.
- Directorate F, 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. To support 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). To operate all JRC-hosted European Union Reference Laboratories related to food safety and GMOs.
- Directorate F, 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, Unit G.2 Standards for Nuclear Safety, Security and Safeguards provides 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

[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

access to its nuclear facilities for external researchers from EU Member States and countries associated to the Euratom Research Programme.

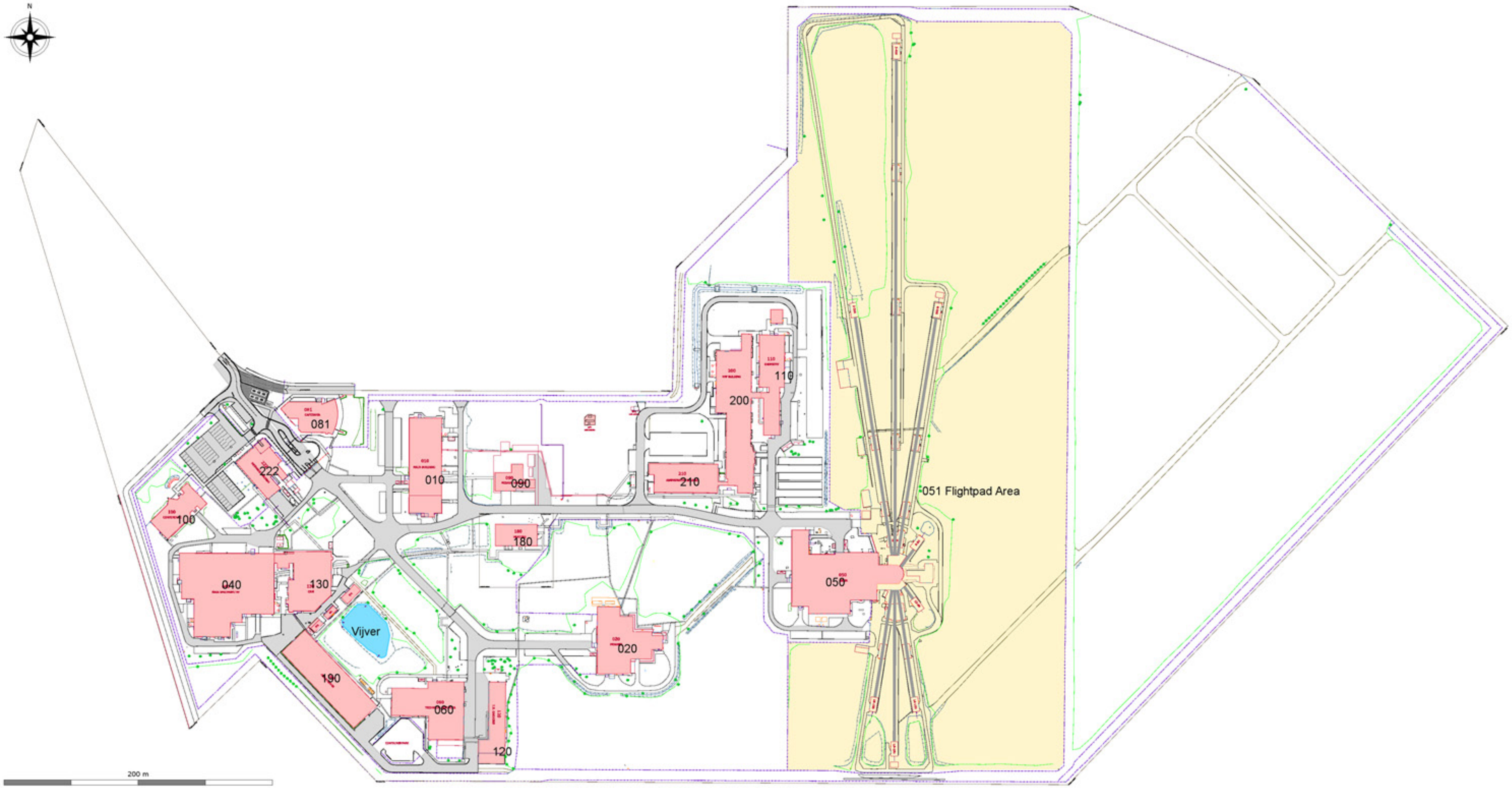
Other Units carry out scientific, technical and support tasks without maintaining own laboratories on the site.

The JRC-Geel site is located in Belgium, 80 km to the north-east of Brussels as shown in Figure D1.

The facilities are spread throughout the site as shown in Figure D2.

Figure D1: Location of JRC-Geel (North of the city of Geel)

Figure D2: JRC-Geel site layout



D2.1.1 Analytical laboratories

JRC-Geel has many analytical laboratories carrying out state-of-the-art 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. For biotechnological research, JRC-Geel has laboratories operating at biosafety levels 1 and 2 allowing work with hazardous materials.

Instruments cover the full range of spectrometric techniques including isotopic mass spectrometry, chromatography and hyphenated techniques in addition to state-of-the-art sample preparation techniques.

The JRC-Geel also has mass metrology instrumentation enabling ultra-precise weighing.

D2.1.2 Reference materials processing and storage facility

There is an increasing world-wide demand for new reference materials for a broadening range of applications. The JRC-Geel is a major certified reference material (CRM) producer, recognised worldwide and is the market leader in provision of GMO reference materials, among others. The range of materials produced at JRC-Geel varies from pure chemicals (including nuclear materials) to agricultural, food and environmental samples, so called matrix reference materials. In 2010, JRC-Geel renewed its reference materials processing facilities and created a scientific and technical facility bridging the gap between laboratory and industrial scale with specialised laboratories and a versatile pilot plant for material processing. Four different reference materials can be processed simultaneously without any risk of cross-contamination. This facility is unique among the major producers of certified reference materials.

JRC-Geel has state-of-the-art storage facilities for reference materials with rooms catering for temperatures ranging from 18 °C to -40 °C on cold cells down to -80° C on ultra low temperature freezers. Storage conditions in the JRC-Geel are monitored constantly. The JRC-Geel has currently over half a million reference material samples in stock of more than 800 different material 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. It focuses on neutron data for standards, safety of operating reactors, handling of nuclear waste and waste transmutation and investigating alternative reactor systems and fuel cycles. The work includes the preparation of certified nuclear reference materials which are produced in dedicated laboratories.

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 a vertical 3.5 MV Pelletron Tandem accelerator. 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 contain multiple glove boxes and dedicated equipment for the safe handling and preparation of the sample materials and targets.

D2.1.4 Explosives detection & transport security

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. Activities include the development of test materials and test methods for verifying the performance of equipment and performing technical assessments of detection equipment and test methodologies for priority applications, e.g. aviation security, first responders, border control and law enforcement.

D2.2 Context – risk and opportunities

JRC-Geel is located on a 38 ha site rented from the Belgian Centre for Nuclear Research SCK on the territory of the municipality of Mol (Belgium Flanders Region). It is subject 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 most important external issues, including both risks and opportunities, affecting JRC-Geel's environmental performance are:

1) Political – Further requirements and commitments to reduce energy consumption (COP 2030) are an opportunity justifying investments for further reduction measures, energy efficiency and use of renewable energy. A site development plan has been drafted, which takes these new objectives into account. Environmental legislation is getting more and more complex and demanding; some developments and changes in the legislation have direct impact on our activities (e.g. waste segregation or cleaning of contaminated soil or more stringent requirements in relation to emissions).
2) Economic – The uncertain economic situation (related also to Brexit) influences investments, staffing and contractors. There is a risk of budgetary constraints with a possible consequence that investments in energy reduction/shift cannot be fully realised.
3) Technological – The "Vlaamse Instelling voor Technologisch Onderzoek (VITO)" is developing geothermal heat recovery in the neigbourhood of JRC-Geel. A contract has been signed between JRC-Geel and VITO with the aim of distributing warm water from geothermal origin for the heating of its facilities by 2021.
4) Environmental – Climate change effects increase rains and storms as well as temperature peaks, which may induce higher HVAC costs.

D2.2.2 Internal issues affecting JRC-Geel's environmental performance[3]

A number of risks and opportunities were identified, possibly affecting JRC-Geel's environmental performance.

1) Activities – The nuclear activities of 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 our environmental performance.
2) Activities – The different installations and activities of JRC-Geel in general and of the GELINA facility in particular are very demanding in terms of energy consumption, both for heating and cooling. The heating requirements can be reduced by investment on insulation and heat recovery.
3) Strategic Direction – Increasing involvement at the international level is affecting travelling needs, with subsequent emissions (CO_2). Promotion of videoconferencing and sustainable event organisation could mitigate this risk.
4) Strategic Direction – The EC decision for implementing EMAS affects positively the environmental management and performance of the JRC-Geel site.

D2.3 Stakeholders' (interested parties) compliance obligations

A structured exercise has enabled JRC-Geel to define, by considering parameters of influence and interest, the main stakeholders in its environmental performance as shown in Figure D3.

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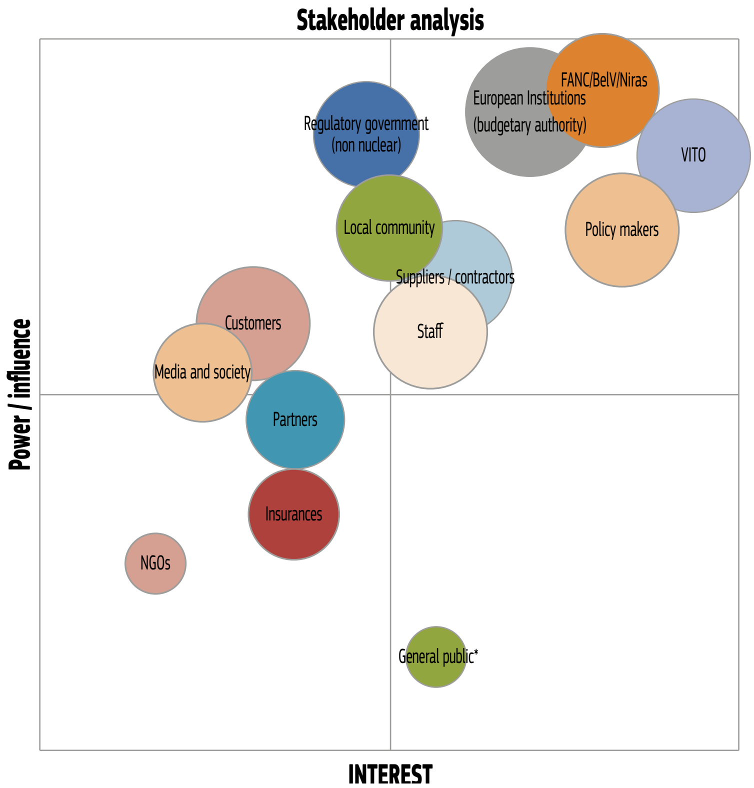
2 Identified using PESTLE criteria: Political Economic, Social, Technological, Legal, Environmental

3 Identified using ASCPF criteria: Activities, Strategic Direction, Culture and employees, Processes and systems, Financial

Figure D3: Stakeholders' analysis



* Other than those mentioned above

Figure D3 illustrates that there are eight stakeholders with particularly high influence and interest in our environmental performance.

- FANC (the Federal Agency for Nuclear Control), BelV (its technical subsidiary) and NIRAS (National Agency for Radioactive Waste and enriched Fissile Material) have high interest and influence regarding the nuclear aspects of JRC-Geel's environmental performance. By far, most of the efforts are targeted towards these aspects;
- VITO (Flemish Institute for Technological Research) has a major influence on the environmental performance as in the near future it could provide heat from geothermal origin, largely contributing to the reduction of our carbon footprint;
- The European Institutions have a major influence as budgetary authority and promoter of EMAS;
- Policy makers, at EU level as well as at national and regional level, set the regulatory and policy standards for the environmental performance JRC-Geel must achieve. In its fulfilment of these standards, the Commission strives to act as an example;
- The regulatory authorities of the Flanders region expect full compliance with the applicable regulations. Communication with these authorities is centred around annual reporting and the management of the environmental licence;
- The local community pays particular attention towards the protection from emergencies as well as the limitation of local disturbances, such as noise, in the direct neighbourhood;
- Contractors play an important role in the environmental performance as most of the infrastructure and/or maintenance work are outsourced; and
- Staff – it is an integral part of an EMAS-compliant management system to closely involve staff who has a crucial role in improving environmental performance.

The EMS requires revising the stakeholder analysis on a yearly basis. During the 2018 exercise two additional stakeholders were identified:

- SCK was added as owner of the JRC-Geel site,
- ECS was added as integrated safety solution provider

By analysing the stakeholders' needs and expectations, it appears that, notwithstanding compliance with the European, Federal (Belgian) and Regional (Flemish) regulations, the major needs and expectations of our stakeholders are included in the EMAS regulations. This is particularly true for the requirements regarding communication and ensuring that the 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);
- Whenever applicable, use at least the core criteria of Green Public Procurement; and
- Ban the use of single use plastic.

D3 Environmental impact of JRC-Geel

D3.1 Environmental aspects

In the course of 2018, JRC-Geel updated its environmental aspects register. Activities taking place in several locations were identified and the aspects and subsequent impact were assessed. Activities taking place in limited places 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 the JRC-Geel 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 catering, sanitary and technical installations
	Helium consumption		NMR[4]
Air	CO_2, SO_x, NO_x, CO, 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
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 (cooling towers)
Biodiversity	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 used for maintenance of the technical installations, 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 most important aspects of JRC-Geel are:

- Use of energy
- Emissions to air and water
- Use of water

[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.

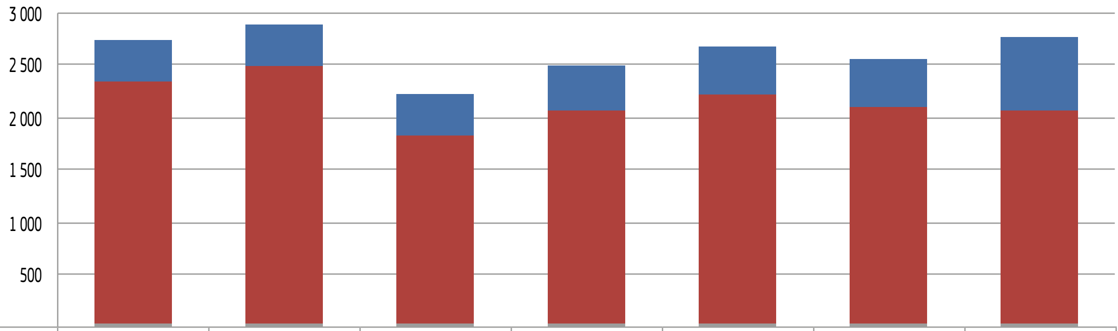
[6] For example: transport, use of natural resources, the lifecycle of the product, recycling, waste management, etc.

D4 More efficient use of natural resources

D4.1 Energy consumption

The building's energy consumption data should be considered in the context of climatic conditions. Analysis of degree data[7] presented below shows a continuous increase of cold degree days requiring more cooling. Staff reduction (including reduction of intra muros staff) also had an impact on per capita consumption. Nevertheless, the use of resources is more efficient in 2018 compared to reference year 2014 as shown in Figure D5.

Figure D4: Total annual degree days at JRC-Geel, 2012-2018

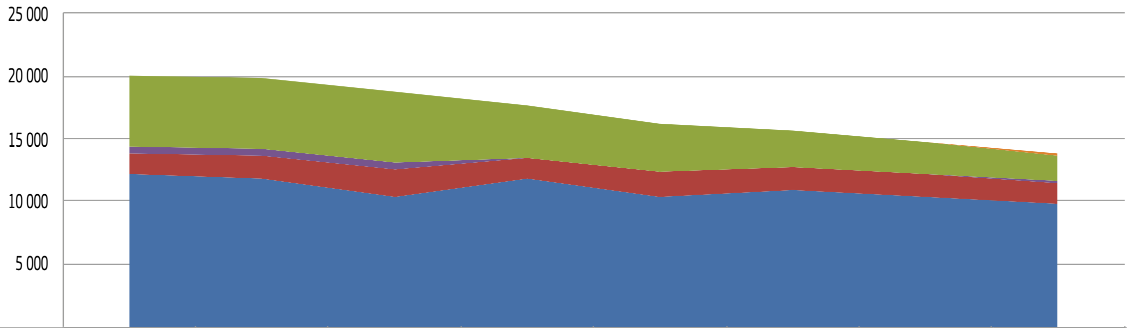


	2012	2013	2014	2015	2016	2017	2018
Total degree days	2 713	2 873	2 209	2 473	2 659	2 534	2 761
Cold degree days (CDD), cooling required	395	412	407	414	452	465	704
Hot degree days (HDD), heating required	2 318	2 461	1 802	2 059	2 207	2 069	2 057
kWh/person/degree day	22.78	19.11	23.17	20.02	19.99	22.00	19.22

a) Buildings

The evolution of total annual energy consumption is presented in Figure D5. Per capita and consumption per square metre are presented in figures D7 and D8.

Figure D5: Annual buildings' energy consumption (MWh) at JRC-Geel (indicator 1a)



	2011	2012	2013	2014	2015	2016	2017	2018
Total	20 066	19 937	18 756	17 719	16 243	15 737	14 777	13 750
electricity heat pumps				84	75	79	74	74
hot water	5 700	5 799	5 747	4 153	3 837	2 937	2 579	2 113
diesel	449	490	490	78	26	27	32	36
mains supplied gas	1 759	1 902	2 108	1 673	1 963	1 860	1 791	1 718
electricity	12 158	11 745	10 411	11 730	10 343	10 833	10 301	9 809

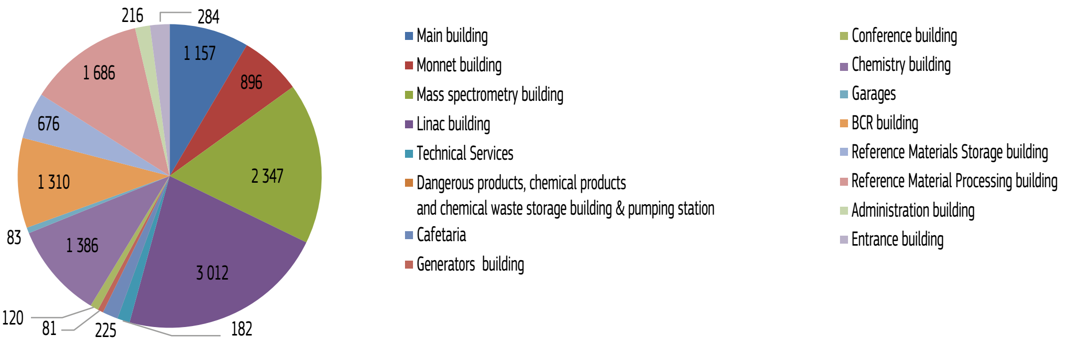
Six buildings accounted for over 80% of total energy consumption in 2018, the Linac building - B050 (hosting the linear accelerator) accounting for 22% as shown below in Table D4. The top 6 consumers are listed in table D4.

[7] Monthly data for Kleine Brogel station (15.5 °C reference temperature), www.degreedays.net using buildings energy consumption data for JRC-Geel.

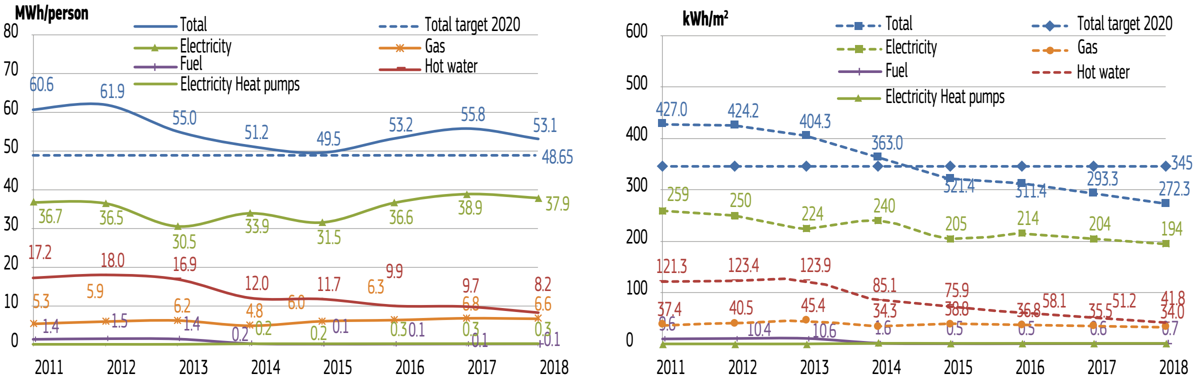
Table D4: JRC-Geel top 6 buildings energy consumption

Building	B 050 Linac	B 040 MS	B 200 RMPB	B 110 Chemistry	B 130 BCR	B 10 Main
% total energy consumed	22.00	17.20	12.30	10.1	9.60	8.50

Figure D6: Energy consumption distribution per building in 2018 (MWh)



Figures D7 and D8: Evolution of total annual energy consumption for JRC-Geel buildings per capita and m²



The overall decrease in energy consumption is largely linked with the decrease in hot water consumption (district heating) as well as electricity consumption. Building 060 was insulated in 2016 and the control of technical installations (pumps, valves, boilers, etc.) by the Building Management System (BMS) has improved. Although successful, these actions do not fully explain the trend.

Main consumers being:

- The accelerators; The cooling of the accelerators and Other cooling installations.

Electricity consumption represents a large part of the overall energy consumption of the buildings on the Geel site. JRC-Geel is in the process of improving its monitoring capacity to further address this aspect.

The most significant actions prioritising the reduction of energy and water consumption (indicators 1a and 1d) in the Annual Action Plan are summarised in Tables D5 and D8.

Finally, one could notice that the energy consumption per square meter has decreased as well as the consumption per capita. The 2020 objective per capita is not reached due to major staff reduction (including “intra muros” staff).

Table D5: 10 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-287	R.6	2 Buildings JRC-Geel	2017	Optimisation of building technical equipment running conditions using the existing building management system (BMS)/energy manager (EM) in Buildings 010 and 100.	multi-stage	2018 – Programming completed spring 2018. Action completed. 2017 – Analysis to be performed (first half 2017); Hardware installed and 80% of BMS programming completed.
EMAS GAAP-392	R.6	All site JRC-Geel	2018	Replacement of existing JRC-Geel street lighting with LED lighting.	Single	2018 – Execution of the contract. To be completed mid-2019.
EMAS GAAP-393	R.6	1 building JRC-Geel	2018	Replacement of B060 central workshop TL lamps with LED lighting.	Single	2018 – Execution of the project. Completed November 2018.
EMAS GAAP-394	R.6	All buildings JRC-Geel	2016	Identification/inventory of electric boards relevant to HVAC for the analysis of electricity consumed by cooling installation and connection of power meters to BMS.	Continuous	2019 – B040 & B200 to be finalised end 2019. 2018 – B020, B050, B081, B100, B110 and B200 completed; Study of B040 performed. 2017 – B020 cooling completed; B130 HVAC completed; Connection of B050 + inventory of buildings 010, 020, 081, 100, 110, 190, 200 done. 2016 – B060 & B210 & B222 HVAC power meters + B010 & B040 & B110 cooling power meters connected; B050 inventory completed.
EMAS GAAP-396	R.6	2 buildings JRC-Geel	2018	BMS optimisation of technical equipment running conditions in B130 to reduce the use of natural resources; analysis of opportunities in B020 and B081.	Multi stage	2018 – All 3 buildings optimisation processes completed. Action closed.
EMAS GAAP-451	R.6	4 buildings JRC-Geel	2019	Renewal of high voltage installations.	Multi stage	2019 – Replace transformers in B060 & B020 (order done). Replace HVAC boards in B050 (started). Electric boards to be replaced in B040 (to start).
EMAS GAAP-452	R.6	1 building JRC-Geel	2019	Replacement of existing lighting with LED.	Single	2019 – Technical specifications under development.
EMAS GAAP-453	R.6	All buildings JRC-Geel	2019	Automation of buildings using presence detectors.	Multi stage	2019 – Technical study to start.
EMAS GAAP-455	R.6	2 buildings JRC-Geel	2019	BMS optimisation.	Multi stage	2019 – Technical study completed. Hardware under order process.
EMAS GAAP-456	R.6/G.2	1 Building JRC-Geel	2019	Electricity impact assessment of the reduction of GELINA accelerator pulse frequency.	Single	2019 – Theoretical study on-going.

(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.

b) Vehicles

There are 7 fleet vehicles of which three are conventional vehicles, from which, one being Euro 2, Euro 3 and Euro 6 engines. The others are; 2 forkflifts, a fire engine and a tractor. Fuel used and energy consumption is presented in Table D6.

Table D6: Summary vehicle energy consumption (indicator 1b)

	2014	2015	2016	2017	2018
Total (MWh/yr)	30.42	29.67	27.71	28.53	25.30
Diesel used (m³)	0.851	0.714	0.860	1.037	0.799
Petrol used (m³)	2.032	2.111	1.734	1.659	1.605
Propane used (kg)	157.5	157.5	157.5	126.0	116.0

The car belonging to the security services and which the guards use for their inspection rounds and escorting deliveries consumes petrol. Unit G.2's fire engine and R.6's forklift and tractor use diesel. Unit G.2's forklift runs on propane[8].

In 2019, one of the central store cars used for deliveries will be replaced by an electric one (JIRA Action GAAP-459).

Total annual vehicle energy consumption illustrated above is about 0.18% of that for the buildings.

c) 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**
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	5.1
mains supplied gas (MWh non-renewable)	1 759	1 902	2 108	1 673	1 963	1 860	1 791	1 718
(% mains gas from non-renewables)	100	100	100	100	100	100	100	100
supplied diesel (MWh non-renewable)	416	455	455	73	24	25	29	33
(% diesel from non renewables)	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
(% from non renewables)	100	100	100	100	100	100	100	100
Site geothermal (MWh renewable)				83.84	74.95	79.4	74	74
(% from renewables)				100	100	100	100	100
Total renewables (MWh)				**83.84**	**74.95**	**79.4**	**74.00**	**9382.74**
(% from renewables)				**0.47**	**0.46**	**0.50**	**0.50**	**68.25**
Total non ren. energy use, (MWh/yr)		19 901	18 720	17 629	16 166	15 655	14 700	4 364
(% from non renewables)		100	100	99.5	99.5	99.5	99.5	31.7

Since 1 January 2018 and the implementation of a new electricity contract, 95% of the suppplied electricity in 2018 was of renewable origin; combined to the heating and cooling of building 210 which is done by a geothermal heat pump, more than 68% of the total energy used in JRC-Geel buildings is from renewable sources.

D4.2 Water consumption

Figures D9 and D10 show the evolution of total annual water consumption for JRC-Geel (indicator 1d).

8 Propane figures are based on the number of gas bottles ordered per year.

Figure D9: Evolution per capita

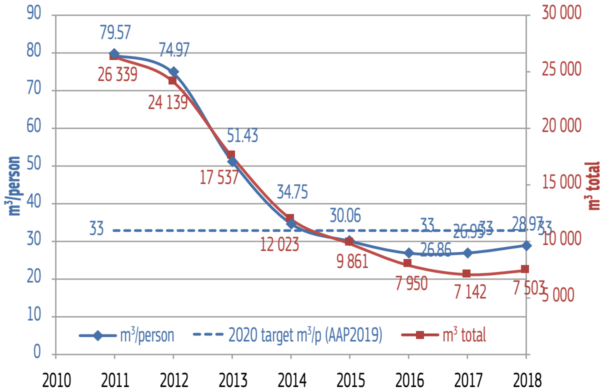
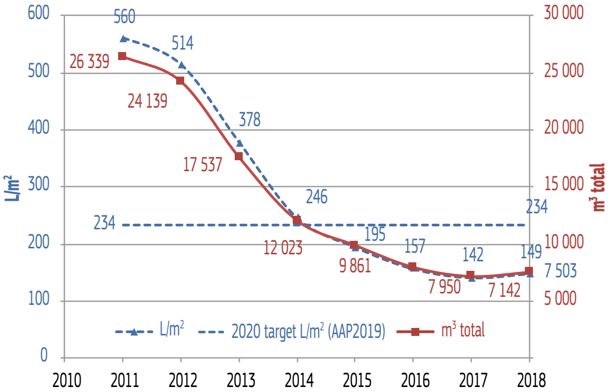


Figure D10: Evolution per m²



Three actions included in the EMAS annual action plan aim at reducing water consumption (see table D8). The slight increase of water consumption recorded in 2018 was due to the weather conditions over the year which increased the need of cooling and to a technical problem on a water purification system which was quickly identified via the measurement instruments installed in previous years in the framework of various environmental improvement actions.

Table D8: Main actions to reduce water consumption in JRC-Geel

JIRA #	Unit	Perimeter of action	Date in AAP	Action description	Description of latest progress
EMAS GAAP-288	R.6	Building 040	2017	Replacement of B040 cooling towers.	2019 – On Hold – Waiting for execution of GAAP-454 for fine tuning of technical specifications. 2018 – Planning set-up. Draft technical specifications. 2017 – First meeting for budget evaluation performed.
EMAS GAAP-454	R.6	Building 040	2019	Replacement of B040 cooling collector.	2019 – Technical study completed and collector ordered.
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.	2019 – Technical specifications completed and hardware ordered.

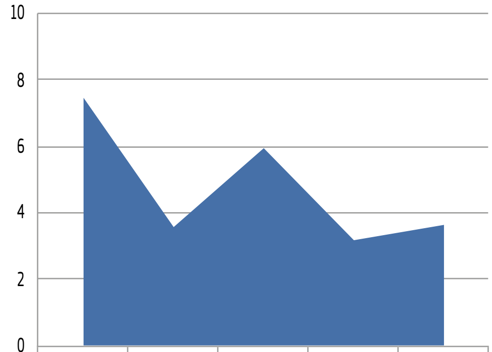
The main reason for the decrease in water consumption is the replacement of (chillers cooled by) old wet cooling towers by dry coolers. This was done gradually over the past years together with the replacement of the chillers containing R22 refrigerant.

Regular monitoring of water consumption allows the detection of abnormal increases (caused for example by to defective valves) and immediate intervention when necessary.

D4.3 Office and offset paper

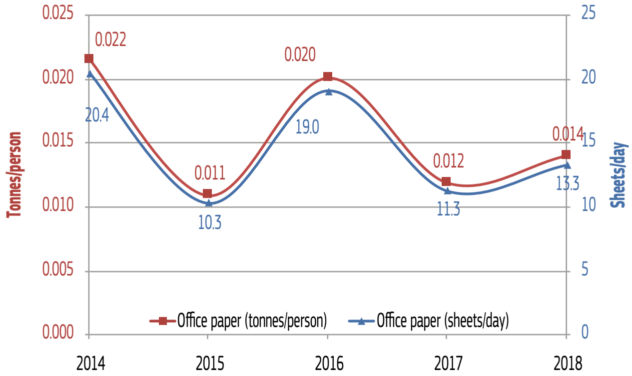
Offset paper is not used at JRC-Geel. The evolution of total and per capita office paper consumption is shown in figures D11 and D12. The figures are based on purchasing data. As a consequence, it is possible that figures show an increase, even if real consumption did not increase, as paper was purchased at the end of the year. The figures should be compared over longer periods. The 2018 increase is due to the fact that a special paper used by the drawing office was taken into consideration compared to the previous years which represents an amount of 533 kg. The consumption of "normal" paper is of the same order of magnitude in 2018 compared to 2017.

Figure D11: Evolution of total paper consumption at JRC-Geel (tonnes, sheets)



	2014	2015	2016	2017	2018
Total paper consumption (tonnes)	7.44	3.57	5.93	3.15	3.62
Offset paper (tonnes)	0.00	0.00	0.00	0.00	0.00
Office paper (tonnes)	7.44	3.57	5.93	3.15	3.62
Office (A4 sheet equivalent) x 1 000 000	1.49	0.72	1.19	0.63	0.73

Figure D12: Per capita consumption of office paper (tonnes, sheets per day)



The status of actions to reduce paper consumption is presented below:

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
EMAS GAAP-158	R.6	All staff-JRC-Geel	2015	Raise awareness of paper consumption through communication.	Continuous	2018 – Figures communicated via Connected. 2017 – Figures communicated via info screens 2016 - The figures of the distributed paper per building hence the paper consumption were communicated to staff in order to achieve a behaviour change resulting in decreased in paper use.
EMAS GAAP-398	R.6	Building 060&200	2018	Trial to use lighter paper (70 or 60 g/m^2 instead of 80 g/m^2) for the printing machines in B060.	Pilot	2018 – Selection of paper and first trials. Completed.
EMAS GAAP-458	R.6	All buildings	2019	Extension of the use of lighter paper (70 or 75 g/m^2) to more buildings following the tests.	Multi-stage	2019 -Palets of 75 g/m^2 paper ordered.

In 2018, feasibility tests were conducted with the use of lighter paper (60, 70 and 75 g/m^2 instead of 80 g/m^2); best results were obtained with the 75 g/m^2 paper. For 2019, all new paper ordered will be of this type.

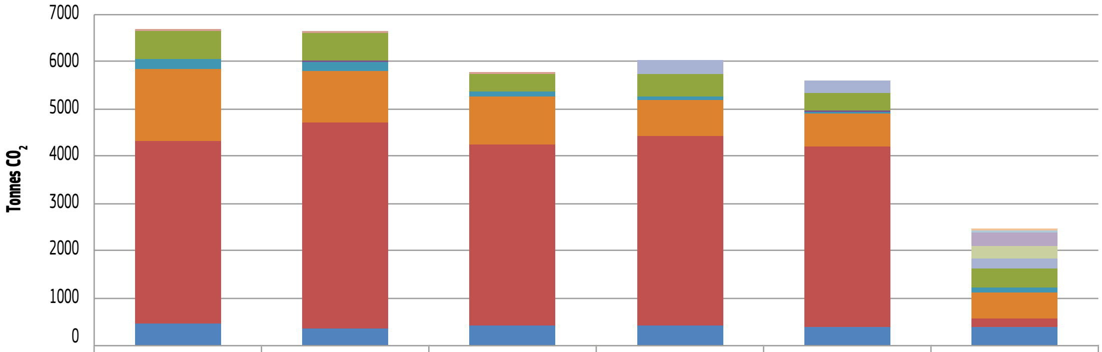
In order to reduce printing, new multi-functional printers have been installed at JRC with the need to use personal badge for printing.

D5 Reducing air emissions and carbon footprint

D5.1 Carbon footprint

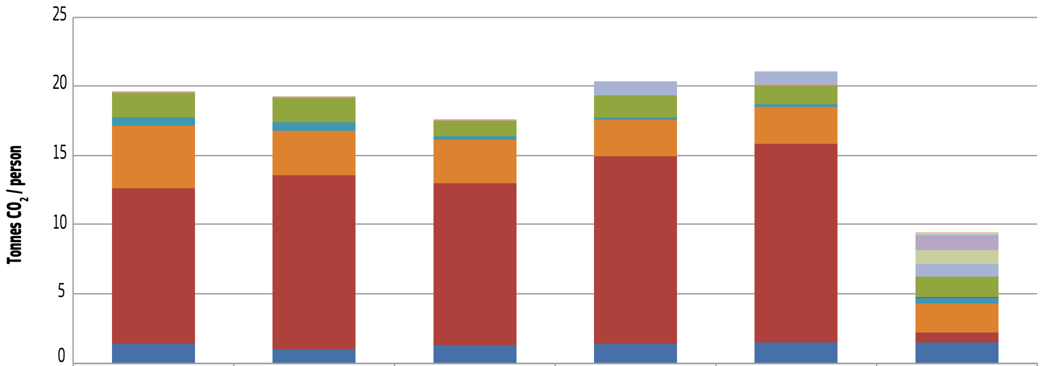
The emissions due to different sources are presented below:

Figure D13: Carbon footprint elements (Tonnes CO_2)



	2013	2014	2015	2016	2017	2018
SUM	6649	6627	5745	6016	5586	2446
Own waste	0	0	0	0	0	31
Goods and Service	0	0	0	0	0	19
Fixed assets - IT	0	0	0	0	0	292
Fixed assets - buildings	0	0	0	0	0	246
Staff commuting	0	0	0	281	251	246
Missions (excluding air)	3	2	7	6	6	1
Missions (air)	571	602	361	459	367	378
Vehicle fleet - fuel consumption	0	9	9	8	8	7
Buildings - refrigerant losses	226	196	85	60	59	98
Buildings - district heating/cooling	1534	1109	1024	784	689	564
Buildings - electricity	3852	4340	3827	4008	3811	185
Buildings - fuels for heating - Mains gas	464	368	432	410	394	378

Figure D14: Carbon footprint elements (Tonnes CO_2/person)



	2013	2014	2015	2016	2017	2018
SUM	19.50	19.15	17.52	20.32	21.08	9.44
Own waste	0.00	0.00	0.00	0.00	0.00	0.12
Goods and Service	0.00	0.00	0.00	0.00	0.00	0.07
Fixed assets - IT	0.00	0.00	0.00	0.00	0.00	1.13
Fixed assets - buildings	0.00	0.00	0.00	0.00	0.00	0.95
Staff commuting	0.00	0.00	0.00	0.95	0.95	0.95
Missions (excluding air)	0.01	0.01	0.02	0.02	0.02	0.01
Missions (air)	1.67	1.74	1.10	1.55	1.39	1.46
Vehicle fleet - fuel consumption	0.00	0.03	0.03	0.03	0.03	0.03
Buildings - refrigerant losses	0.66	0.57	0.26	0.20	0.22	0.38
Buildings - district heating/cooling	4.50	3.20	3.12	2.65	2.60	2.18
Buildings - electricity	11.30	12.54	11.67	13.54	14.38	0.71
Buildings - fuels for heating - Mains gas	1.36	1.06	1.32	1.38	1.49	1.46

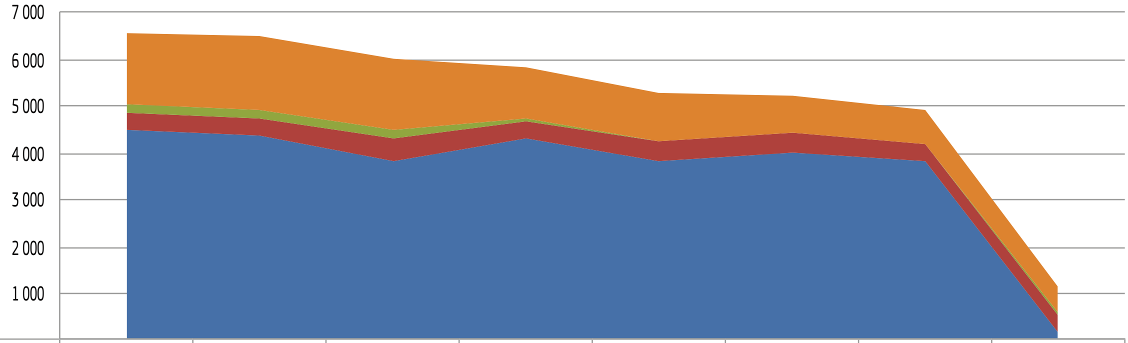
As a consequence of the 2016 re-organisation, some units were spread over several sites. Further follow-up is needed to assess if this re-organisation has had a major impact on the carbon footprint due to missions. The first results do not show any significant increase.

D5.2 CO_2 emissions from buildings

a) Buildings (energy consumption)

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
Total (tonnes)	6 556	6 475	6 012	5 843	5 292	5 211	4 905	1 139
district heating/ cooling	1 522	1 548	1 534	1 109	1 024	784	689	564
diesel	148	162	162	26	8	9	10	12
mains gas	387	419	464	368	432	410	394	378
electricity	4 498	4 346	3 852	4 340	3 827	4 008	3 811	185

Electricity consumption is responsible for the major reduction of CO_2 emissions since 1 January 2018, 95% of the electricity supplied is from renewable sources.

Emissions from district heating/cooling have been reduced by over 50% over the last years. These CO_2 emissions may be further reduced by the end of 2020, beginning 2021 as JRC-Geel district heating will be supplied from geothermal origin.

Figures D16 and D17 show emissions from building energy consumption per capita and per m².

Figure D16: CO_2 emissions per capita

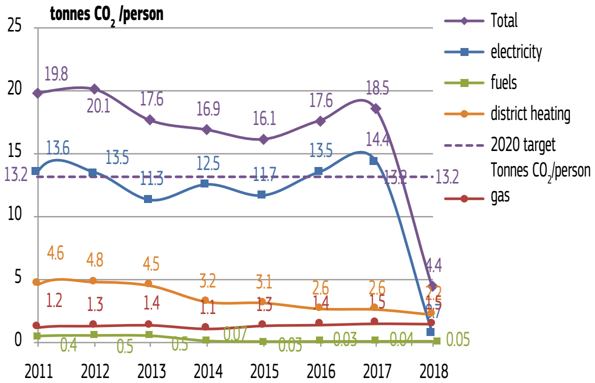
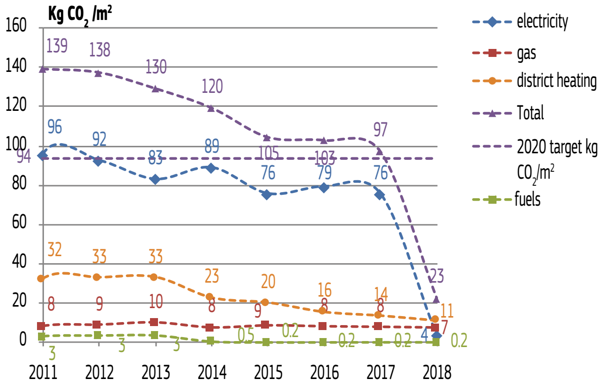


Figure D17: CO_2 emissions per m²



The 2020 target for reducing CO_2 emissions per square meter as well as per capita has been met due to the new electricity contract in operation since 1 January 2018.

Actions specifically targeting reduction in CO_2 emissions are included in table D10. Many other actions to reduce energy consumption will also result in lower CO_2 emissions. These are detailed in Section D4.1.

Table D10: Main actions planned to further reduce the CO_2 emissions

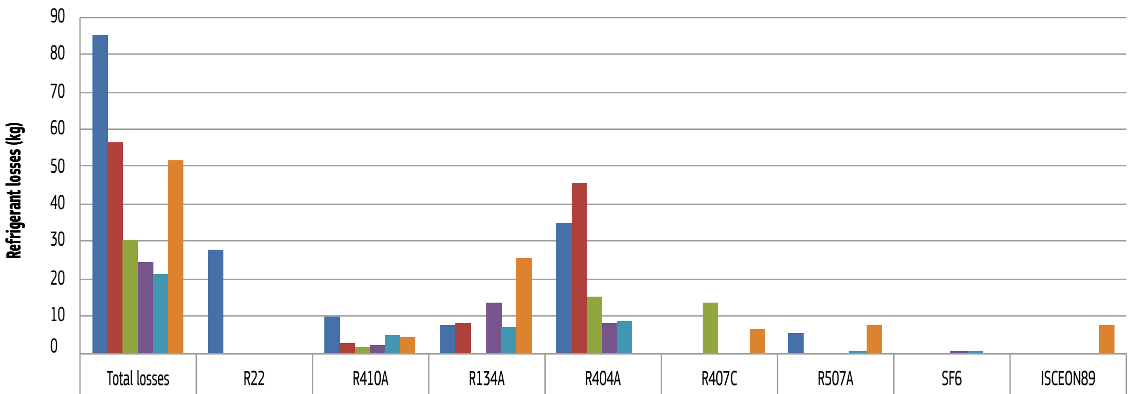
JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-190	R.6	All site-JRC-Geel	2016	New electricity contract.	Single	2018 – Completed. Electricity supplied from renewable sources. 2017 – New electricity contract (100% green) signed on 20.11.2017. 2016 – Preparation of the specifications of the new contract for electricity supply, at least 50% should be green electricity (GPP requirement).
EMAS GAAP-301	R.6	All buildings JRC-Geel	2017	Heating from geothermal origin: new contract to be signed.	Single	2017 – Completed. Contract ref. C931626 signed. As of end 2020 / beginning 2021, hot water for heating will be from geothermal origin.
EMAS GAAP- 459	R.6	JRC-Geel Site	2019	Replacement of one of the Central Store cars with an electric one.	Single	2019 – Car ordered, delivered and in operation. Action completed.
EMAS GAAP- 460	R.6	JRC-Geel Site	2019	Installation of a quick charging pole for charging electric cars.	Single	2019 – Technical specifications under preparation.

b) Buildings -other greenhouse gases (refrigerants)

Figures D18 and D19 provide an overview of the evolution in recorded gas losses from refrigerating Units (HFCs and in 2013 also R22). As from 2016, losses of SF_6 (which has also a high GWP) is also recorded. SF_6 is not a refrigerant but an insulating gas used mainly in the new MONNET accelerator as well as in the electric power switches.

Following the full implementation of EU Regulation No. 517/2014 on fluorinated greenhouses gases, since 2018 the cooling gas (ISCEON89) used in the various freeze dryers is also included in the reporting.

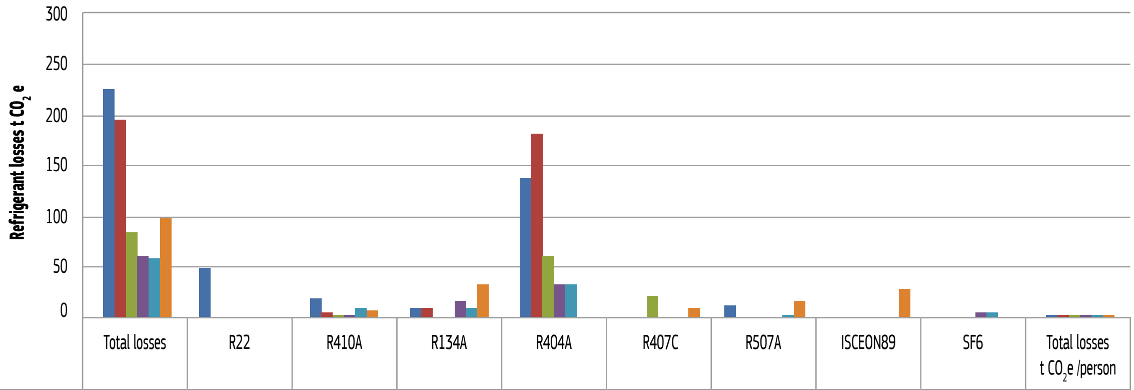
Figure D18: Losses of refrigerants at JRC-Geel (kg) (indicator 2b)



	Total losses	R22	R410A	R134A	R404A	R407C	R507A	SF6	ISCEON89
2013	85.00	27.50	9.80	7.50	34.60	0.00	5.60	0.00	0.00
2014	56.40	0.00	2.60	8.00	45.80	0.00	0.00	0.00	0.00
2015	30.19	0.00	1.43	0.00	15.21	13.55	0.00	0.00	0.00
2016	24.22	0.00	2.02	13.66	8.31	0.00	0.00	0.23	0.00
2017	21.30	0.00	5.08	6.95	8.49	0.00	0.55	0.23	0.00
2018	51.59	0.00	4.45	25.66	0.00	6.42	7.52	0.00	7.54

The trend since 2013 has been a reduction of losses which is due to the renewal of installations and adequate maintenance.

Figure D19: Losses of refrigerants at JRC-Geel (tonnes CO_2 e) (indicator 2b)



	Total losses	R22	R410A	R134A	R404A	R407C	R507A	ISCEON89	SF6	Total losses t CO_2e /person
2013	225.8	48.4	18.8	9.8	136.3	0.0	12.5	0.0	0.00	0.66
2014	195.8	0.0	5.0	10.4	180.5	0.0	0.0	0.0	0.00	0.57
2015	84.6	0.0	2.7	0.0	59.9	22.0	0.0	0.0	0.00	0.26
2016	59.8	0.0	3.9	17.8	32.7	0.0	0.0	0.0	5.41	0.20
2017	58.9	0.0	9.8	9.0	33.5	0.0	1.2	0.0	5.41	0.22
2018	97.8	0.0	8.5	33.4	0.0	10.4	16.8	28.7	0.0	0.38

Refrigerant losses represent about 4.4% of CO_2 carbon footprint of JRC-Geel as reported in D5.1. Upgrading installations (linked with the decommissioning of old ones containing R22), improved maintenance and close follow-up are responsible for the gradual reduction in losses from refrigerants.

The 2018 increase is due to the full implementation of regulation N.517/2014 taking into account cooling installations not managed by R.6 unit and is also due to old equipment which is in the process of being replaced.

According to the fluorinated gas regulation No. 517/2014, from 1 January 2020 there will be a replenishment ban for F-gases with a GWP (Global Warming Potential) ≥ 2500. In this context, JRC-Geel is analysing the possibility to switch to alternative gases in its existing installations.

D5.3 CO_2 emissions from vehicles

a) Commission vehicle fleet

Table D11: Fleet vehicle characteristics and tailpipe CO_2 emissions

	2014	2015	2016	2017	2018
Total (MWh/yr)	30.42	29.67	27.71	28.53	25.30
MWh/person	0.085	0.087	0.094	0.108	0.098
CO_2 emissions (tonnes)					
From Diesel	2.69	2.26	2.72	3.28	2.52
From Petrol	5.71	5.93	4.87	4.66	4.51
From Propane	0.36	0.36	0.36	0.29	0.27
Tailpipe emissions (CO_2)	8.8	8.6	8.0	8.2	7.3
Tailpipe emissions (CO_2/ person)	0.025	0.026	0.027	0.031	0.028

The emissions related to the JRC-Geel fleet represent less than 0.4% of the emissions due to energy consumption.

b) Local work based travel (excluding Commission vehicle fleet)

JRC-Geel encourages bicycles to be used for transfers from one building to another. In this context, 90 bicycles from JRC-Geel are available 29 of which are white. The white ones are not allocated to any particular person but can be used by anyone needing to commute on site.

c) Commuting

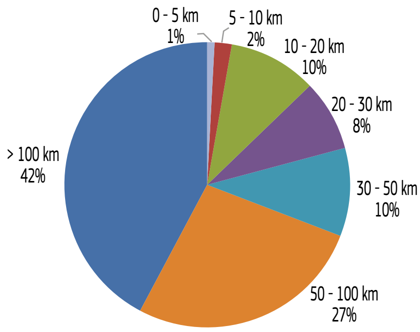
In 2015, a pilot study was launched to assess the feasibility of a shuttle connection from Mol/Geel stations to JRC-Geel. Unfortunately, it was unsuccessful largely due to the remoteness of the JRC-Geel site.

People living in the immediate area around the site are more inclined to come by bike or walk to work. Those living in the centres of Geel or Mol have the option to take a bus operated by De Lijn which comes within proximity of the site towards the European School. However, people living further away would need to change the public transport means twice or more thus making public transport inconvenient for JRC-Geel staff in terms of time and efficiency.

Furthermore, people with children of school age generally drop off and pick up their children from their respective schools on their way to and from work. This is particularly the case for children attending the European School of Mol which is located in the same area as the JRC-Geel site and thus carpooling the children to school makes the car an obvious convenient option. No financial incentive is offered to staff coming to work by public transport.

In 2016, a survey was conducted to estimate the carbon footprint of staff commuting. 132 staff members replied to this survey, and altogether they commuted an average daily distance of 5366 km. The distribution of journey length is presented in Figure D20 below.

Figure D20: Distribution of daily commuting distance



Excluding journeys by bicycle, on foot or as a car passenger (including carpooling) this represents 4469 km/day or 33.86 km per person per day mostly representing individual car journeys.

Taking average emissions of 133 kg CO_2/km[9], the number of staff members of 296 and the number of working days of 211, the annual CO_2 emissions due to commuting is 281 Tonnes for year 2016; 0.95 Tonnes CO_2/person. This represented approximatively 5% of the site's measured carbon footprint in 2016.

Keeping the same 0.95 Tonnes CO_2/person, based on the 259 JRC-Geel staff members, the total emissions due to commuting for 2018 can be estimated at 246 Tonnes corresponding to approximatively 11% of the site's carbon footprint for 2018.

D5.4 Total air emissions of other air pollutants (SO_2, NO_2, PM_{10})

Emissions from other air pollutants is limited as, on one hand buildings are heated by Natural gas and, on the other hand the diesel is used only for the emergency generators which run less than 100 hours per year since 2014.

Table D12: Total air emissions of other air pollutants (SO_2, NO_2, PM_{10})

	2013	2014	2015	2016	2017	2018
Total air emissions buildings (tonnes), as minimum NO_2, SO_2, PM_{10}	4.844	1.053	0.640	0.630	0.659	0.649

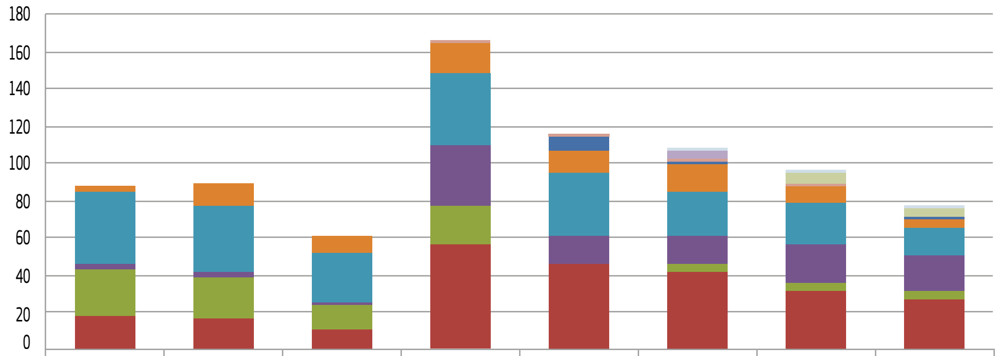
D6 Improving waste management and sorting

D6.1 Non-hazardous waste

The evolution of non-hazardous waste disposed of from JRC-Geel is represented in Figure D21.

[9] 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/

Figure D21: Evolution of non-hazardous waste disposed

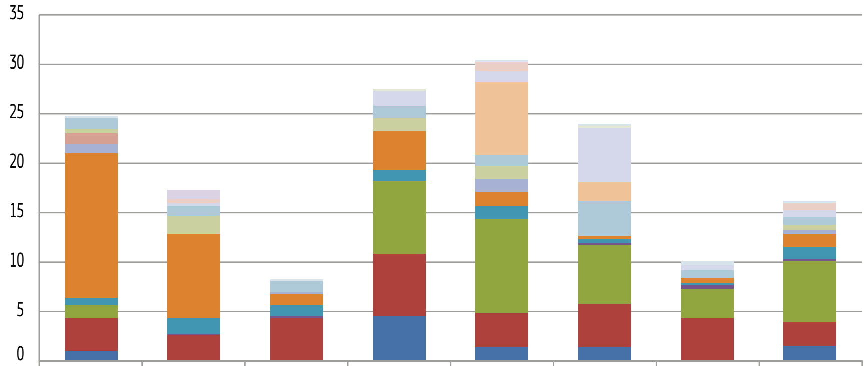


	2011	2012	2013	2014	2015	2016	2017	2018
Total	88.3	88.7	61.5	165.8	115.0	107.7	95.0	75.7
Total (tonnes/person)	0.27	0.28	0.18	0.48	0.35	0.36	0.36	0.29
Plastics (200139)						0.05	0.06	0.00
Wine samples (020304)						4.45	0.00	0.00
Swill (200108)	0.00	0.00	0.00	0.00	0.00	0.76	5.49	3.57
Packaging waste: PMD (150106)	0.00	0.00	0.00	1.16	0.54	0.69	0.95	0.67
Glass (200102, 150107)	0.00	0.00	0.00	0.04	7.83	2.14	1.19	0.98
Wood (170201, 200138)	4.20	12.0	8.54	16.3	11.9	15.5	8.2	4.7
Metal (191202, 200140)	38.2	35.3	27.0	37.7	33.2	22.3	22.2	15.0
Paper and cardboard (200101)	2.72	2.62	1.62	32.7	14.6	14.8	20.9	19.5
Building, brick and stone (170102, 170301)	24.7	22.6	13.7	21.8	0.00	4.50	4.26	4.26
Residual; mixed (070299, 080318, 191210, 191212, 200301, 200307)	18.6	16.2	10.7	56.1	46.9	42.5	31.8	26.6

D6.2 Hazardous Waste

The evolution of hazardous waste disposed of from JRC-Geel is represented in Figure D22.

Figure D22: Evolution of hazardous waste disposed



	2011	2012	2013	2014	2015	2016	2017	2018
Total	24.74	17.34	8.12	27.44	30.38	23.86	10.09	17.30
Total (tonnes/person)	0.075	0.054	0.024	0.079	0.093	0.081	0.038	0.067
Fluorescent lamps and mercury containing objects (200121, 160307, 060404)	0.18	0.00	0.06	0.00	0.08	0.11	0.31	0.11
Waste from mechanical processes (191211)	0.07	0.87	0.00	0.00	0.00	0.00	0.00	0.00
Waste from production of water for industrial use including resins (190905)	0.00	0.00	0.00	0.05	0.04	0.07	0.07	0.12
Batteries and accumulators (160601, 200133)	0.03	0.52	0.01	0.06	0.96	0.01	0.03	0.66
Pressurised gasses and lab chemicals (160504, 160506, 200119)	0.00	0.34	0.00	1.41	1.03	5.57	0.58	0.74
Antifreeze, PCB (160114, 160209)	0.00	0.00	0.00	0.00	7.36	1.93	0.00	0.00
Packaging waste, absorbents, cleaning cloth, filters (150110, 150202)	1.00	0.92	1.09	1.31	1.12	3.43	0.62	0.74
Cooling gasses (140601)	0.00	0.00	0.00	0.03	0.07	0.00	0.00	0.00
Waste oil (130205, 130301, 130802)	0.43	1.87	0.08	1.27	1.29	0.03	0.05	0.62
Waste from thermal processes (100804)	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paint, ink, glue, resin containing hazardous substances (080111, 080317, 200127)	0.92	0.00	0.08	0.09	1.36	0.03	0.00	0.37
Waste from organic chemical processes (070101, 070103, 070104, 070701, 070704)	14.60	8.50	1.19	3.86	1.46	0.41	0.58	1.36
Waste from inorganic chemical processes (060106, 060205, 060399)	0.87	1.58	1.15	1.14	1.32	0.26	0.22	1.25
Asbestos (170605)	0.05	0.08	0.15	0.02	0.00	0.25	0.24	0.08
Electric & electronic, AEEA (160213,160214, 200136)	1.23	0.00	0.00	7.34	9.34	5.92	3.12	6.20
Biological waste (180103)	3.29	2.68	4.30	6.36	3.60	4.46	4.27	2.48
Radioactive waste	1.04	0.00	0.00	4.49	1.36	1.40	0.00	1.49

D6.3 Waste sorting

Table D13: Percentage of waste sorted at JRC-Geel

	2011	2012	2013	2014	2015	2016	2017	2018
Percentage of waste sorted	83.6	84.8	84.6	71.0	67.8	67.7	70.7	71.4
Percentage of waste not sorted	16.4	15.2	15.4	29.0	32.2	34.8	30.2	28.6

Table D14 gives an overview of the actions seeking to improve waste sorting.

Table D14: Actions relevant to waste

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-305	HPS	5 buildings-JRC-Geel	2017	To set-up and implement a new clearance procedure for waste generated in the controlled areas (B10; 20; 40; 50 &51).	Single	2017 – Procedure approved & implemented.
EMAS GAAP-399	R.6	All buildings	2018	Replacement of plastic cups by bio-degradable ones at the water fountains.	Pilot	2019 – Call for water fountains re-launched. 2018 – Use of glass carafes implemented for meeting. In the cafeteria single package milk cups has been phased out by the service provider and now bottled milk is used.
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	2019 – Hardware ordered.
EMAS GAAP-462	R.6	2 buildings	2019	Study of the possibility to install water meters on the 2 main industrial wastewater tanks. (B170 and B200)	Single	2019 – Kick of meeting completed. Technical specifications under development.

D7 Protecting biodiversity

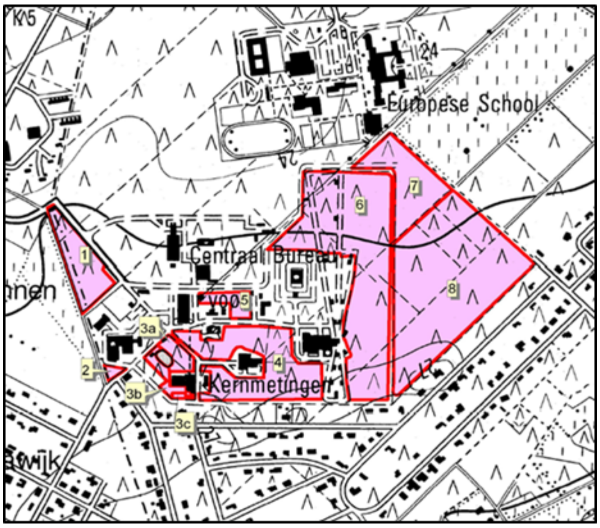
The built surface area slightly increased in 2018 compared to 2017 (70 309 m^2 vs 70 203 m^2) due to the installation of new high voltage cabins and an extension to B110 (called B114), representing 18.5% of the total surface). As a consequence of staff reduction the built surface per person increased by 2%.

JRC-Geel has a Forest Management Plan which has been approved by the authorities. The overall aim is to gradually replace the pine trees by endemic species.

A specific plan to eradicate and prevent regrowth of the foreign species such as "Amerikaanse vogelkers" or "American black cherry" is implemented and executed on the planned timespan from 2010 to 2029. Different kinds of endemic oaks and other trees and plants are slowly replacing the foreign species of trees and other vegetation spread on the same planning as indicated *supra*.

As every year, special care is taken for the smooth and safe migration of toads during their pairing season by placing screens so that toads are prevented to cross the streets to go from one pond to the next**.** The toads are then carried over safely in buckets from one side of the street to the other.

Figure D23: Location of the forest lots (forest management plan)



In order to develop biodiversity, two insect hotels were placed in zone B051. More will be installed in 2019.

Figure D24: View of the insect hotels located close to B050

Table D15 gives an overview of the main actions related to this topic.

Table D15: Actions relevant to biodiversity

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-309	R.6	All site – JRC-Geel	2017	To execute the Forest Management Plan (FMP) in order to regain natural tree vegetation.	Continuous	2017 – one hundred new trees from which Quercus robur (20%), Sorbus aucuparia (20%), Frangula alnus (20%) and Ilex aquifolium (10%)
EMAS GAAP-463	R.6	All site – JRC-Geel	2019	Identification of strategic spots for installation of new insect hotels.	Single	2019 – 4 new hotels ordered.
EMAS GAAP-464	R.6	All site – JRC-Geel	2019	Inventory biodiversity. 10 years after the start of JRC-Geel forest management plan, a study will be performed to make an inventory of the biodiversity on site. Results may generate an updated forest management plan.	Single	2019 – To start.

D8 Green Public Procurement (GPP)

D8.1 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[10] (Common Procurement Vocabulary), flagging the request as soon as GPP criteria are involved. In 2018, 12 out of 34 high value contracts (35%) were flagged as falling under GPP. However, if we take into account the estimated contract value this is equal to 73%.

Table D16 gives an overview of the main actions related to this topic.

Table D16: Actions relevant to procurement

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-190	R.6	All site - JRC-Geel	2016	New electricity contract.	Single	2018 – New electricity contract operational. 2017 – Finalisation of electricity contract and procurement launched; 2016 – Preparation of the specifications of the new contract for electricity supply, at least 50% should be green electricity (GPP requirement).
EMAS GAAP-465	R.6	One building	2019	New cafeteria contract to include stronger GPP criteria's to reduce water consumption and CO_2 footprint.	Single	2019 – Call to be launched.

D9 Demonstrating legal compliance and emergency preparedness

The follow-up of the legal compliance can be split into nuclear and non-nuclear areas.

- 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; and
- The non-nuclear environmental protection is regulated by the Flanders Region. The main agencies are Departement Omgeving, OVAM (Openbare Afvalstoffen Maatschappij) and VMM (Vlaamse Milieu Maatschappij). In order to follow-up the appropriate legislation an environmental coordinator must be retained. At JRC-Geel this is outsourced. In 2018, the contract for the external environmental coordinator expired and a new contract was concluded with a new company.

In 2018, the follow-up of the legal compliance at JRC-Geel was distributed as follows:

- Nuclear legislation by the Health Physics Service (HPS), administratively belonging to Unit G.2; and
- Non-Nuclear Environmental Legislation is followed up by Unit R.6 through the environmental legal register which was set up in 2018, as well as through the contribution of the external environmental coordinator, doing regular checks in the form of site visits and audits.

In addition, in the framework of the contained use of GMOs and pathogens a staff member of Unit F.6 has the task of Biosafety Coordinator.

Table D17 gives an overview of the main actions related to this topic.

[10] 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.

Table D17: Major actions relevant to legal compliance

JIRA #	Service	Perimeter of action	Date in AAP	Action description	Action type	Description of latest progress
EMAS GAAP-323 & 324	G.2 / F	6 buildings-JRC-Geel	2017	Set up and execution of a maintenance plan for cooling equipment subject to the F gas regulation 517/2014	Continuous	EMAS GAAP-323 completed December 2017. EMAS GAAP-324: completed May 2018
EMAS GAAP-325	R.6	All buildings-JRC-Geel	2017	Update of environmental licence	Single	2018 – New environmental permit granted on 08.02.2018.
EMAS GAAP-328	R.6	All site-JRC-Geel	2017	Improvement of legal compliance follow-up	Multi-stage	2018 – New legal register in operation.
EMAS GAAP-329	R.6	All buildings-JRC-Geel	2017	Make an inventory of “fixed” gas tanks	Single	2018 – Completed May 2018.
EMAS GAAP-466	R.6 / HPS	All buildings-JRC-Geel	2019	Integration of environmental emergency scenario’s in JRC-Geel emergency exercises	Multi-stage	2019 – Set-up on going.
EMAS GAAP-468	R.6	All buildings-JRC-Geel	2019	Characterisation of waste water and correlation with legal requirements	Multi-stage	2019 – Analysis of waste water network on going.

D10 Communication

D10.1 Internal communication

JRC-Geel mostly uses the flat screens in the different buildings as well as the JRC intranet (Connected) to promote the different actions and inform staff. In 2018, 17 Campaigns via the Overhead Screens were held and the majority was also communicated with complementary links and documents via Connected. In addition, 6 more campaigns were held via the intranet (Connected).

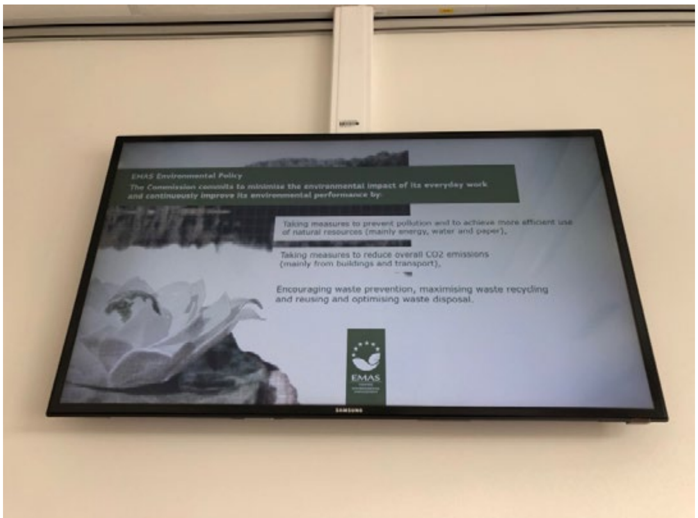
A number of campaigns were held in support of and with the material of DG HR.

Some campaigns were held on initiative of JRC-Geel Site.

This includes:

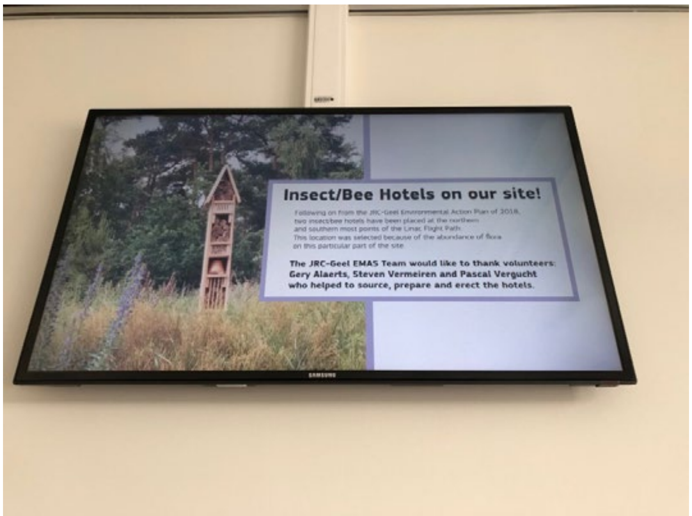
- A set of screens showing the Environmental policy (on slide per week see figure D25 as an example)

Figure D25: Environmental Policy (example)



- Information on biodiversity initiatives at JRC-Geel site (Insect hotels slide below)

Figure D26: Communication on insect hotels at JRC-Geel



- 2017 Environmental Statement main figures
- New waste segregation rules and waste procedure(s)
- JRC-Geel Environment Management review

D10.2 External communication and stakeholder management

The mandatory annual reports to LNE (Department Leefmilieu, Natuur en Energie) and VMM (Vlaamse Milieu Maatschappij) were prepared and dispatched on schedule (March 2018).

Continuous communication via reports and/or meetings is performed with sub-contractors (i.e. maintenance, cleaning, building management system etc.) regarding environmental aspects.

Communication with FANC (Federaal Agentschap voor Nucleaire Controle) and BelV (subsidiary of the FANC taking care of the regulatory controls in nuclear installations) are more regular.

D11 Training

D11.1 Internal training

In 2018, the following training sessions related to environmental protection took place:

- Induction course for newcomers;
- Biosafety;
- Context, Stakeholders, risks and opportunities (EMAS);
- Buying ECO Friendly ICT Devices (GPP);
- Buying Green - Practices in Food and Catering (GPP); and
- CLP (*Classification, Labelling, Packaging)* regulation.

The Biosafety course is available for both Commission Staff and for staff members from external companies; only Commission staff members are counted in the statistics displayed in figure D27. The induction course was specifically prepared for Commission Staff.

The JRC-Geel Site Director as well as Head of Units joined the internal course on context and stakeholders following the new EMAS regulation (2017).

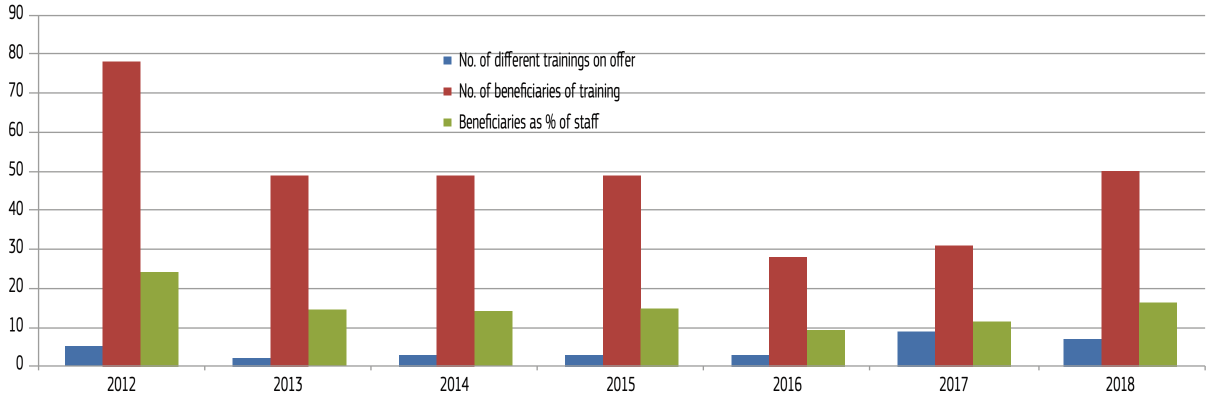
For the sake of this report, training courses on radiation protection are considered to relate to Health and Safety and are not included in the statistics.

D11.2 External training

The EMAS deputy co-ordinator is following an external dedicated and officially recognised course to become environmental co-ordinator.

Figure D27 gives the evolution of training given to JRC-Geel staff:

Figure D27: Evolution training



The decrease over the years in beneficiaries is largely due to the staff reduction and subsequent very limited number of newcomers. The increase observed in 2017 and 2018 is due to the release of the new ISO 14001 (2015) standard and the new EMAS regulation (2017) for which JRC-Geel staff had to be trained for an efficient implementation.

D12 EMAS Costs and saving

Table D18: EMAS administration and energy costs for buildings in the EMAS area

	Costs								Change in last year
	2011	2012	2013	2014	2015	2016	2017	2018	
Total Direct EMAS Cost (EUR)			66 000	66 000	67 000	67 000	69 000	74 000	5000
Total Direct Cost per employee (EUR)			194	191	204	226	260	286	25
Total buildings energy cost (EUR)	1 695 266	1 665 015	1 340 061	1 334 506	1 199 208	1 192 005	1 084 120	1 042 082	– 42038
Total buildings energy cost (EUR/person)	5 122	5 171	3 930	3 857	3 656	4 027	4 091	4 023	-68
Total water costs (EUR)	27 807	25 607	19 005	13 491	11 706	9 905	12 399	15 449	3050
Water (EUR/ person)	84	80	56	39	36	33	47	60	13
Total paper cost (EUR)				7 419	3 793	6 462	3 518	4 568	1051
Total paper cost (EUR/person)				21	11	19	10	13	3
Waste disposal (general) - unit cost/tonne					210	290	340	533	193
Waste disposal (general) - EUR/ person					73	105	126	156	30

D13 Conversion factors used for JRC-Geel

Table D19: Conversion factors

Parameter and units	2010	2011	2012	2013	2014	2015	2016	2017	2018
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
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
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
Paper Density (g/m^2)		80	80	80	80	80	80	80	80
Kgs CO2 from 1 kWh of electricity (3)		0.285	0.285	0.285	0.285	0.285	0.285	0.285	0.285
Kgs CO2 from 1 kWh natural gas (4)		0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Kgs CO2 from 1 kWh diesel (4)		0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
GWP of R22	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
GWP of R134A (5)	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
GWP of R407C (5)	1 620	1 620	1 620	1 620	1 620	1 620	1 620	1 620	1 620
GWP of R507A (5)			2 240	2 240	2 240	2 240	2 240	2 240	2 240
Kgs CO2 from one litre of diesel (7)	0	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Kgs CO2 from one litre of petrol (7)	0	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28
Annual cost of one FTE (6)				132 000	132 000	134 000	134 000	138 000	138 000

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)

D14 Site breakdown performance of selected parameters

Table D20: Site breakdown

Building	Address	Occupant	Useful surface area (m²)	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 2018:					**2) Building use 2018**														**3) Energy sources and amount (MWh for 2018)**										**4) Water and waste consumption**			
10	Main building	F.4, G.2	8 327		X												X	X	755				402					**1 157**	388			
20	Monnet building	G.2	3 351		X													X	728				168					**896**	65			
40	Mass spectrometry building	G.2	6 791		X												X	X	1 710				637					**2 347**	2174			
50 (and FP51)	Linac building	G.2	8 303		X							X		X				X	2 666	346								**3 012**	1257			
60	Technical Services	R.5	2 764		X				X		X	X							114				68					**182**	136			
70 - 71- 72 & 170	Dangerous products, chemical products and chemical waste storage building & pumping station		181								X																					
81	Cafetaria		665			X	X												114				111					**225**	529			
90	Generators building		756												X				48			32						**81**				
100	Conference building		779																46				74					**120**	28			
110	Chemistry building	F.5	2 030		X												X		589	797								**1 386**	437			
120	Garages	R.5			X						X								28				56					**83**	66			
130	BCR building	E.5, F.4, F.5	2 599		X												X		809			0.91	500					**1 310**	1191			
190	Reference Materials Storage building	F.6	3 276		X						X								676									**676**	387			
200	Reference Material Processing building	F.6	5 880		X									X			X		1 111	575								**1 686**	622			
210	Administration building	F, R.5, R.10	3 074		X														142							74.06		**216**	229			
222	Entrance building	G.2	1 723		X					X				X					187				96					**284**	277			
JRC-GEEL Total			**50 499**																**9 724**	**1 718**		**33.0**	**2 113**					13 662	**7 786**			

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

European Commission

Environmental Statement 2019

2018 results

Annex E: JRC-Seville

EMAS
Verified environmental management
REG.NO. BE-BXL-000003

Prepared by JRC-Seville EMAS Site Coordinator Juanjo Pardo Ecija

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Head of Resource Management Seville Unit
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Cover illustration: Photo of the EXPO building the location of JRC-Seville, provided by the EMAS Site coordination Team at JRC-Seville.

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ANNEX E: Seville – Administrative activities

The European Commission's site of the Joint Research Centre (JRC) in Seville is one of the JRC's seven scientific institutes across Europe. It was established 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 (hereafter referred to as 'Sevilla').

JRC'-Seville's mission is to provide scientific and technical support for community policy-making by the European Commission (EC) involving a socio-economic and scientific/technological dimension. Its main activity involves carrying out studies in the above context, and it therefore assumes an administrative nature. Contrary to other JRC sites, JRC-Seville does not operate laboratories nor facilities other than the offices of the researchers with well-equipped computers and data processing resources suitable for performing the simulations and analyses required.

E1 Overview of core indicators at Sevilla since 2010.

Table E.1 below summarizes the evolution of main environmental indicators of the JRC-Seville site since 2010. The general EMAS targets for improvement were established for the period from 2014 to 2020 allowing for some degree of flexibility within the years. These 2020 Targets are indicated in the right hand column, while the annual change is presented in the performance trend column.

Table E1: Historical data, performance and targets for core indicators proposed for Commission level reporting

Physical indicators:	**Historic data values**					**Performance trend (%) since:**				**Target**	
(Number, desciption and unit)	2010 (1)	**2014**	2016	2017	2018	2010	2014	2016	2017	2020	
										Δ % (2, 3)	value (2, 3)
1a) Energy bldgs (MWh/p)	11.17	**9.13**	8.05	8.11	6.87	**– 38.5**	**– 24.7**	**– 14.6**	**– 15.2**	– 8.0	8.402
1a) Energy bldgs (KWh/m²)	425	**376**	337	345	310	**– 27.0**	**– 17.5**	**– 7.9**	**– 10.0**	– 8.0	346
1c) Non ren. energy use (bldgs) %	100	**77.4**	84.2	83.6	79.3	**– 20.7**	2.5	**– 5.8**	**– 5.1**	Q	Q
1d) Water (m³/p)	42.81	**21.73**	17.85	20.11	14.66	**– 65.8**	**– 32.6**	**– 17.9**	**– 27.1**	– 5.0	20.65
1d) Water (L/m²)	1 627	**895**	748	854	661	**– 59.4**	**– 26.1**	**– 11.5**	**– 22.6**	– 5.0	850
1e) Office paper (Tonnes/p)	0.03	**0.012**	0.011	0.012	0.013	**– 60.9**	1.7	**14.9**	**8.8**	– 5.0	0.012
1e) Office paper (Sheets/p/day)	31	**12.6**	11.1	11.7	12.8	**– 58.3**	1.7	**14.9**	**8.8**	– 5.0	11.9
2a) CO_2 buildings (Tonnes/p)	5.03	**3.53**	3.18	3.17	2.60	**– 48.2**	**– 26.2**	**– 18.1**	**– 17.8**	– 5.0	3.35
2a) CO_2 buildings (kg/m²)	191	**145**	133	135	118	**– 38.6**	**– 19.1**	**– 11.8**	**– 12.7**	– 5.0	138
2c) CO_2 vehicles (g/km, manu.)	136	**136**	136	136	136	0.0	0.0	0.0	0.0	– 5.0	129
2c) CO_2 vehicles (g/km, actual)		**260**	232	250	210		**– 19.4**	**– 9.5**	**– 16.2**	– 5.0	247
3a) Non haz. waste (Tonnes/p)		**0.022**	0.060	0.035	0.031		**40.6**	**– 48.4**	**– 10.9**	– 5.0	0.021
3b) Hazardous waste (Tonnes/p)		**0.012**	0.008	0.004	0.004		**– 66.5**	**– 52.0**	**9.9**	– 15.0	0.010
3c) Separated waste (7) (%)	NM	**77**	92	64	59		**– 24.2**	**– 36.4**	**– 8.1**	5.0	81
Economic indicators (Eur/p)											
Energy consumption (bldgs)		**1 142**	1 014	956	780		**– 31.7**	**– 23.0**	**– 18.4**	– 5.0	1 085
Water consumption		**38.3**	38.7	41.0	30.5		**– 20.4**	**– 21.3**	**– 25.6**	– 5.0	36.4
Non haz. waste disposal											

Notes: (0) The performance trend refers to the previous year,

(1) 2010 is the earliest reported data;

(2) the target refers to the reference year 2014;

(3) based upon % values in EMAS Annual Action Plan 2018

(4) indicators are based on actual surface area occupied in the Expo Building

The table E1 shows a downwards trend for most indicators for the period 2010 – 2018 except. This trend is very positive, particularly taking into account a significant increase since 2010 in terms of staff staff (increase by 61%) and occupied surface area (by 36%), as illustrated in Figure E1.

Over the past years Sevilla strived for an effective cooperation with the landlord, EPGASA, aimed to minimizing the environmental impact in all related to the building and parts thereof. In 2015 JRC-Sevilla and EPGASA signed an environmental commitment letter with the landlord stating the aspects to be properly monitored by the landlord. In 2016, these commitments were included as annex in the rental contract.

As a result of the rental commitments, the landlord performed several upgrading works in the building and building services considerably improving the environmental performance. Therefore the positive trend achieved in the period 2010-2018, obtaining reductions, ranging from 61% in office paper consumption (t/p) to 38% Energy consumption (MWh/p).

This positive outcome has led likewise to significant financial savings related to Energy consumption and water consumption, 31 % and 20 % respectively.

In 2018, all upgrading works in the building were concluded and no further interventions were planned. Considering that both the staff grew by 6%, being the EMAS useful surface unvaried in respect to 2017, the results achieved in 2018 for most of the indicators have decreased considerably with regard to 2017, except for paper consumption and the generation hazardous waste. In the latter case of Seville this waste is generated at the medical service, such syringes, which scale up with the number of staff that has increased over the past years.

As far as the energy consumption is concerned, there was a significant decrease by 38 % and 27 % % in the overall Energy Consumption since 2010, referred to MWh/p and KWh/m^2.The decrease in Cool Degree Days by 20 % in 2018 with regard to 2017, may well explain this reduction. Although, as the Hot Degree days raised by 6 % in 2018, it is reasonable to think that the improvements accomplished by the landlord in the Heating Ventilating Air Conditioning System in 2018, positively contributed to reducing the overall energy consumption of the building.

The environmental indicators related CO_2 emissions, and water, present better figures in relation to those in 2017. Particularly significant is the reduction in water consumption by 27,1% m^3/p and 22,3% l/m^2. This has been a big achievement considering the increase in both occupied surface area and in the number of staff by 5,8% and 7,3% respectively, and the additional water consumption coming from the kitchen within the lunch room. To this reduction has contributed the upgrading works performed by the landlord in the building and the environmental awareness of the staff. Furthermore water consumption has dropped by 66% per capita and 59% per square metre since 2010. More efficient drinking water dispensers were placed across the facilities in 2015, helping to save water and electricity (a green public procurement action).

CO_2 emissions have reduced since 2010 by over 48% per capita and by 38% per sq. m, with an average yearly reduction rate of 6% per capita and 5% per sq. m respectively.

Office paper consumption diminished since 2010 by 61% per capita and 58% in sheets per person & day. The measurement methodology was further improved in 2017 through individual monitoring of printers. In addition, since 2018 all printers are networked via the so-called 'follow-me' function. Printing requires now also re-confirmation via the staff service card; potential erroneous prints are now less likely and have contributed to the paper reduction. In addition, the Program Office at Sevilla applies a restrictive policy for the printing of publications. The default is that no report will be printed, unless authorized by the Programme Manager. These measures have reduces paper consumption as illustrates the significant reduction of 22% of offset paper achieved in 2017 (see section E4.3).

The economic indicators show also a descending trend since 2012.

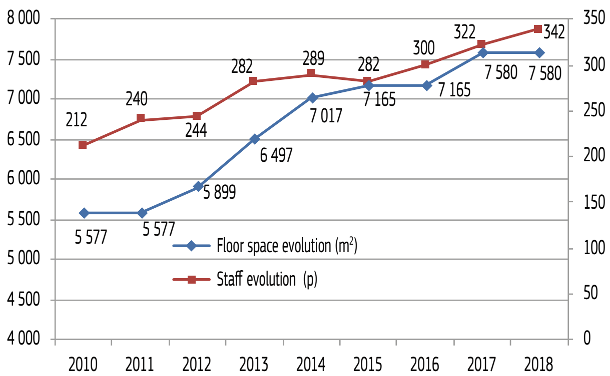
Since 2010, Sevilla has constantly invested in technology to support high-performance computing for economic modelling, which allows centralised monitoring and management of energy consumption from its data centre.

Taking into account that no further upgrading interventions were executed by the landlord in the Expo building in 2018 nor are foreseen in 2019, Sevilla put it effort to further reduce energy and water consumption by continuously raise awareness among its staff to promoting a sound environmental behaviour at the office space aimed to minimizing the related environmental impact. In particular for 2018, Sevilla focussed on sustainable mobility and sound environmental organisation of its events, trying to reducing the waste generated. To that purpose Sevilla will try to influence the different stakeholders involved also in 2019 and beyond. In addition, Sevilla will

initiate contacts with different local authorities aimed to organising varied environmental events to raise awareness among the staff.

The evolution of the EMAS system in Sevilla since 2010 is as shown below:

Figure E1. Sevilla EMAS Basic Parameters evolution from 2010 to 2018

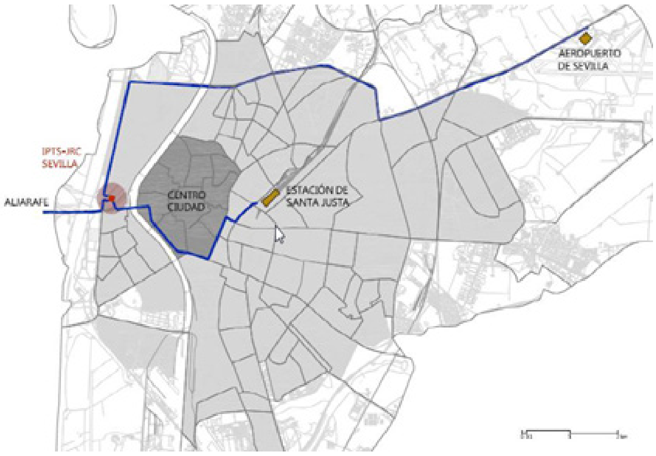


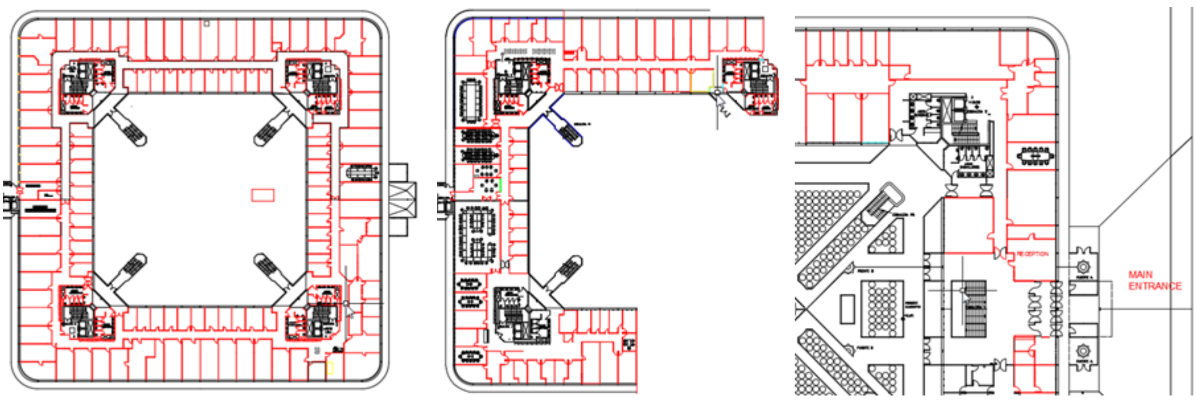
The staff in Seville has significantly increased rising from 212 colleagues on 31/12/2010 to 342 on 31/12/2018; thus an overall increase of 61% or a 7,6% average annual increase rate for the period 2010-2018.

The EMAS perimeter useful surface area in Sevilla has progressively increased over the last few years to reach an overall increase rate of 36% as of 2010, representing a 4, 5% average annual increase rate for the period 2010-2018

[1] Staff no. centrally collected figures from DG HR; surface area collected by Kalrsruhe's technical services (adding up the surface areas of all rooms)

Figure E2 Site location & layout





SECOND FLOOR **FIRST FLOOR** **GROUND FLOOR**

E2 Description of Seville activities[1] and key stakeholders:

Sevilla is located in the building known as the “Expo building” since 1994. The building is located on the Science and Technology Park (*Isla de la Cartuja*) to the west of the city of Seville. The “Expo building” is managed by EPGASA, a public company owned by the regional government of Andalusia.

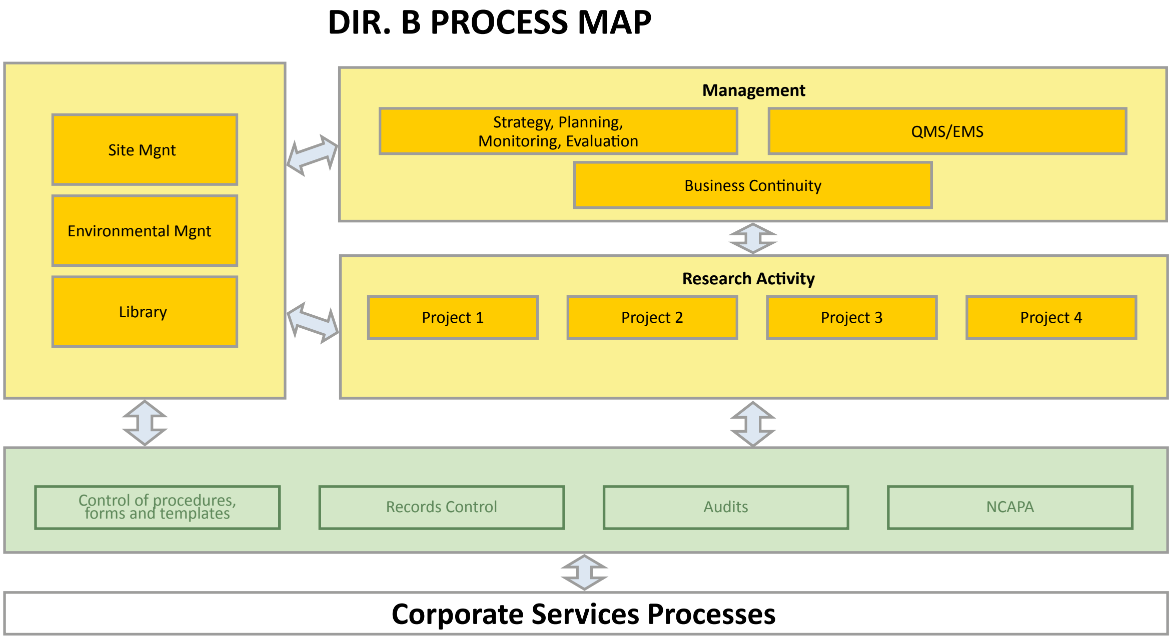
The Expo Building is a 3 storey multi-tenant offices building with a total office space of 12 584 m^2 of which Sevilla occupies 7 580 m^2, equivalent to 60,3% of the total and distributed across the ground, first and second floors. The building has two basements used mainly as car parks but including bicycle parking, and the building plant room. The total site area is 11 669 m^2. The building itself occupies 8168 m^2 at ground level.

E2.1 Sevilla organisational structure

The Seville site accommodates several units of the JRC, (in 2018 Units B.2, B3, B.4, B.5, B.6, B.7, C.6, D.4, R.1 and parts of the units I.2, I.5, and AMC.8), The JRC-Seville Site Director is also Director of JRC Directorate B, Growth and Innovation and reports to the Director General of the JRC. S/he is responsible for the Seville site and for Directorate B under Programme Office and seven Scientific Units located in Seville (Spain), Ispra (Italy) and Brussels (Belgium).

Each Scientific Unit is led by a Head of Unit who is responsible for the execution of the research work programme in their policy and scientific fields of competence. The work of the scientific units is structured by projects under specific work-packages. Scientific coordination, internal communication, publications services, audits and quality management are handled by the Programme Office.

Figure E3: Sevilla Process Map



The JRC Directorate B Management System consists of the main processes shown in the Process Map below. Dir. B processes are divided into 5 groups: Management, Research, Infrastructure, Stakeholders & Customers, and System Control & Improvement. This process map is based on the IMS process map, which currently is being mapped to the corresponding processes.

The table below shows the main core business activities carried out in Sevilla.

[1] 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

Table E2: Description of main activities in Sevilla

DIR or UNIT	Activies
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 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. •To analyse the efficiency and equity of the different taxation systems and the associated regulatory burdens. •To analyse the socio-economic effects of tax systems and their potential structural reforms.
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 so as 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 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.
R.1 AMC.8	To support and coordinate the implementation of resource management functions on the JRC-Seville Site To provide technical support for the scientific programmes of the site and to develop and maintain the infrastructure of JRC-Seville. To provide support to human resources dossiers
I.5	To provide informatics support to the JRC-Seville site

The Resource Management Unit R.1 in Sevilla provides technical support for the scientific programmes of the site and is responsible for the implementation of EMAS. The dossiers related to human resources are handled by Unit AMC.8

E2.2 Interested parties and Stakeholders

In terms of a management system, we can say that Sevilla's main customers are the policy Directorate-Generals (DG) of the EC, although the JRC prefers not to call other DGs as 'customer' but consider them as partner DG with whom or for whom we provide our research–based services. Albeit, other DG are our main customer, JRC-Seville does occasionally provide services also for other European institutions, notably the European Parliament.

Seville adopts several measures for strategic and operational management of relations with customers, stakeholders and partnerships. Within our Directorate, it is the Programme Office who is responsible for co-ordinating Sevilla's involvement in JRC internal coordination in connection with established processes.

In addition to the JRC efforts to implement EMAS internally, it is worth mentioning that the Unit JRC B5 *Circular Economy & Industrial Leadership* has an important role to play in environmental regulation in much that the unit provides the techno-economic support in the fields of industrial emissions, product policy, waste and environmental management. In this sense unit B.5 has contributed to design of policies that have led to EMAS.

Sevilla, 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.

As mentioned before the environmental responsibility is shared, being the main actor the public company EPGASA who owns the Expo Building, and is responsible for the general building management, maintenance and most accessory services. Sevilla's infrastructure related processes seek to guarantee that staff enjoy a properly functioning and clean working environment while taking into account environmental issues and ensuring the premises' security and business continuity. The rental contract and the associated Environmental Commitment letter signed by EGPASA constitute the reference framework for environmental and occupational health and safety related issues.

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

Other stakeholders for infrastructure management include the authorised waste management companies, the cleaning services company and the catering services company. While the cleaning service is commissioned directly by the JRC-Seville, the selection of the company running the catering services at the EXPO building and also providing restauration to events promoted by JRC-Sevilla has been commissioned by the landlord EPGASA; thus JRC-Seville has no direct influence upon environmental considerations of the catering service

The latter provides a dedicated infrastructure for Sevilla's staff and organises all the events promoted by Sevilla, although these are commissioned to EPGASA.

Table E3.Stakeholders Analysis

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 - 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	On regular basis	Keep satisfied
Suppliers / contractors	◆ Landlord 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	On regular basis	Manage closely
Employees	◆ Staff -	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	Keep satisfied
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
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

Figure E4.Stakeholders Analysis

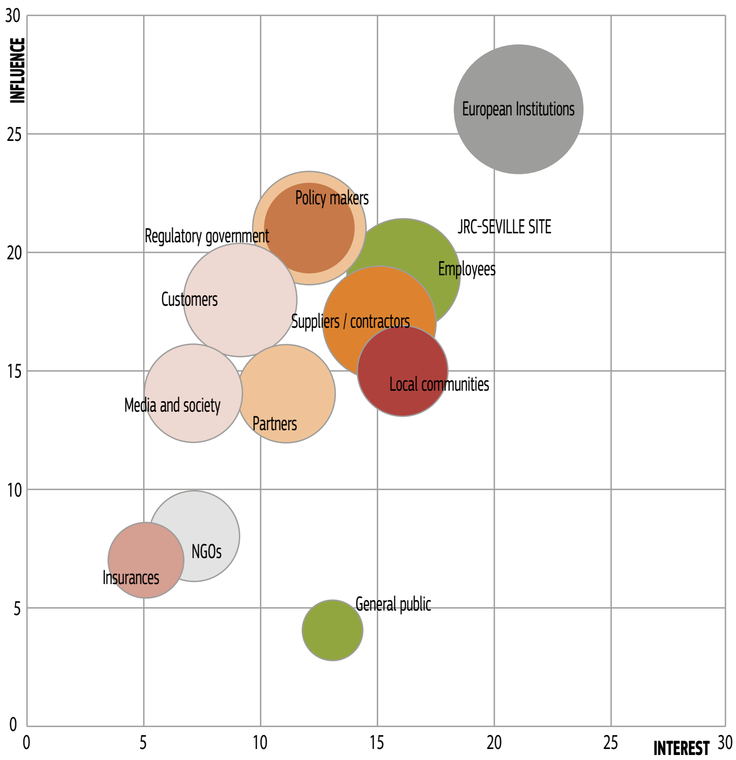


Table E4 Context Analysis External Issues

PESTLE criterion	External issues & circumstances that influence JRC- Seville's environmental targets (4.1) *(current conditions or future developments)*	Risks (6.1.1)	Opportunities (6.1.1)	Actions (6.1.4)
Political	Energy transition and COP (Conference of Parties) 2030 energy targets	The Expo Building is Energy Class D certified. Lack of direct control over the management of the building. Financial and other constraints faced by the landlord. Time planning regulation constraints Uncertainty about the future seat of JRC-Seville	Improve the energy efficiency, integration of renewable energy sources	Propose potential energy saving measures that could be agreed with the landlord to reach COP 2030 targets.
	Changing policies can affect scientific activities on the site and use of resources.	Budgetary constraints		
	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)	Outsource expert consultancy on key subject matters External Legal Compliance audits
	Demands/ wishes of the surrounding communities	Reputational risk, complaints	Promote external communication	Develop an external communication plan
	Requirements from the Regulations: EMAS / ISO	Significant Changes	Improve the Environmental Management System of the Organization	Develop an strategy to fully integrate the principles of the new Annexes I, II,II of the EMAS Regulation in the EMS.
	Buildings' infrastructure	The Expo Building is Energy Class D certified. Lack of direct control on the management of the building. Financial constraints faced by the landlord Time planning regulation constraints Uncertainty about the future seat of JRC-Seville Budgetary constraints	Improve the energy efficiency	Propose potential energy saving measures that could be agreed with the landlord

PESTLE criterion	External issues & circumstances that influence JRC- Seville's environmental targets (4.1) *(current conditions or future developments)*	Risks (6.1.1)	Opportunities (6.1.1)	Actions (6.1.4)
Economic	The uncertain economic situation (related also to Brexit) influences the investments, staffing and contractors	Budgetary constraints so investments in energy reduction/shift		
	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 investment in energy reduction (refurbishment, insulation, new buildings)	
	Largely captive market (for several suppliers/providers of staff and material)	High cost, reduced availabilities		
	Increasing awareness of society on environmental impact and demand for transparency and reporting.		Opportunity for developing good external communication	Enhance the external communication Initiate contacts with local authorities and stakeholders Publish the environmental statement
Social	Skills shortage - demographic change	Positions cannot be re-staffed, number of specialized companies decrease (can lead to monopoly position in the market), also problem for business continuity		
	Energy transition and COP (Conference of Parties) 2030 energy targets	The Expo Building is Energy Class D certified. Lack of direct control over the management of the building. Financial and other constraints faced by the landlord. Time planning regulation constraints Uncertainty about the future seat of JRC-Seville	Improve the energy efficiency, integration of renewable energy sources	Propose potential energy saving measures that could be agreed with the landlord to reach COP 2030 targets
	Changing policies can affect scientific activities on the site and use of resources.	Budgetary constraints		

Table 1a External issues

Technological	Development of green energy technologies	The Expo Building is Energy Class D certified. Lack of direct control over the management of the building. Financial and other constraints faced by the landlord Time planning regulation constraints	Improve the energy efficiency, integration of renewable energy sources	Propose potential energy saving measures that could be agreed with the landlord
	Availability of electric cars can influence the emissions of the employee's cars	Lack of direct control over the management of the building. Financial and other constraints faced by the landlord Uncertainty about the timespan on the lease contract	Incite JRC-Seville staff towards sustainable mobility Evaluate installing electricity charging poles in the parking areas for both electric and hybrid cars aimed to promoting sustainable mobility among the staff	Feasibility study / available budget
	Increasing digitalization of processes, computer based management systems, videoconference systems	Budgetary constraints	Paper consumption reduction, Missions reduction	Green Public Procurement, ensure adequate video-conferencing systems
Legal	More complex environmental regulations	Risk of missing requirements or insufficient monitoring Lack of adequate resources Budgetary constraints	Improve legal compliance monitoring. Improve environmental performance (better impact monitoring)	Outsource expert consultancy on key subject matters External Legal Compliance audits
Environmental	Climate change effects: heat and cold periods-temperature peaks and average are increasing.	The Expo Building is Energy Class D certified Risk for higher heating and cooling costs demand compromising a sound environmental performance. Lack of direct control over the management of the building. Financial and other constraints faced by the landlord. Time planning regulation constraints Uncertainty about the future seat of JRC-Seville	Improve the energy efficiency, integration of renewable energy sources	Propose potential energy saving measures that could be agreed with the landlord

Table E5. Context Analysis Internal Issues

Criterion	Internal issues that influence JRC-Seville environmental targets	Risks (6.1.1)	Opportunities (6.1.1)	Actions (6.1.4)
Activities	Provide scientific and technical support for community policy-making by the European Commission (EC) involving a socio-economic and scientific/ technological dimension. Its main activity involves carrying out studies in the above context, and it therefore assumes an administrative nature. It does not have special laboratories or facilities other than the offices of the researchers with well-equipped computers and data processing resources suitable for performing the simulations and analyses required.	The Expo Building is Energy Class D certified. Lack of direct control over the management of the building. Financial and other constraints faced by the landlord. Time planning regulation constraints		Operational control procedures, regular meetings with inspection bodies such as UM
Strategic direction	JRC restructuration towards international level is affecting travelling needs	Higher travel emissions (CO_2), more complex reporting lines and decision making		Promote video conferencing, Ensure Green/sustainable event organizations
	Resource limitation increases every year	Direct negative influence on the environmental management Fulfilment of the environmental objectives set compromised		Regular demand for adequate resources to higher management
Culture & employees	Multi-culturalism at JRC-Seville has to be also considered from the point of view of impact on the environmental behaviour.	“Negative” behaviour can have negative influence on a the environmental performance	“Positive” behaviour can have positive influences on the environmental performance as well as positively impact the general behaviour	Regular communication campaigns on environmental issues (Connected, info screens), awareness campaigns, specific trainings provided to key sectors of the organization.
Processes & systems	Increased demand for remote/ flexible working		Reduction of commuting emissions and decreased resources (use of office space, energy, etc.)	Promotion of telework where feasible
	Complex procurement procedures and documentation management. Migration to Integrated management System	Risk of inefficiency. Devote more time to bureaucratic/ administrative tasks rather than to the area of expertise. Risk of delay in set deadlines	Adequate resource allocation and training.	Corporate guidance and support. Adequate resources allocation.
Financial	Contract management sometimes unsatisfying	Non fulfilment of contractual requirements on environmental issues, such as proper waste segregation	Adequate contract performance	Define and communicate adequate Roles and responsibilities

E3 Environmental impact of Seville activities

Sevilla undertook a full update of the environmental aspects in 2018[2] 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 four main aspect groups were identified, as described in Table E4. The other aspects described in the Environmental Aspects Register can be considered of minor significance or insignificant.

Table E6 – Summary of significant environmental aspects for Sevilla

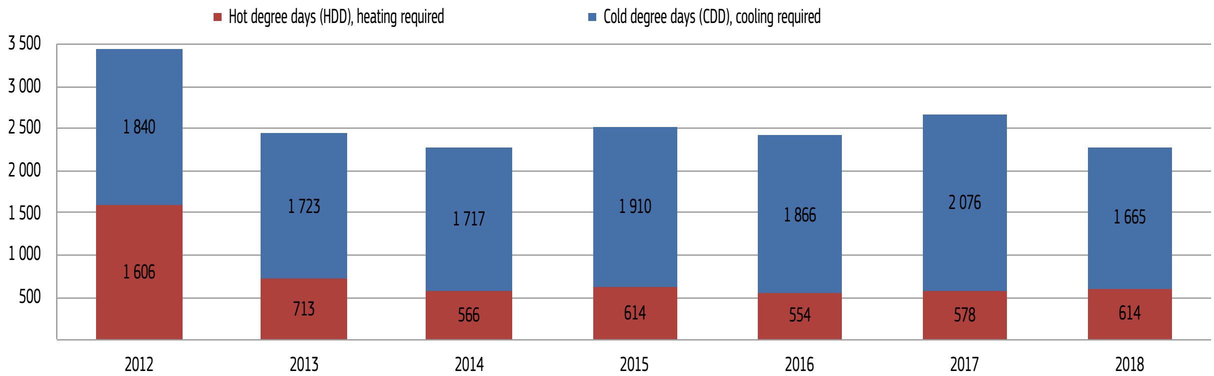
Aspect Group	Environmental Aspect	Environmental Impact	Activity product or service	Indicator / action plan
Ressources	Electricity & fossil fuel consumption	Resources depletion, air emissions, global warming	Lighting, Electrical equipment, Heating, cooling, ventilation	Indicator I a
Ressources	Gas consumption (Heating)	Resources depletion, air emissions, global warming	Heating, cooling, ventilation,	Indicator I a
Resources	Paper consumption	Resources depletion, air emissions, global warming	Office activities, printing, publications	1e, 1f
Emissions to Air	CO_2 emissions	Air pollution, global warming	HVAC and equipment maintenance Transport: work-related travel (Commuting)	2 a, 2c, 2d
Resources	Water Consumption	Resources	Drink water consumption, Heating, cooling	1d

E4 More efficient use of natural resources

E4.1 Energy consumption

The building's energy consumption needs to be considered in the context of climatic conditions. According to official metrological data[3] suggests that the climatic conditions have been quite stable since 2013 with remarkably hot summers and mild winters (see Figure E4). In 2018, the Hot Degree Days rose by 6%, whereas the number of Cold Degree Days was lower by 20%.

Figure E5: Total annual degree days at Sevilla, 2012-2018



a) Buildings

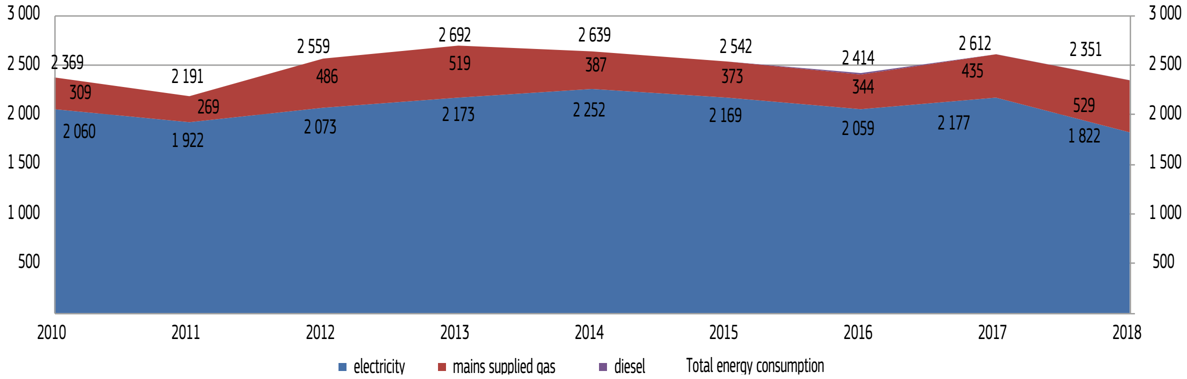
The evolution of total annual energy consumption is presented in Table E6, while data per capita and per square metre are presented in Figures E7 and E8. In view that JRC-Seville's energy consumption is not metered individually, but there is one single meter for the whole building, the values presented on a linear consumption based on

[2] Environmental Aspects Register (S.6.1-R003 Environmental Aspects JRC-Seville).

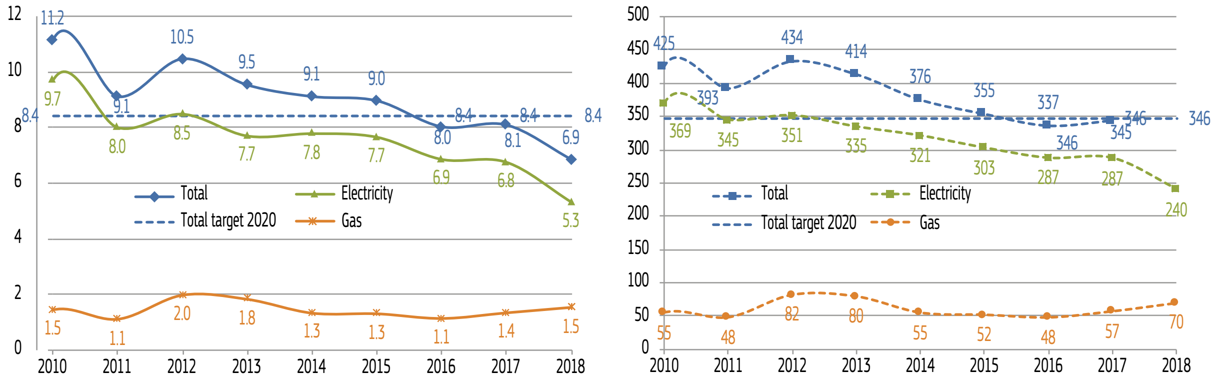
[3] Monthly data for San Pablo airport (Seville) station reference temperature 15,5 C, www.degreedays.net; using buildings energy consumption data for Sevilla

the building occupation rate (2018: 60,25% share ot the total building consumption).In 2018, there was not any refill of diesel reported by the landlord

Figure E6: Annual buildings energy consumption (MWh)perimeter (indicator 1a)



Figures E7 and E8: Evolution of total annual energy consumption for Sevilla EMAS building



in MWh/person

in kWh/m²

Figures E7 and E8 show that since 2010, there has been a continuous reduction in energy consumption both in term of energy per capita or relative to surface area by 38% (from 11 MWh/p in 2010 to 6,87% MWh/p in 2018) or by 27 % (from 425 KWh/m² in 2010 to 310 Kwh/m² in 2018) respectively.

The reduction in the period 2015-2018 is the result of upgrading works performed by the landlord having replaced two chillers and two boilers by better performing equipment devices, and refurbished all the toilets areas by incorporating energy and water saving measures.

In 2018, the decrease in energy consumption in relation to 2017, was of 15% and 10% MWh/p and KWh/m² respectively, resulting in 6,87 KWh/p and 310 KWh/m². Note that both values are already well under the 2020 target of 8,4 MWh/p and 346 KWh/m², respectively.

Relating energy consumption to heating and cooling degree days further suggests more efficient use of energy per capita since 2014.

As mentioned before, in the renewal rental contract in 2016 included specific environmental clauses with an environmental commitment letters setting out the environmental regulatory framework that the landlord had to comply with. Sevilla also encouraged the landlord to implement different energy and water saving measures aimed to improve the building's energy and water efficiency. Also in 2018, Sevilla continue continued with its strategy to encourage the landlord to adopt more efficient environmental site management measures and to better control related significant environmental aspects, therefore ensuring more stringent compliance with environmental legislation. As a additional new measure, Seville launched a continuous and systematic environmental campaign to raise of awareness to Sevilla staff on different environmental issues such as sustainable mobility, waste management, Green Public Procurement, Good Environmental Practices was promoted under the umbrella of "Integrating a sound environmental behaviour in our daily work at JRC-Seville". For 2019, Sevilla will keep focusing on influencing the staff towards a holistic sound environmental behaviour at the work place.

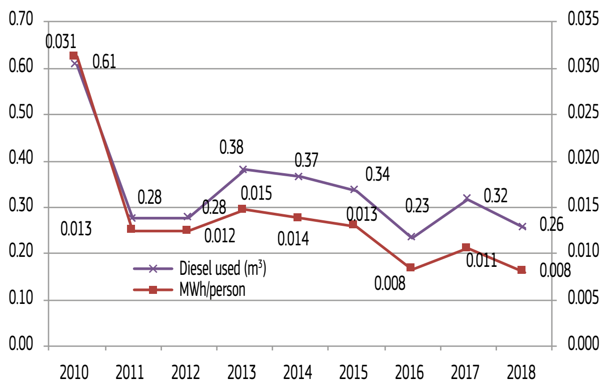
Sevilla has committed to a reduction of 5% in building's energy consumption over the period 2014 to 2020; equivalent to reducing consumption by 0,85% annually. As can be seen Sevilla has achieved already many of the

2020 targets and strieves to continue to improve. However, because Sevilla does not posses direct control over the environmental aspects relating to the building's infrastructure, the actions included in the Commission's 2018 EMAS Global Annual Action Plan (GAAP), shown below, focus mainly on Green Public Procurement, Staff behaviour, promoting sound environmental practices at the office space:

Table E7 Further actions to reduce buildings energy consumption (indicator 1a)

Action plan no	Planned	Description	Progress	Status / Date
273	2017	Consolidate the participation of actors other than the EMAS site coordinator in the implementation of the Environmental Management System	EMAS training: introductory sessions for key sectors of the organisation. Analysis and publication of impact of training sessions	EMAS soundly implemented across the Organisation. Additional EMAS introductory sessions planned in 2019 for key actors and departments of the organisation.
422	2018	Keep promoting EMAS training for newcomers aimed to spread a sound environmental behaviour within the office space, thus minimizing the environmental impact.	EMAS training for newcomers done at regular intervals. More accurate feedback from attendees to be collected aimed to streamline the evaluation of the environmental training provided	Implemented. Specific dedicated l info sessions on good environmental habits at the office space provided fortnightly
431	2018	Reduce the energy consumption of those sources directly managed by JRC-Seville.	Thorough monitoring of energy consumption sources aimed to identifying potential efficient energy saving measures to be implemented. Launch a specific guide for good environmental practices at the office space aimed to reducing the energy consumption at the office space	Major upgrading works carried out by the landlord over the past years. JRC-Seville is now focused on the starting the procedures to build its own building. The initial planning phase will start late 2019.

Figure E9 Summary vehicle energy consumption (indicator 1b)



The Sevilla site vehicle fleet consists of one (diesel) vehicle, and its impact can be considered insignificant, as it represents just over 0,1% of the building's energy consumption.

Distances travelled are usually short as the vehicle is used mostly for airport transfers. In 2018, the target was to reduce the vehicle's diesel consumption by 5%, but due to an increase of 26% in the distance travelled, the diesel consumption raised in the same proportion.

The vehicle's fuel consumption figures are 136 g/km (manufacturer) and 212 g/km (actual).

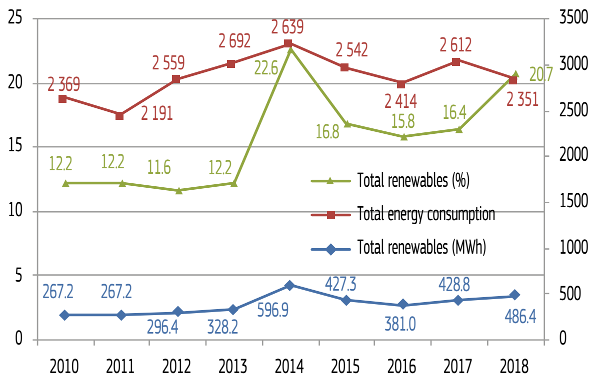
c) Renewable energy use in buildings and vehicles

The Expo building does not have installations for producing renewable energy. As a proxy of the renewable energy consumed, we employ the share of renewable sources used by the electricity supplier. The energy mix is published annually by the Spanish competent body *Comisión Nacional de los Mercados y la Competencia.*

Table E8: Non-renewable energy use in the buildings (indicator 1c)

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Electricty from renewables (MWh)	0	267	296	328	597	427	381	429	486
(Electricity from renewables (%))	0	13.9	14.3	15.1	26.5	19.7	18.5	19.7	26.7
Electricty from non-renewables (MWh)	2 060	1 655	1 777	1 845	1 656	1 742	1 678	1 748	1 335
(electricity from non-renewables (%))	100	86.1	85.7	84.9	73.5	80.3	81.5	80.3	73.3
mains supplied gas (MWh non-renewable)	309	269	486	519	387	373	344	435	529
(mains supplied gas (from non-renewables (%))	100	100	100	100	100	100	100	100	100
Total renewables (MWh)	**267.2**	**267.2**	**296.4**	**328.2**	**596.9**	**427.3**	**381.0**	**428.8**	**486.4**
Total renewables (%)	**12.2**	**12.2**	**11.6**	**12.2**	**22.6**	**16.8**	**15.8**	**16.4**	**20.7**
Total non-renewables (MWhr/yr)	2 369	1 924	2 263	2 364	2 042	2 114	2 033	2 183	1 865
Total non-renewables (%)	100	87.8	88.4	87.8	77.4	83.2	84.2	83.6	79.3

Figure E10: Non- renewable energy use in the buildings (indicator 1c)

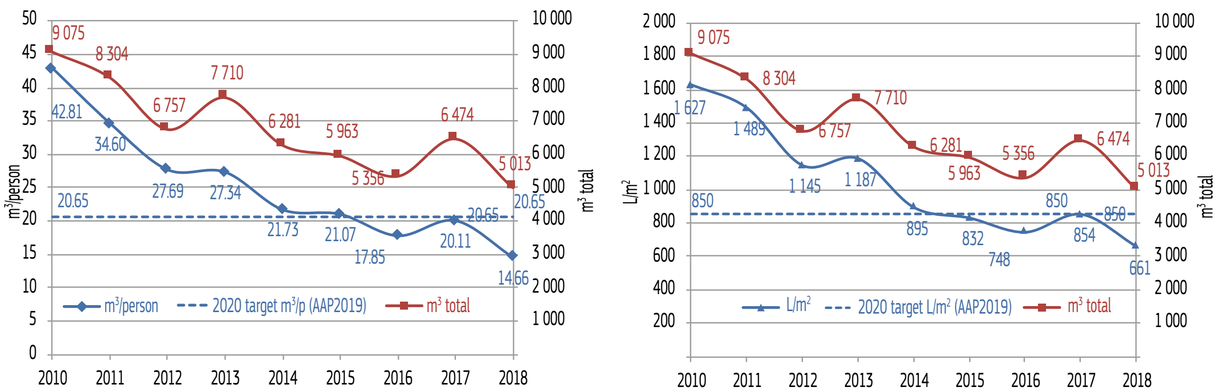


As shown in figure E10, the percentage share of electricity in the grid generated from renewables has increased by over the years, reaching an overall 45% increase since 2010. In 2018, the total amount of electricity produced from renewable sources represented a share of 20% of the total building energy consumption. In 2018 the target was to continue to raise the landlord's awareness of alternatives that could increase the share of renewable energy coming from the mains electricity supply, such as "green" supply contracts.

For 2019, the performance target is to keep informing the landlord of opportunities to improve the EXPO building's energy efficiency and will suggest different energy saving measures that could be feasible to implement, as well as potential renewable sources of energy that could be considered.

E4.2 Water consumption

Figure E11 & E12: Evolution of total annual water consumption for Seville EMAS building



Figures E11 and E12 show that, the annual water consumption since 2010 dropped by 45%, resulting in an overall saving of 28 m^3 per capita. Part of this favourable trend is due that environmentally friendly drinking water dispensers, equipped with high-performance filters, were introduced in 2016 that significantly improved water quality while reducing water. Since then awareness campaigns, reduced contributed to reduce the overall water consumption in the following years. In 2018, the target was to continue raising staff awareness on water saving while improving facilities. And in 2019, Sevilla will keep focusing on the environmental awareness of the staff and their environmental behavioural patterns aimed to further reducing water consumption.

The 2019 targets and actions include:

1. Continuing to strengthen influence over the landlord to ensure environmental legal compliance and more thorough operational control;
2. Striving for a closer cooperation with the landord to better monitoring aspects he controls;
3. Continuing to inform the landlord of opportunities to improve the EXPO building's water efficiency, and regularly suggesting different water saving measures;
4. Continuing to raise environmental awareness of staff and
5. Consolidating the participation of actors other than the EMAS site coordinator in the implementation of the Environmental Management System.

Sevilla's actions included in the Commission's 2018 EMAS GAAP focussed on fostering employee involvement and raising awareness. The corresponding actions are listed below:

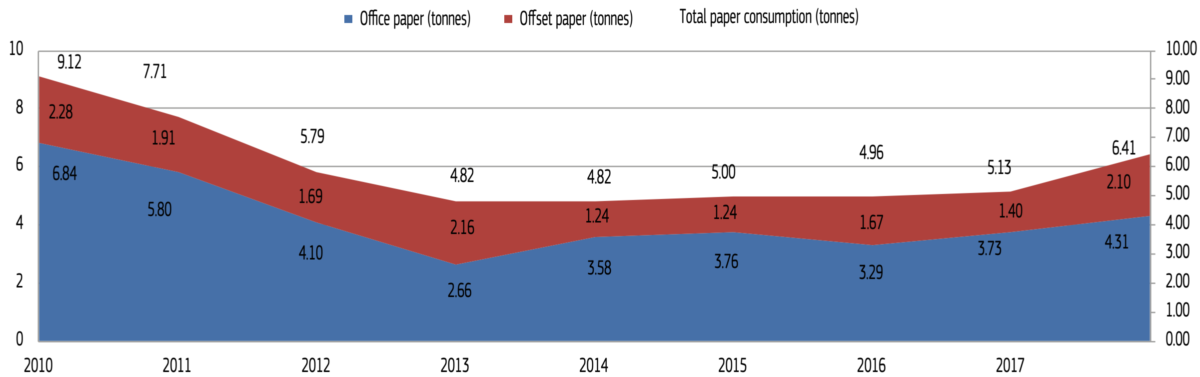
Table E9 Further actions to reduce buildings water consumption (indicator 1d)

Action plan no	**Planned**	**Description**	**Progress**	**Status / Date**
432	2018	Reduce the water consumption of those sources directly managed by JRC-Seville. Launch a specific guide for good environmental practices at the office space aimed to reducing the water consumption	Tap water promoted on permanent basis	Done
433	2018	Keep fostering the employee involvement and raise of awareness in environmental initiatives with the involvement of middle and senior Management	Done	Done

E4.3 Office and offset paper

The evolution of office and offset paper at Sevilla and per capita breakdown presented below:

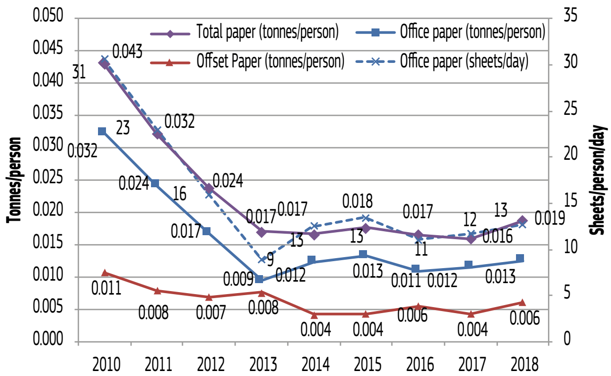
Figure E13: Evolution of paper consumption at Sevilla (totals)



Paper consumption is controlled directly by the Sevilla site. Figure E13 shows a significant reduction of both office and offset paper consumption from 2010 to 2013, and a steady consumption since then. With respect to the previous year, both office and offset paper consumption increased in 2018 by 9% (t/p) and 50% (t/p). However, the paper consumption remains considerably lower than 2010 and below the ceiling for the 2020 target values. For 2019 objective is to thoroughly monitor printing, identifying the most critical devices, on which to focus specific actions such as awareness campaigns to help reducing consumption more effectively.

The actions included in the Commission's 2018 EMAS GAAP were focused on a) fostering employee involvement and raise awareness, and b) involving the relevant sectors and actors in the implementation of GPP criteria.

Figure E14: Evolution of paper consumption at Sevilla (totals, and per person)



The counting method, introduced in 2016, uses printed copy totals to provide more reliable data enabling the identification of the heaviest consumers by location, thus facilitating the targetting for specific print-less campaigns.

The objective for 2018 was the launch of targeted campaigns to raise staff awareness on the need to reduce printed paper consumption.

The status of actions related to reducing paper consumption is presented below.

Table E10 Further actions to reduce paper consumption (indicator 1e)

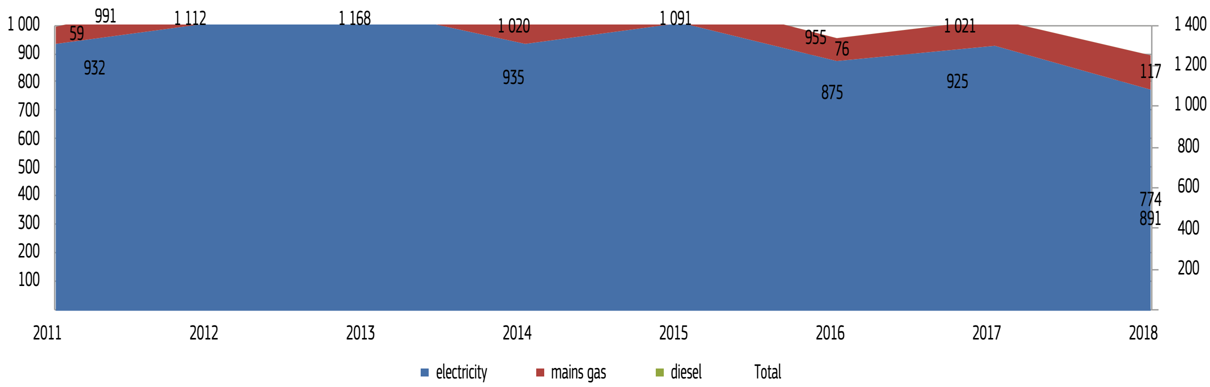
Action plan no	Planned	Description	Progress	Status / Date
271	2016	Improve the methodology to manage the environmental performance to make it more efficient and effective, ensuring the active involvement of related actors as well as an accurate tracking of the data.	Fully operational. A dedicated work instruction was developed aimed to automatizing the data collection and analysis process and obtaining reliable evidence based results.	Fully implemented
272	2017	Launch of targeted campaigns to raise staff awareness on the need to further reduce printed paper consumption. Analysis of data by individual printer and publication of results.	Thorough printing activity monitoring by individual printing Machines	Done
430	2018	Reduction of office paper consumption.	Keep on raising awareness of staff aimed to reducing the office paper consumption.	Done

E5 Reducing air emissions and carbon footprint

E5.1 CO_2 emissions from buildings

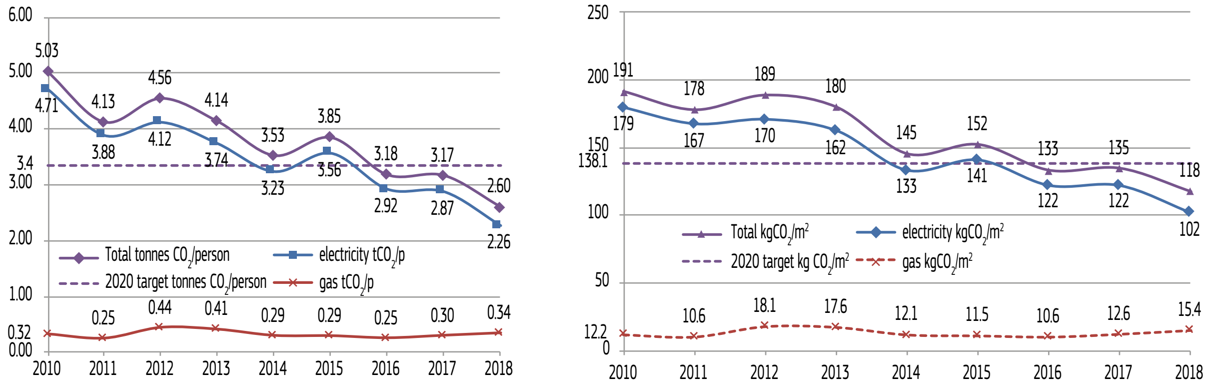
a) Buildings (energy consumption)

Figure E15: CO_2 emissions from buildings heating in the EMAS perimeter, tonnes (indicator 2a)



The main sources of CO_2 emissions considered under EMAS are from energy used for the buildings, (including equivalent emissions from release of refrigerants), vehicle fleet, missions and commuting. Sevilla has evaluated the annual CO_2 emissions for buildings in 2018 at 2,6 Tonnes/person.

Figures E16 & E17: CO_2 emissions from buildings heating (t/p & kg/m²) in the EMAS perimeter, tonnes



Figures E15, E16 and E17 show an overall CO_2 emissions decrease in 2018 by 13 % related to 2017, with a significant rise by 22 % in the Emissions from combustion of gas to which has contributed the increase of hot degree days by 6 %.

The 2019 target is to:

- Keep encouraging the landlord to behave in an environmentally responsible manner, focusing on full environmental legal compliance.
- Keep fostering the employee involvement in environmental initiatives.
- Management of JRC-Seville's direct environmental aspects and careful monitoring of related indicators.

E5.2 CO_2 emissions from vehicles (indicator 2c)

a) Commission vehicle fleet

In 2018 the car consumed 257 litres of diesel (about 20% less than in 2017) producing 210 gCO_2/km against the manufacturer's technical specification of 136 gCO_2/km. Car use has been constantly diminishing since 2012, when it peaked at 9889 Km/year, to 3859 Km travelled in 2018. The overall CO_2 emissions have decreased by 4% in 2018 in relation to 2017 mainly due to a similar decrease of the diesel consumption.

b) Missions and local work based travel (excluding Commission vehicle fleet)

Sevilla-based staff undertook 360 missions in 2018. Sevilla promotes the use of the available videoconferencing infrastructure as an alternative to go on mission. The videoconference equipment and dedicated videoconference room have been upgraded over the last couple of years.

Figure E18: Evolution of videoconferences organised in Sevilla

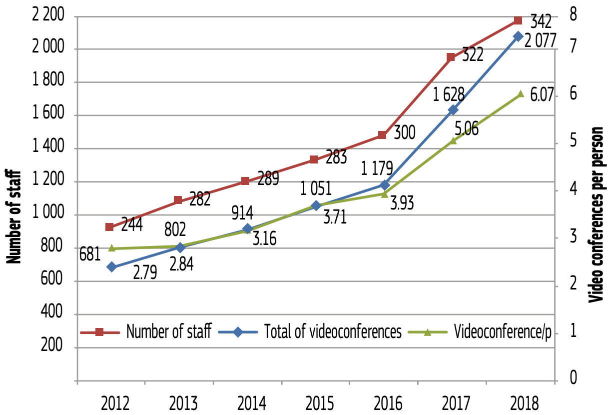


Figure E18 shows the steady increase in the use of videoconferencing. In 2018, 2077 videoconferences took place. While it is impossible to determine the share of missions that were replaced by videoconferences, it is evident that the Seville staff is participating rate in numerous Commission internal meetings by videoconference that otherwise would have resulted in a mission or not participating

b) Buildings -other greenhouse gases (refrigerants)

The landlord manages maintenance of the cooling system and is therefore responsible for the refrigerant life cycle. A comprehensive detailed register was developed grouping all the air conditioning devices installed at Sevilla's premises, thoroughly describing the preventive maintenance activities and their periodicity. In 2015, the

landlord reported a leakage of R-134 refrigerant gas amounting to 36 kg, equivalent to 51, 5 tonnes equivalent of CO_2. No leakage was reported by the landlord since then for the following years. The target in 2018 is to continue to monitor the preventive and corrective maintenance activities to be carried out by the landlord.

c) Commuting

In May 2019, JRC-Seville launched a survey to understand the means of transport used to commute between their homes and the working place. 151 Colleagues participated, which corresponds to a response rate of 45%, statistically robust to extract useful information. The breakdown is given in Figure 2.

Figure E19: Daily commuting patterns of JRC-Seville staff.

Transport Means	Distance (in km)	CO_2 equivalent (in kg CO_2)
Bicycle	237.9	0.000
Walking	89.3	0.000
Electric Scooter	4.0	0.160
Train	4.0	0.112
Bus	32.4	0.940
Motorbike	94.0	10.434
Car: hybrid	4.1	0.328
Car: electric	4.0	0.160
Car: petrol	130.0	25.740
Car: diesel	312.5	46.875
Total		84.749

151 Persons participated in the survey (May 2019)
As a matter of comparison: a tree absorbes 22 kg CO_2 per year

As gross result, the 151 colleagues generated 84.7 t CO_2 daily or 0.560 t CO_2/p. This value is higher than the result of survey in 2016 with an average 0,253 t CO_2/p. Unfortunately, these two values are not comparable because the assumptions for the calculations differ. The 2019 methodology is more accurate, in as much it allows to verify the survey data with actual data of the Seville sustainable mobility pilot. Therefore, the idea is to repeat this survey on regular intervals, ideally every 12 or 24 months and compare the evolution.

The 2019 target is to continue to the Greening Commuting and minimizing the related CO_2 emissions by

- Monitoring commuting Carbon footprint of staff.
- Promoting staff awareness campaigns to use more sustainable means of transport.
- Testing different incentives for staff to shift Itowards 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
275	2017	Carbon footprint commuting monitoring.	A new survey on commuting to work launched. 153 responses. Results Analysis to be released in June 2019	Done
425	2018	Greening daily Commuting of JRC-Seville staff, thus minimizing the related CO_2 emissions.	Launch a new Commute to work survey with a view to evaluating different initiatives aimed to greening the daily commuting of the staff.	Done 31.12.2018
427	2018	Incite JRC-Seville staff towards sustainable mobility.	JRC-Seville Sustainable Mobility Project 2019 launched in March 2019. 69 participants, 3802 Sustainable km travelled by JRC-Seville staff, saving 749 kg CO_2, equating to 34 trees.	Done
429	2018	Evaluate installing electricity charging poles in the parking areas for both electric and hybrid cars.	The new JRC-Seville headquarter will include electricity charging poles in the parking areas for both electric and hybrid cars.	Postponed

E5.3 Carbon footprint

Figure E21: Evolution of per capita CO_2 emissions

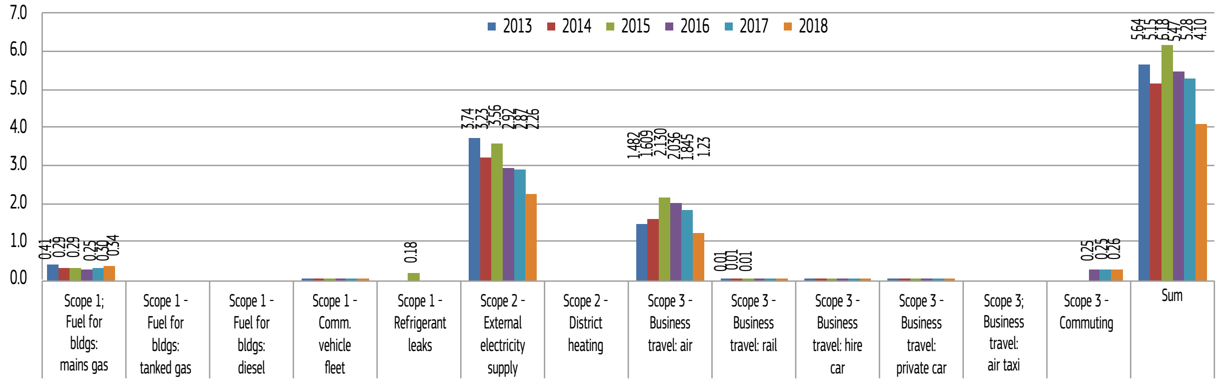


Figure E21 summarises the relative contributions of different components to the sites measured CO_2 emissions. Emissions generated by the mains electricity supply is the most important single contributor, slightly greater than business travel by air.[4]

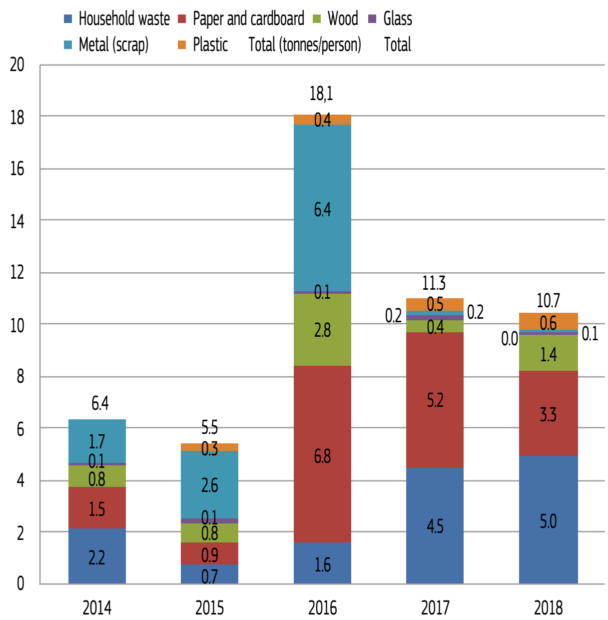
E5.4 Total air emissions of other air pollutants (SO_2, NO_2, PM)

Air emissions result mainly result from the building energy consumption (electricity and gas) and the gas feeding the boilers. The landlord does not report on these parameters. This issue requires calculating theoretical air pollutants emissions from boilers. These emissions will be reported in the declaration of the next year

E6 Improving waste management and sorting

E6.1 Non hazardous waste

Figure E22: Evolution of total non-hazardous waste in Sevilla (tonnes)

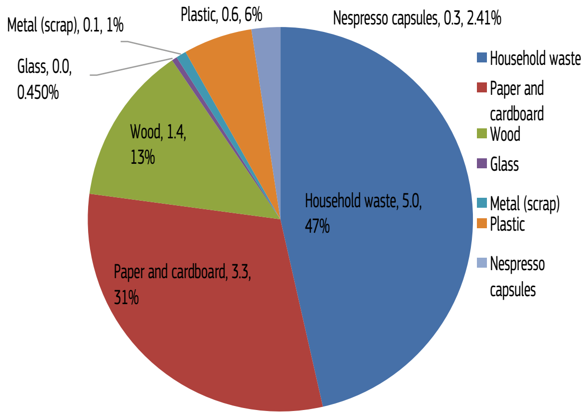


In 2018, Sevilla disposed of a total of 11t of non– hazardous waste, including household waste, paper and cardboard, wood, glass and metal, which represents a reduction of 66% compared to 2014 and it decreased by 5% in relation to 2017.

The amount of each type of non-hazardous waste disposal remained steady in 2018 with regard to 2017.

4 Emissions from business are travel evaluated using Radiative Forcing Index (RFI=2)

Figure E23: Breakdown of non-hazardous waste in 2018 (tonnes)



In 2018, Sevilla further developed the following improvement actions to better manage urban waste:

- Waste collection and disposal by authorised waste managers, thus improving monitoring of legal compliance;
- Improved monitoring of whole waste life cycle ensuring evidence based effective quantification;
- Reorganisation of waste collection areas and improved signage, for full waste segregation;
- Provision of a dedicated temporary waste store area for the cleaning company with high precision weighing scales; and
- Streamlining of co-operation and coordination with the cleaning company and other authorised waste managers.

Sevilla has significantly improved waste measurement compared to previous years for some waste types that were estimated in the past.

Sevilla inaugurated a new lunch room for the staff in June 2017. The waste regenerated in the lunch room is now captured in this report, while the equivalent waste generated previously by our colleagues in the canteen or somewhere else was not accounted. This explains the significant increase for different waste types such as organic (+178 %), glass (+104 %) and plastic (+23%).

Nespresso capsules are collected and disposed separately in accordance with the applicable legislation. They have been quantified and disposed for recycling by the service provider since 2016.

In 2017, there was a significant increase (+218 %) with regard to 2016. In 2018, the non-hazardous waste decreased by 4,5 % in relation to 2017.

The new waste management procedure ensures a correct waste management throughout the waste life cycle and gets accurate and reliable reporting data.

In 2019 the target is to reduce plastic waste generated in the events promoted by JRC-Seville. For this reason, it was carried out a preliminary analysis considering replacing the plastic cups provided by Nespresso by other more environmentally friendly options.

The status of actions related to optimizing and reducing waste is presented below:

Table E12 Further actions to better manage and to reduce non-hazardous waste (indicator 3a)

Action plan no	Planned	Description	Progress	Status
424	2018	Sign an Environmental Commitment Letter with the Owner of the catering services of the Expo Building.	Preliminary meetings held with a positive feedback from the Owner of the Catering Services of the Expo Building.	In progress
426	2018	Sound waste management aimed to minimizing waste and properly managing it in accordance with the applicable legislation.	Pending to carry out a legal compliance audit by an external consulting.	Done. The JRC Sevilla EMAS Coordinator ensures the compliance by the EMAS team of the Environmental Legislation
428	2018	Progressively eliminate single use items, including plastics, in the events organized by JRC-Seville, replacing them by environmentally friendly options.	Preliminary meetings held with a positive feedback from the Owner of the Catering Services of the Expo Building.	In progress

E6.2 Controlled Waste

Figure E24: Evolution of total controlled waste in Seville (tonnes)

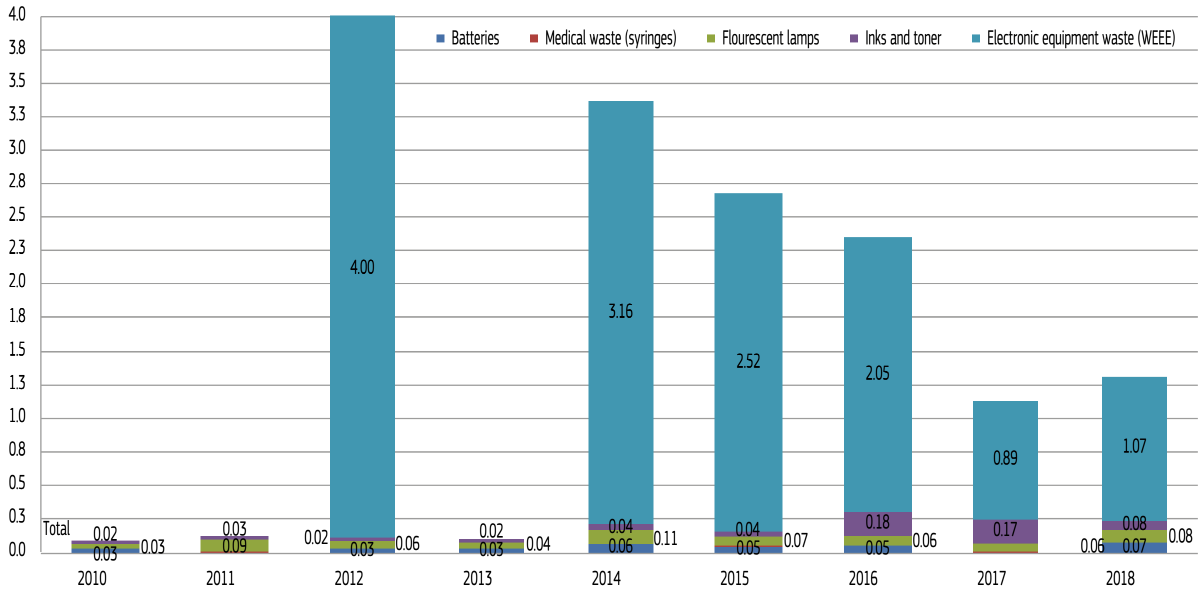
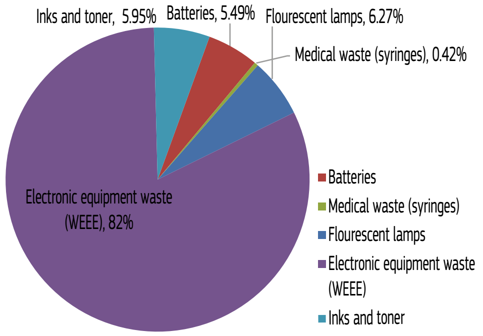


Figure E24 illustrates that the hazardous waste at Sevilla has fluctuated over the last few years. WEEE has been largest component of waste since 2012, having achieved a 68 % reduction in 2018 compared to 2012. Ink and toner waste is the second greatest contributor, growing substantially in 2016, and by 17 % with regard to 2017, due to the increase of printing office paper.

The remainder of controlled waste generated by Sevilla comprises batteries, and medical waste, quantities ranging from 0,03 t to 0,18 t whose breakdown for 2018 is shown in figures E24 and E25.

Figure E25:Breakdown of hazardous waste in 2018 (tonnes and %)



The 2018 target was to further develop the waste management procedure, consolidating a comprehensive efficient management of waste, ensuring legal compliance and obtaining accurate and reliable data, which was successfully achieved. The actions that Sevilla implemented in 2017 described in E6.1 also apply to controlled waste. Additionally, 2018 target is described in table E11 below.

Table E11 Further actions to better manage and to reduce controlled waste (indicator 3a)

Action plan no	Planned	Description	Progress	Status / Date
434	2018	Carry out an independent review of the implementation of legal requirements for full compliance check.	Preliminary meetings held with a positive feedback from the Owner of the Catering Services of the Expo Building.	Done. The JRC Sevilla EMAS Coordinator ensures the compliance by the EMAS team of the Environmental Legislation

E6.3 Waste sorting

Table E14: Percentage of waste sorted at the Commission in Sevilla

	2014	2015	2016	2017	2018
Percentage of waste sorted	77.4	90.8	92.2	63.8	58.7
Precentage of waste not sorted	22.6	9.2	7.8	36.2	41.3

Sevilla is separating waste since 2014. Bins for each type of waste disposal are distributed throughout the facilities to facilitate separation. The cleaning company collects waste daily, providing the monthly measurement of quantities disposed.

While waste is separated as much as possible, the remaining common household waste cannot further be separated in our premises due to the separation policy of the municipal waste collection company. of non-recovering organic matter comprises cellulose type waste from toilet paper, wipes, napkins, compresses. At the JRC-Seville premises, a dedicated brown colour container for the latter has been placed all over the city aimed to ensuring the correct segregation.

Due to the increase of organic waste in 2018 by 10% in relation to 2017, the percentage of waste sorted decreased in 2017 by 8%.

E7 Protecting biodiversity

The total area of the site occupied by the Expo building, including the surrounding garden strips and the pavement, is 11 669 m^2, equivalent to 38, 9 m^2 per capita. The air emissions at Sevilla are those coming from the building services mainly from the HVAC systems and the boilers, and from the different means of transport used by Sevilla's staff in their daily commuting.

At the centre of the site, there is a central courtyard with different trees species providing a cooling effect by shading. It occupies 2 227 m^2, representing 19% of the total site area.

E8 Green Public Procurement (GPP)

E8.1 Incorporating GPP into procurement contracts

Sevilla aims to incorporate GPP into its contracts where appropriate, irrespective of their value.

The 2018 target was to include GPP criteria in all contracts, except for those related to scientific and other studies. Accordingly further involvement of key actors was sought and training provided by the EMAS Site Coordinator. The Public Procurement Management Tool, automatically assigns Green Criteria to those contracts having a Common Procurement Vocabulary code with Green Criteria.

The site Environmental Coordinator is in charge of validating the Technical Specifications of those contracts that must have Green Criteria, refusing for correction, those that do not include environmental clauses.

One clear and relevant example of Sevilla's Green Public Procurement is the lease contract signed with the landlord of the Expo Building for a 10 years period, which included for the first time environmental clauses and attached an Environmental Commitment letter as amend.

In 2019 Sevilla will seek to reinforce the organisation's GPP culture and involve relevant actors. Operational staff is always encouraged to consider including environmental criteria in the technical specifications for contracts, respecting the provisions of the Financial Regulations.

The status of GPP related actions included in the EMAS annual plan is presented below.

Table E15: Further actions to enhance GPP culture (indicators 5a & 5b)

Action	Year started	Description	Progress	Status/date
238	2016	Promoting "green" procurement.	GPP criteria training sessions provided to relevant actors.	Fully implemented Sevilla keeps encouraging the organisation, mainly the Resource Management Unit, to take into consideration GPP criteria in all the contracts no matter the value. The Corporate Public Procurement Management Tool automatically demands Green clauses to those Contracts with "Common Procurement Vocabulary codes" having Green Criteria.
423	2018	Ensuring accurate and traceable GPP reporting data.	Ensure an effective Green Public Procurement data reporting and monitoring.	Done The Corporate Public Procurement Management Tool keeps track of those contracts having Green CriteriaDone

E8.2 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 Sevilla 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 specific management approved action to support further improvement.

E9 Demonstrating legal compliance and emergency preparedness

E9.1 Management of the legal register

Sevilla annually conducts a legal compliance evaluation by thoroughly monitoring legal requirements to be fulfilled by landlord in all related to the building and parts thereof. The legal register[5] was fully reviewed and updated in 2018 to include new legal requirements.

The JRC-Seville EMAS Site Coordinator quarterly updates the legal register, integrating new relevant applicable legislation.

5 (S.6.2.a - Legal and other environmental requirements compliance register)

In 2018, the JRC-Seville's EMAS Coordinator performed a full assessment of the actual environmental legal compliance achieved by Sevilla, being validated by the auditor in the course of the Internal Audit done in October 2018.

E9.2 Prevention and risk management

Since 2010 Sevilla has recorded statistics relating to incidents on health, safety and environment and in this time there have been no recorded accidents. Every year a third party audit is conducted of the management system, during which all aspects of emergency preparedness and response are checked and updated if necessary. Particular attention is paid to identifying potential accidents and reacting quickly to emergencies and therefore minimising negative impacts.

The Joint Research Centre annually conducts a risk assessment exercise at corporate level, covering those risks associated with the process Environmental Management.

Furthermore, those potential environmental aspects that can eventually cause emergency situations are identified, collected and evaluated every year in the Aspects Register.

E9.3 Emergency preparedness

Sevilla has a dedicated Health and Safety procedure describing the methodology used at local level to identify and react to potential accidents and emergency situations minimizing the negative impacts that can be produced on staff, facilities as well as on the environment. Environmental emergency situations are managed in accordance with the Emergency preparedness and response procedure within the Environmental Management System. Sevilla has in place a dedicated emergency Initial Response Team and conducts annually a fire drill in close coordination with the landlord. The safety and security equipment and installations are regularly checked in accordance with the applicable legislation.

Sevilla has set the following Health and safety objectives for 2018:

Table E16: Health & Safety Objectives 2018

Domain	Risk mitigation action	Objective
Planning, Processes and Systems	Ensure the safeguarding of the site against incidents involving infrastructures and staff	Ensure the physical safety of all members of staff
		Ensure functioning of OH&S equipment and installations (preventive maintenance)
	Ensure legal compliance	Implement work plan associated to legal requirements review 2016 to maintain the OHS management system (96 actions)
People and organisation	Promote H&S culture (management and staff)	Reinforce the corporate OHS system at local level
		Ensure effective participation in corporate networks
		Ensure effective cooperation with the landlord

E10 Communication

E10.1 Internal communication

Internal communication may typically involve Commission staff and contractors. A summary of the actions is included below:

Table E17: Internal communication actions promoted at Sevilla in 2018

Action description	Organisation	Dates in 2018	Replication at Sevilla site level	Participants (estimated)
Earth hour	Centrally organised (Commission wide)	23th March	Published on Connected	16
Environmental Statement 2018	EMAS Site Coordinator	May	Published on Connected	6
Environemtal Co-operation with ExpoRest catering services Expo Building.	EMAS Site Coordinator	13th April	Published on Connected	50
Vélomai Competition	Centrally organised (Commission wide)	18th May	Published on Connected	33
Buying Green: Best practice exchange session_ EMAS WEEK 2018_Web-streaming	Centrally organised (Commission wide	25th May	Published on Connected	11
EU Inter-institutional EMAS Week	Centrally organised (Commission wide)	25th May	Published on Connected	7
Web-streaming Lunch-time-event: How to organise sustainable EC-events? Let's get started!	Centrally organised (Commission wide)	25th May	Published on Connected	18
World Environment Day. "Beat Plastic Pollution"	EMAS Site Coordinator	05th June	Published on Connected	52
Inter-institutional EMAS day	Centrally organised (Commission wide)	8th Jun	Published on Connected	18
Green @ work campaign	Centrally organised (Commission wide)	Jun_Sep	Published on Connected	27
EMAS Staff Survey	Centrally organised (Commission wide)	July	Published on Connected	64
Environmental Performance results 2017 (Data 2016) released to staff	EMAS Site Coordinator	11th Sep		33
ENVIRONMENTAL PERFOMANCE INDICATORS TRENDS 2010_2017	EMAS Site Coordinator	11th Sep	Published on Connected	26
2018 Mobility week	EMAS Site Coordinator	16th -22nd Sep	Published on Connected	48
New Guidelines on organising sustainable events at the Commission	EMAS Site Coordinator	24th Sep	Published on Connected	67
Survey on Environmental Awareness and Behaviour of Commission staff 2017_ Final Report!	Centrally organised (Commission wide)	04th October	Published on Connected	19
From Policy to Reality_Lecture on Sustainable Mobility Projects in Seville and management	EMAS Site Coordinator	11th May	Published on Connected	67
European Week of Waste Reduction 2018_ Forthcoming lectures on Waste Management	EMAS Site Coordinator	11th May	Published on Connected	67
From Policy to Reality_Lecture on Sustainable Mobility Projects in Seville and management of urban mobility from a Smart City perspective.	EMAS Site Coordinator	15th November	Published on Connected	169
From Policy to Reality_Lecture on Urban Waste Management in Seville city	EMAS Site Coordinator	22nd November	Published on Connected	191
From Policy to Reality_ Lecture on Waste Management in Andalusia in the framework of the Circular Economy Package and the Waste Management Regional Master plans	EMAS Site Coordinator	22nd November	Published on Connected	167
From Policy to Reality Lecture by LIPASAM on Urban Waste Management in the municipality of Seville	EMAS Site Coordinator	27th November	Published on Connected	49

E10.2 External communication and stakeholder management

Sevilla constantly seeks to influence its external suppliers in order to obtain environmental commitments and encourage them to contribute to sustainable development. Since 2014 Sevilla has encouraged the external services providers to sign an environmental commitment letter.

In 2016, a new rental contract with the landlord was signed, integrating specific environmental clauses and amending the previous environmental commitment letter which was signed in 2015.

In 2018, contacts took place with the manager of the catering services of the Expo building to discuss best practices for a sound waste management and seeking of environmentally friendly single use items, particularly those made of plastic, in the events promoted by Sevilla.

Additionally, contacts with the city council or municipal companies took place in 2018 by which the representatives of the municipal companies provided info sessions related to different environmental issues.

E11 Training

E11.1 Internal training

Environmental related internal training is scheduled annually for staff working at Sevilla's premises as highlighted in table E 18 below.

Table E18: Internal training provided at Sevilla in 2018

Description	**Organisation**	**Dates in 2018**	**Participation at Sevilla site level**	**Participants (estimated)**
First things you need to know about Security, Environment, Health and Safety and use of the infrastructure	Sevilla	Fortnightly	75 min/session for newcomers	60
EMAS info session	EMAS Site Coordinator	May	Secretary network Published on Connected	8
Good environmental practices in our daily work at JRC-Seville	EMAS Site Coordinator	Fortnightly	newcomers	60

In 2019, more EMAS info sessions will be provided for different target audiences within the organisation, in order to raise awareness on EMAS and how staff may contribute to minimise the environmental impact of their day to day activities.

The status of environmental related training actions included in the EMAS annual plan is presented below.

Table E19: Further actions related to environmental training in 2018

Action	Year started	Description	Progress	Status/date
435	2017	Manage the environmental related training trough the Commission platform EU Learn, aimed to obtaining accurate data related to number of training attendees and to the evaluation of the training provided.	Preliminary contacts with local Human Resources department in Seville in 2018	In Progress

E11.2 External training

On the occasion of the 2018 mobility week, the Director General of Mobility from the Seville City Council, provided an information session on Sustainable Mobility Projects in Seville and management of urban mobility from a Smart City perspective in which he explained the evolution over the past years. He could not give no firm confirmation about the future projects, due to the uncertainty of the upcoming local elections in Spring 2019.

E12 EMAS Costs and saving

Table E 20: EMAS administration and energy costs (Euros) for buildings in the EMAS area

Parameter	2010	2011	2012	2013	2014	2015	2016	2017	2018	Change in last year
Total Direct EMAS Cost (EUR)			132 000	151 840	132 000	134 000	134 000	138 000	148 000	10 000
Total Direct Cost per employee			541	538	457	473	447	429	433	4
Total buildings energy cost (Eur)			295 470	331 838	329 966	300 602	304 217	307 918	278 261	– 29 656
Total buildings energy cost (Eur/person)			1 211	1 177	1 142	1 062	1 014	956	814	– 143
Total fuel costs (vehicles) (Eur)		356	384	530	502	412	260	325	325	0
Total energy costs (Eur/person)		1	2	2	2	1	1	1	1	0
Total water costs (Eur)			11 892	13 415	11 068	11 091	11 623	13 208	10 543	– 2 674
Water (Eur/person)			49	48	38	39	39	41	31	– 10
Total paper cost (Eur)	9 457	8 481	6 601	5 495	4 338	3 337	33 220	24 297	35 451	11 154
Total paper cost (Eur/ person)	45	35	27	19	15	12	111	75	104	28
Waste disposal (general) - unit cost/ tonne							226	365	234	– 131
Waste disposal (general) - Eur/person							14	13	7	– 5

Total direct costs per employee increased in 2018 by 3% in relation to 2017, from 429€ in 2017 to 433€ in 2018, for reasons of comparison assuming the same fuel costs. Savings have been achieved over the years: per capita energy costs were reduced by 21% from 1211€ in 2012 to 814€ in 2018 -. Per capita water consumption costs reduced 37 % from 49€ to 31€ in the same period.

Because the building is managed by the owner, Sevilla has direct control over relatively few parameters, but these include paper consumption, waste disposal and fuel costs (vehicles). Anyhow, Sevilla since 2014 has encouraged the landlord to behave in a more environmentally responsible manner which have also been successful in reducing operational costs.

As far as paper consumption is concerned, in 2018 it has been considered the costs incurred both in paper purchase for office paper and those related to the printing service provider for offset paper (publications). In 2018, the per capita waste disposal is estimated to amount to 7€.

E13 Conversion factors:

Table E 21 Conversion factors considered in Sevilla

nb	INDICATOR	UNIT	Value 2018	SOURCE	COMPETENT BODY
1	**Renewables in electricity mix**	**%**	**13.000**	Comisión nacional de los mercados y la competencia. / Factura	Comisión Nacional Mercados de la Competencia
2	**Electricty conversion factor**	**Kg CO_2/kwh**	**0.34**	Comisión nacional de los mercados y la competencia.	Comisión nacional de los mercados y la competencia.
3	**Gas conversion factor**	**Kg CO_2/kwh**	**0.200**	Invoice gas / official applicable conversion factor	Ministerio de Indstrua Energía y Turismo
4	**Diesel energy conversion factor kwh / litre**	**kwh/litre**	**10.700**	International Energy Agency Ministerio de Medio Ambiente-Factores de Emisión	Ayuntamiento de Sevilla Ministerio de Indstrua Energía y Turismo /
5	**Building Diesel conversion factor kgCO_2 / Kwh**	**KgCO_2/Kwh**	**0.270**	International Energy Agency Ministerio de Medio Ambiente-Factores de Emisión	Ministerio de Medio Ambiente-
6	**Diesel conversion factor kg CO_2 / Litre**	**kg CO_2/ Litre**	**2.50**	(Agencial local de la energía de Sevilla_Tabla de emisisones GEI) Ministerio de Medio Ambiente-Factores de Emisión	Ayuntamiento de Sevilla Ministerio medioambiente
7	**Diesel conversion factor kgCO_2 / Kg**	**KgCO_2/Kg**	**3.16**	(Agencial local de la energía de Sevilla_Tabla de emisisones GEI)	Ayuntamiento de Sevilla
8	**Building Diesel conversion factor kgCO_2 / Kwh**	**KgCO_2/Kwh**	**0.25**	International Energy Agency Ministerio de Medio Ambiente-Factores de Emisión	International Energy Agency Ministerio de Medio Ambiente-
9	**Service car emissions (manufacturer)**	**g CO_2/km**	**136**	BMW	-
10	**Service car emissions (actual)**	**g CO_2/km**	**210**	REPSOL card	-

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Annex F: JRC-Karlsruhe

Prepared by the EMAS Site Coordination Team in JRC-Karlsruhe
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Cover illustration: Entrance of JRC-Karlsruhe site

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Annex F: JRC-Karlsruhe

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ANNEX F: JRC-Karlsruhe

JRC-Karlsruhe (hereafter referred to as Karlsruhe) is one of seven Institutes of the European Commission's Joint Research Centre. It provides the scientific foundation for the protection of European citizens against risks associated with the handling and storage of highly radioactive material.

Karlsruhe's prime objectives are to serve as a reference centre for basic actinide research, to contribute to an effective safety, safeguards and security system for the nuclear fuel cycle, and to study technological and medical applications of radionuclides/actinides.

F1 Overview of core indicators at JRC-Karlsruhe 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. Data and performance trends since 2012 and 2014 are shown in Table F1, along with performance trend, and targets where applicable for 2020.

Table F1: Historical data, performance and targets for core indicators proposed for Commission level reporting

Physical indicators:	**Historic data values**					**Performance trend (%) since:**				**Target for the period:**	
(Number, desciption and unit)	2008 (1)	**2014**	2016	2017	2018	2008	2014	2016	2017	2014- 2020*	
										Δ % (2, 3)	value (2, 3)
1a) Energy bldgs (MWh/p)	78.64	**64.028**	67.56	68.64	73.06	**-7.1**	**14.1**	**8.1**	**6.4**	-5.0	60.827
1a) Energy bldgs (KWh/m²)	610	**491**	507	512	536	**-12.0**	**9.3**	**5.8**	4.8	-5.0	466.4
1c) Non ren. energy use (bldgs) %		**82.0**	78.8	78.0	75.8		**-7.6**	-3.8	-2.9	-5.0	77.9
1d) Water (m³/p)	16.51	**21.03**	19.24	18.65	19.11	**15.7**	**-9.1**	-0.7	2.5	-5.0	19.980
1d) Water (L/m²)	128	**161**	144	139	140	**9.6**	**-13.0**	-2.8	0.9	-10.0	145.1
1e) Office paper (Tonnes/p)		**0.019**	0.015	0.011	0.011		**-39.4**	**-23.3**	1.6	-20.0	0.015
1e) Office paper (Sheets/p/day)		**17.8**	14.1	10.6	10.8		**-39.4**	**-23.3**	1.6	-20.0	14.2
2a) CO_2 buildings (Tonnes/p)	21.98	**20.46**	20.01	22.53	22.72	3.3	**11.1**	**13.5**	0.9	-5.0	19.434
2a) CO_2 buildings (kg/m²)	170.5	**156.9**	150.2	168.0	166.8	-2.1	**6.4**	**11.1**	-0.7	-5.0	149.0
2c) CO_2 vehicles (g/km, manu.)		**202**	165	162	173		**-14.4**	4.8	**6.8**	-15.0	171.7
2c) CO_2 vehicles (g/km, actual)		**277.7**	NR	NR	NR					-5.0	263.8
3a) Non haz. waste (Tonnes/p)		**0.33**	0.25	0.25	0.27		**-20.1**	**5.2**	**7.3**	-20.0	0.266
3b) Hazardous waste (Tonnes/p)		**0.033**	0.025	0.016	0.019		**-42.2**	**-25.3**	**20.6**	-30.0	0.023
3c) Separated waste (%)		**69.2**	71.2	74.6	71.0		**2.7**	**-0.3**	**-4.8**	4.8	72.5
Economic indicators (Eur/p)											
Energy consumption (bldgs)		**5 210**	5 461	5 528	5 885		**13.0**	**7.8**	**6.5**	-5.0	4 950
Water consumption		**46.27**	42.34	41.03	42.04		**-9.1**	-0.7	2.5	-3.0	44.9
Non haz. waste disposal		**NA**	NA	NA	NA						

Note: (1) Earliest reported data; (2) compared to 2014; (3) EMAS Annual Action Plan 2019
* Target for % improvement for the period 2014-2020
NA Two major building sites starting operation during 2015, resource consumption related targets difficult to define, NR not reported

As a nuclear facility subject to German nuclear legislation, Karlsruhe must comply with extensive legal requirements which can limit the scope for some environmental improvements (cf. 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 F1 shows positive performance trends in all core parameters except energy consumption and therefore CO_2 emissions from buildings since 2014. Per capita energy consumption has reduced slightly since 2008 and consumption per square metre has reduced more considerably although both indicators recorded an increase since 2015. The decrease of the latter parameter is partially also due to an increase of the surface of approximately 22% since 2012. The increase in CO_2 emissions in 2017 is due to a change in electricity supplier, a decision outside Karlsruhe's influence. Water consumption 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 F2: EMAS baseline parameters[1]

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Population: staff in EMAS perimeter	276	273	294	305	299	305	320	322	324	322	317
Population: total staff	276	273	294	305	299	305	320	322	324	322	317
No. buildings for EMAS registration	0	0	0	0	0	2	2	2	4	4	4
Total no. operational buildings	2	2	2	2	3	2	2	4	4	4	4
Useful surface area in EMAS perimeter, (m^2)	35 592	35 592	35 592	35 592	35 592	41 735	41 735	41 735	43 170	43 170	43 170
Useful surface area for all buildings, (m^2)	35 592	35 592	35 592	35 592	35 592	41 735	41 735	43 170	43 170	43 170	43 170

Karlsruhe did not set quantitative EMAS targets in 2017 for 2018 as it focussed on achieving the qualitative objectives and actions identified in its Environmental Program and this was difficult due to the fact that two new buildings were inaugurated and another one under construction. A target was set for most parameters to not exceed the 2014 values. Moreover, since 2014 an Environmental Program has been prepared yearly to better manage environmental aspects.

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.

[1] Staff no. centrally collected figures from DG HR; surface area collected by Karlsruhe technical services (adding up the surface areas of all rooms)

[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

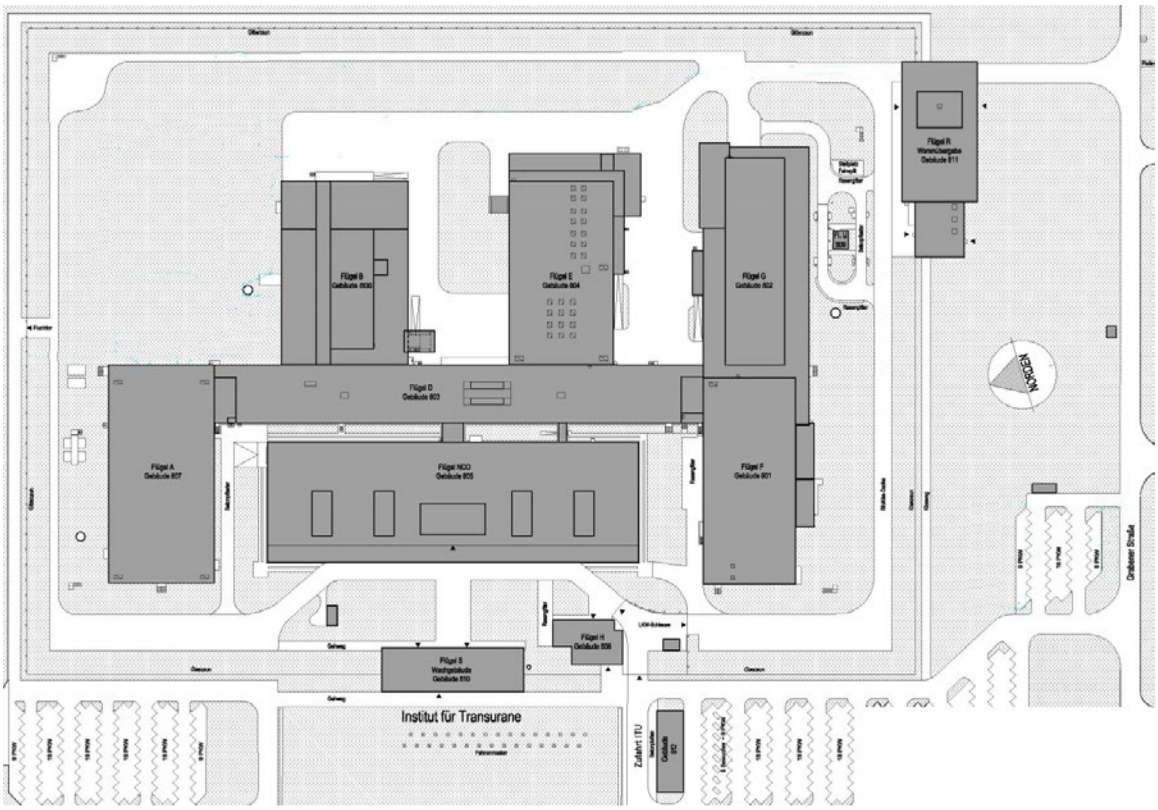
Figure F1a: Site location

As shown below in Figure F1b, other than the guard's house and the goods transfer building, the site is dominated by one building with nine interconnected wings.

When the new offices wing became operational in January 2013 total floor space increased from 35.592 m² to 41.735 m². At the end of 2015 two new buildings (guardhouse and goods transfer facilities) started operation (guard's house mid of October and good transfer building end of December). Hence, the total floor space increased to 43.170 m². The total site area is about 234.000 m² of which about 72.100 m² are sealed surfaces (paved or built-up). The site consists of the used area as shown in figure F1b and about additional 120.000 m² of unused forested area east of the built-up part (cf. figure 18).

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.

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:

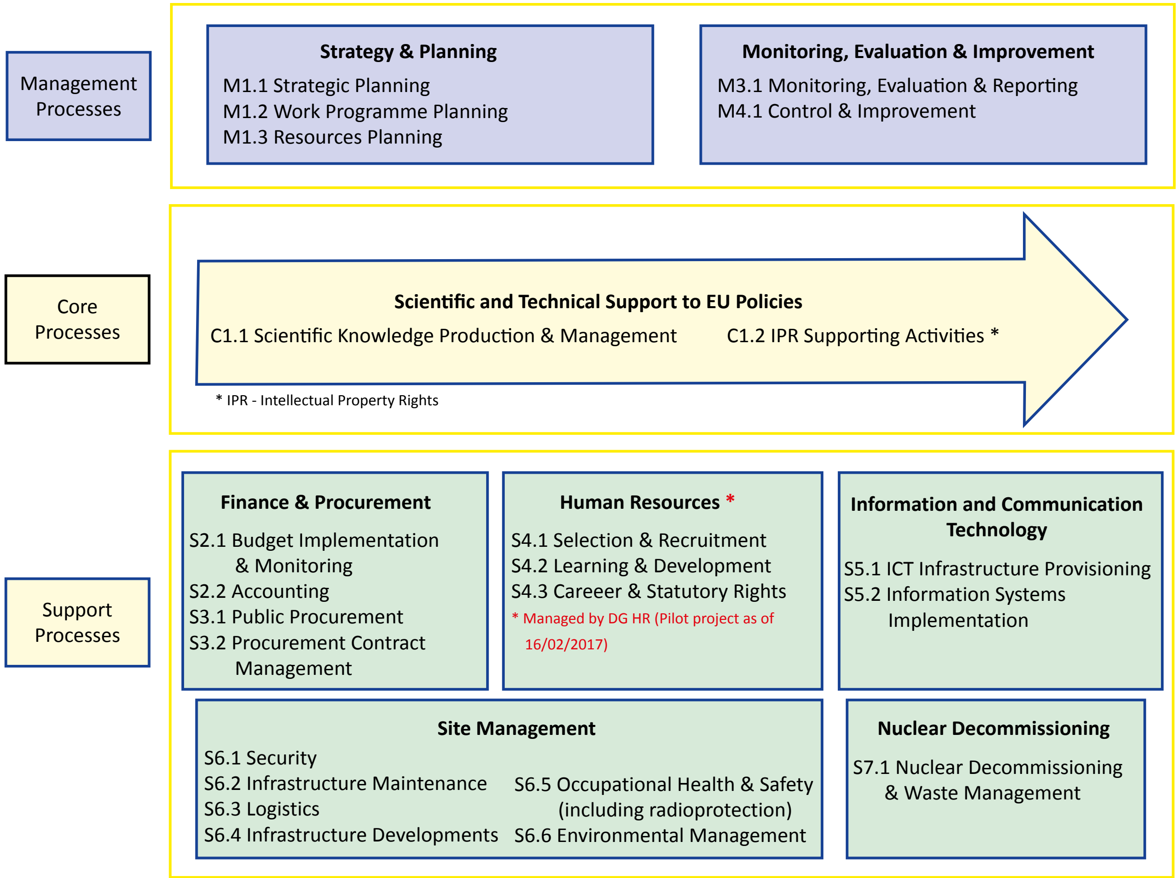
Table F2: Description of main activities in JRC-Karlsruhe's nuclear area

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 Laboratories
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 9 001 and 14 001 as well as ISO 45001 (since 2018, before BS OHSAS 18 001). Since 2015 the local IMS has been partially replaced by a JRC wide system.

The JRC IMS consists of five "Management Processes", two "Core Processes" (e.g. the Scientific knowledge production and management) and a number of "Support Processes" (e.g. Occupational health and safety, Environmental management). The process map is shown below in Figure F1d.

Figure F1d: JRC Process Map



F2.2 Stakeholder analysis

Important stakeholders for JRC-Karlsruhe include, in addition to the German nuclear regulatory authorities are peer nuclear scientists, journalists and influence makers, several Commission Directorate Generals (e.g. DG ENER), EURATOM, co-operators on nuclear safety, young academics, local and regional politicians or 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 which was adapted in 2019 (retrospectively for 2018). The result is shown in table F3. The various groups are sorted by taking into account their level of interest/influence and involvement on environmental matters using a semi-quantitative approach.

Table F3: Stakeholders' description - JRC-Karlsruhe

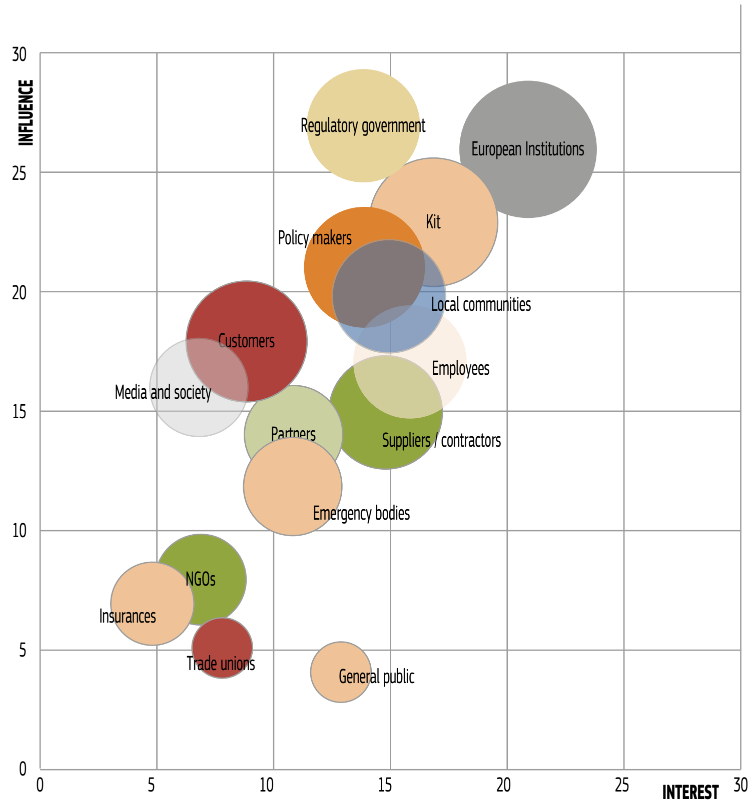
Stakeholder group	**Main representatives**	**Interest, needs and expectations** **Obligations***	**Necessary communication**	**Prio.**
European Institutions (€)	◆ DG JRC, ◆ EC, ◆ Council & parliament ◆ Member states ◆ Commission panels ◆ EC citizens	◆ Services well responding to DG's demands ◆ Minimal costs on energy/waste/soil ◆ They define the policy ◆ Multi-annual investment plans: they decide on investments: refurbishment, construction,... ◆ Site development plan		1
KIT	KIT	**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 2030 targets on energy		1

Stakeholder group	Main representatives	Interest, needs and expectations **Obligations***	Necessary communication	Prio.
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		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, DEVCO, TRADE, TAXUD, HOME	Timely and correct delivery of reference materials and policy support, no specific requirements on environmental criteria.		1
Local communities	◆ Neighbours 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 know 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 outstanding projects). Indirect influence on impact through image effects.		2
Partners	◆ national laboratories ◆ policy advisors ◆ other JRC sites ◆ OECD	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
Trade Unions	◆ Members	**Working conditions**, contract fulfillment	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 either positively or negatively.

For external issues this has been done in a PESTLE[4] analysis and is shown below (Table F4a).

[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

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)
Political	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.
	Changing policies can affect scientific activities on the site and use of resources.	Budgetary constraints		
	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) External Legal Compliance audits
	Demands/ wishes of the surrounding communities	Reputational risk, complains	Promote external communication	
	Requirements from the Regulations: EMAS / ISO	Significant Changes		Contract and keep expertise on key functions (incl. using an external service provider)
	Buildings' infrastructure	Budgetary constraints	Improving in energy efficiency	Site development plan; Environmental Program 2018, No. 2a-2k
Economic	The uncertain economic situation (related also to Brexit) influences the investments, staffing and contractors	Budgetary constraints so investments in energy reduction/shift cannot be realized		
	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 investment in energy reduction (refurbishment, insulation, new buildings)	Environmental Program 2018, No. 2a-2k
	Largely captive market (for several suppliers/providers of staff and material)	High cost, reduced availabilities		

[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) [5] ***(current conditions or future developments)***	Risks (6.1.1)	Opportunities (6.1.1)	Actions (6.1.4)
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 monopoly position in the market), also problem for business continuity		
	Phase out of nuclear technologies for energy production. Higher demand for specialists for radiation protection and decommissioning	Decrease in specialized manpower available on the market; increasing prices for contracts		
Technological	Development of green energy technologies		Improving in energy efficiency	Environmental Program 2018, No. 2c
	Availability of electric cars can influence the emissions of the employee's cars			Evaluation of local charging point (Included in Environmental Program 2019)
	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 2018, No. 1i)
Legal	More complex environmental regulations	Risk of missing requirements	Improve environmental performance (better control of impact)	Contract and keep expertise on key functions (incl. using an external service provider) External Legal Compliance audits
Environmental	Climate change effects: heat 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 2018, No. 2a-2k

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 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 neighborhood		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 2018, No. 2c; Improvement of monitoring to allow optimal regulation.
Strategic direction	JRC restructuration towards international level is affecting travelling needs	Higher travel emissions (CO_2), more complex reporting lines and decision making		Promote video conferencing (Environmental Program 2018, No. 1f); Green/sustainable event organizations
	Resource limitation increases every year	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 trainings (Environmental Program 2018, No.4)
	Increased demand for remote/ flexible working		Reduction of commuting emissions and decreased resources (use of office space, energy, etc.)	Installation of telework where feasible
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		

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)
Financial issues	Restrictions/decreasing of the budget for infrastructure measures	Direct negative influence on the environmental performance - fulfilment of the environmental targets endangered		Constant demand for adequate resources to higher management
	Financial procedures are complex	It is sometimes difficult to obtain what is needed (missing points, deadlines, quality issues)		Training and guidance documents

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). It is reviewed at least annually and updated when necessary, most recently on 16th April 2018. 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 remain unchanged for several years. The other aspects described in the Environmental Aspects Register can be considered of minor significance or insignificant. 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 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
Emissions to air	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

F4 More efficient use of natural resources

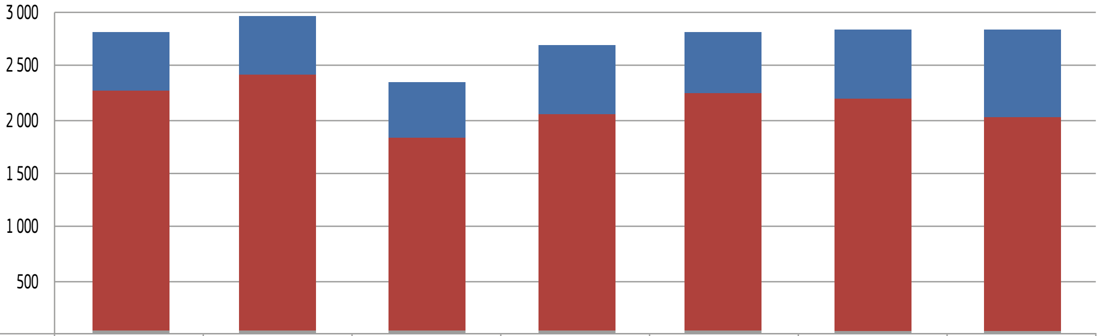
F4.1 Energy consumption

Buildings energy consumption data should be considered in the context of climatic conditions. Analysis of degree data[6], a very rudimentary approach to considering climatic context but presented below suggests that climatic conditions may have been harsher in 2016, 2017 and also 2018 than in either 2014 or 2015 and that consequently more heating and cooling may have been necessary. In fact, the measured values do not support this because all district heating values in 2016 to 2018 do not correlate with the development of number of heating days. E.g.: 2016 had a higher number of heating days than 2015 but the value for district heating decreased;

[6] Monthly data for EBBR station (15,5C reference temperature), www.degreedays.net;

in 2017 the number of heating days remained comparable to 2016 but the value for district heating went up. This development continued in 2018 (lower number of heating days than 2017 but the value for district heating increased).

Figure F3: Total annual degree days[7] at Karlsruhe, 2012-2018



	2012	2013	2014	2015	2016	2017	2018
Total degree days	2 785	2 924	2 325	2 662	2 798	2 811	2 802
Cooling degree days (CDD)	543	527	524	648	576	641	814
Heating degree days (HDD)	2 242	2 397	1 801	2 014	2 222	2 170	1 988
kWh/person/degree day	24.67	25.66	27.54	26.58	24.15	24.42	25.41

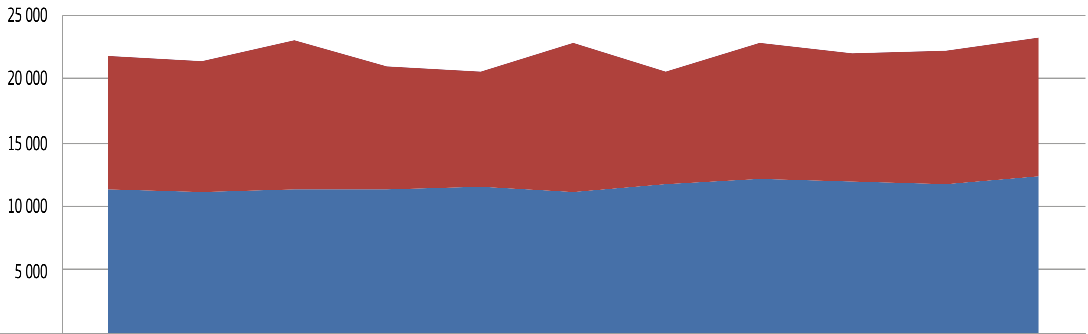
a) Buildings

Buildings' energy consumption is one of the significants aspects. Figures F3 and F4 below show that most energy consumption parameters have been fairly steady during the last few years, although energy consumption, particularly district heating, fell considerably in 2014. This was due to the installation of a new more efficient heating control system in one of the laboratory wings in combination with a rather warm winter.

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. The reduction of the total energy consumption per square meter in 2013 was due to the opening of the new administration building and an increase of the surface area by about 6 000 m^2.

Total energy consumption decreased slightly from 2015 to 2016 despite two new buildings becoming fully operational in 2016. Hence, the surface area increased by 4 %. As a consequence the consumption per m^2 remained steady in 2017 and increased slightly in 2018. Total energy consumption shows a slight increase from 2016 to 2018. Hence, the target for 2018 not to exceed the 2014 values could not be reached for the total consumption and for the value per m^2. Nonetheless, the 2018 figures both in total and also per m^2 as well as per capita are still within the range of or even below the values recorded since 2008.

Figure F4: Annual buildings energy consumption (MWh) in the EMAS perimeter (indicator 1a)[8]

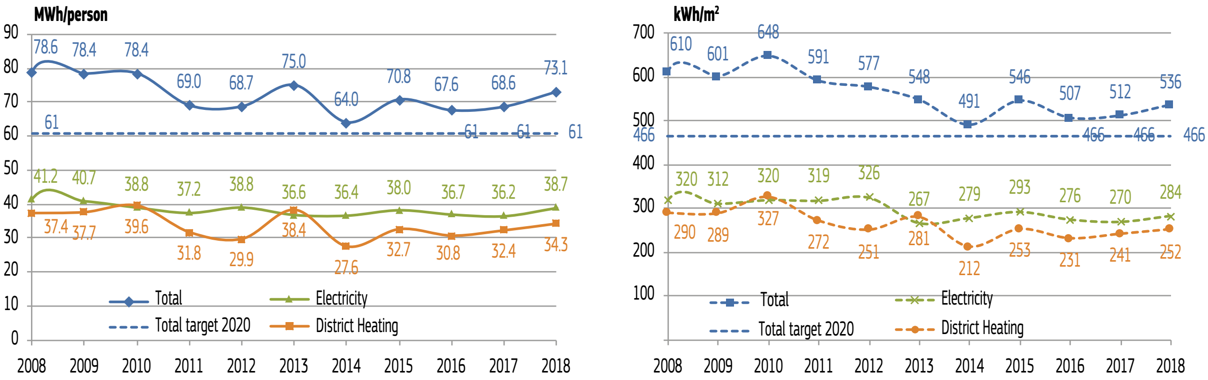


	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	21 705	21 393	23 059	21 046	20 544	22 882	20 489	22 786	21 889	22 104	23 158
diesel			10	10	10	10	10	10	10	10	10
district heating and cooling	10 330	10 293	11 649	9 692	8 932	11 710	8 839	10 540	9 982	10 423	10 888
electricity	11 375	11 100	11 400	11 344	11 602	11 162	11 650	12 236	11 897	11 670	12 260

7 One degree day is equivalent to a variation of 1 degree from the reference temperature for 24 hours

8 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.

Figures F5 and F6: Evolution of total annual energy consumption for JRC-Karlsruhe



Electricity consumption has remained fairly constant in the last few years despite an increase in floor area of 22% since 2013. The ventilation system is responsible for over 80% of Karlsruhe's electricity consumption. Unfortunately, an evaluation by wings and the various consumers as in the previous years was not possible because the respective measuring equipment was renewed and temporarily did not work properly. 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. In 2017 and 2018 the electricity for the construction site of wing M was taken from the power current net of wing A and therefore has to be deducted. Unfortunately there is no separate counter to record this, hence, conservative estimations of 200.000 kWh based on the average value of the years 2012-2016 for 2017 and of 150.000kWh for 2018 (less, because the cranes were dismantled in the second half of the year) were used.

The rise in 2018 is mostly due to the necessity to let the ventilation run on full power for 24h over several weeks because otherwise the radon level in the building (the radon being brought in with the surrounding air by the ventilation itself) would have become too high. Usually, the ventilation is reduced to 50 % during the night and the weekends.

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 buildings insulation. In 2013 a new "state of art" office building became operational and hence consumption per m² decreased by 2% compared with 2012. From 2013 to 2014 there was a further decrease of 24%. The further development follows the weather conditions. This goes along with a comparable development of water consumption from 2016 to 2018 because water is required for moistening of the incoming air in the laboratory wings which is a considerable percentage of the water consumption. Nevertheless, the target for 2018 not to exceed the 2014 water consumption values was almost reached for the value per m².

The **2018 target** for energy consumption was to maintain 2014 levels. In addition Karlsruhe also subscribes to the commission wide proposal of a 5% reduction of this parameter from 2014 to 2020. Karlsruhe opened two new buildings, a guardhouse and goods transfer facilities at the end of 2015. These buildings will require additional energy therefore reducing total energy consumption will be difficult at least when measured per capita. The development when measured per m² could looks more positive due to the increase of the surface area and also due to the weather conditions but it remains doubtful if this criterion can be met.

Performance measured per m² has clearly improved since 2010 with this trend continuing in 2018. Despite increasing the useful surface area of the buildings by 22% since 2013, the total consumption decreased since 2013 with a slight re-increase in 2015 and a subsequent drop in 2016 and almost maintaining the value in 2017 and 2018. 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.

Karlsruhe creates an Environmental Program for each year describing the various actions dealing with environmental aspects. The significant ones prioritising the reduction of energy consumption (indicator 1a) are summarised below.

Table F6: Important actions targeting indicator 1a (buildings energy consumption)

Goal	Action	Action type	Status of target achievement	Date
Reduction of energy consumption	Replace blowers in the ventilation system by more effective ones.	Multi-stage	2 machines replaced In the meantime, first durability problems with the machines installed in 2016 already occurred.	Dec 2018
	Installation of heat exchanger in the exhaust system in active areas.	Multi-stage	Decision about wing with continuing operation taken (wing A) but remains on hold as there are no financial means available, continuation earliest in 2020 (or after completion of wing M), only wing A will be considered as the other ones (F&G) will go into decommissioning;	started in 2014
	Thermal insulation of the “old” wings of JRC-Karlsruhe.	Multi-stage	Decision about wing with continuing operation taken but remains on hold as there are no financial means available, continuation earliest in 2020 (or after completion of wing M), only wing A will be considered as the other ones (F&G) will go into decommissioning;	started in 2014
	Installation of a more effective heating control system in wing E (comparable to wing A).	Single	10%; put on hold as there are no financial means available, continuation earliest in 2020 (or after completion of wing M)	started in 2016
	Replacement of fluorescent tubes by LEDs - basement wing D and wing E, main tool shop, lab A221, tool shop wing B	Single	100%	Dec 2018
Reduction of energy consumption	Replacement of illuminated safety signs by LEDs; complete wings D, E, F, G	Multi-stage	75%	Dec 2018
	Replacement of current perimeter lights by LEDs (depending on the availability of financial means)	Single	Feasibility study completed (result: feasible);respective actions to be started in 2019	started in 2017
	Substitution of fluorescent tubes by LEDs during maintenance when replacement is necessary	regularly repeated	ongoing	started in 2016
	Installation of a new heating transfer system in wing D	Single	100%	May 2018

b) Vehicles

Table F7: Summary vehicle energy consumption (indicator 1b)

	2014	2015	2016	2017	2018
Total (MWh/yr)	172.44	140.13	150.68	166.09	140.24
MWh/person	0.539	0.435	0.465	0.516	0.442
kWh/m^2	4.13	3.36	3.49	3.85	3.25
Diesel used (m^3)	5.71	7.79	12.47	14.30	11.71
Petrol used (m^3)	11.71	5.87	1.58	1.10	1.35

JRC-Karlsruhe operates a small fleet of 11 vehicles of which four are mostly (or only) used on the premises. One of the latter is an all-electric car. Their combined fuel consumption of 140 MWh per year can be considered as insignificant compared to the total energy consumption (0,7 % of the total energy consumption in 2017 and 0,6 % in 2018) but nevertheless decreased by 12,4 %. The Environmental Program 2018 describes the following action regarding the vehicles consumption:

Table F8: Important actions targeting indicator 1a (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 emission etc.)	Multi-stage	ongoing (purchase criteria: 50% CO_2 for new service cars); manufacturer values for CO_2	started in 2015

c) Renewable energy use in buildings

According to the supplier (responsible for 84% of the electricity), approximately 53% of the supplied electricity mix is supplied by renewable sources. There are no renewable energy sources directly on site but a photovoltaic installation operated by the KIT which contributes 1% to the purchased electricity adding up to a total percentage of 45,7 % of energy by renewable sources. District heating is generated from natural gas combined with a heat and power generation in a block-type thermal power station. There were no specific targets in 2018 because Karlsruhe does not directly influence the electricity mix. JRC-Karlsruhe is committed to a 5% reduction in non renewable energy use from 2014-2020 and is on track to meet this target at least when considering the values per m².

Table F9: Non-renewable energy use in the buildings (indicator 1c)

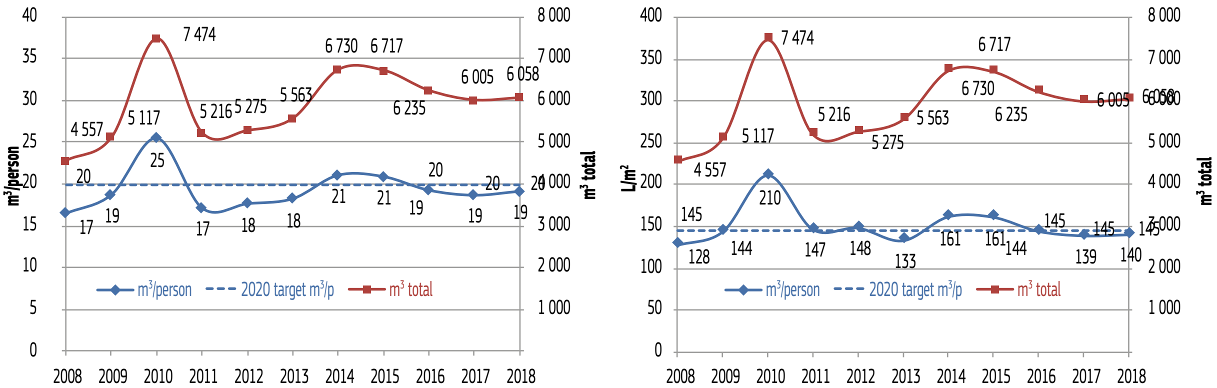
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Electricity from renewables (MWh)	2 220	2 280	2 269	2 320	2 232	3 681	4 833	4 640	4 855	5 603
Renewables (%)	20	20	20	20	20	31.6	39.5	39	41.6	45.7
Electricity from non renewables (MWh)	8 880	9 120	9 075	9 282	8 930	7 969	7 403	7 257	6 816	6 657
Non renewables (%)	80	80	80	80	80	68.4	60.5	61	58.4	54.3
supplied diesel (MWh non renewable)	0	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
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
Non renewables (%)	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**
Total renewables (%)	**10.4**	**9.9**	**10.8**	**11.3**	**9.8**	**18.0**	**21.2**	**21.2**	**22.0**	**24.2**
Total renewables (MWh/p)	**8.1**	**7.8**	**7.4**	**7.8**	**7.3**	**11.5**	**15.0**	**14.3**	**15.1**	**17.7**
Total renewables (kWh/m2)	**62.4**	**64.1**	**63.7**	**65.2**	**53.5**	**88.2**	**115.8**	**107.5**	**112.5**	**129.8**
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
Total non renewables, (%)		90.1	89.2	88.7	90.2	82.0	78.8	78.8	78.0	75.8

d) Emergency generators

JRC-Karlsruhe operates two diesel emergency generators for the production of 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 even more negligible than the consumption of the service cars representing 0,04% of the total energy consumption in 2018.

F4.2 Water consumption

Figures F7 and F8: Evolution of total annual water consumption for Karlsruhe (indicator 1d)



These figures indicate that water consumption per m² remained essentially steady in recent years with the higher value recorded in 2010 due to a malfunction in the hydrogen generating plant.

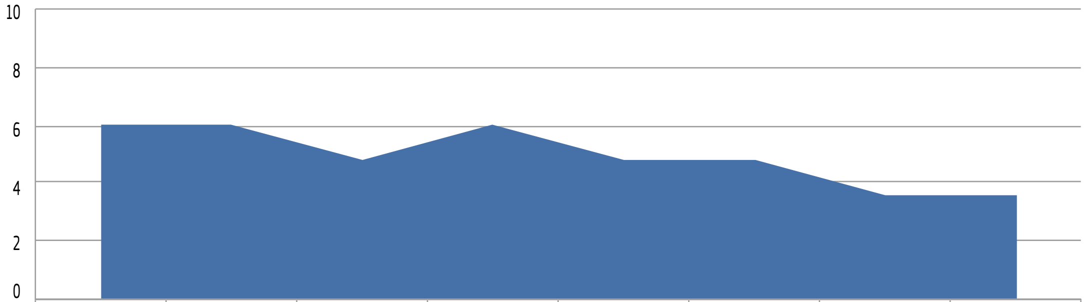
Water consumption rose significantly in 2014 partially due to the opening of the new office building in 2013 and also due to higher water consumption needed for humidifying the incoming air in the laboratory wings. This trend continued in 2015. In 2016 and 2017, the water consumption decreased due to warmer temperatures during the winter months which require less moistening of air pumped into the laboratory wings. The 2018 value is comparable to the one of 2017.

The **2018 target** not to exceed the 2014 levels was almost met for both total consumption as well as consumption per m², even with two new buildings starting operation in the fourth quarter of 2016. The **target for 2019** is once again not to exceed the 2014 values. The target for 2014-2020 is a 5% reduction in water consumption on a per square metre basis, one that is currently being met.

F4.3 Office and offset paper

The evolution of office paper at Karlsruhe and per capita breakdown presented below. There is no offset paper.

Figure F9: Evolution of paper consumption at Karlsruhe (totals)



	2011	2012	2013	2014	2015	2016	2017	2018
Office (A4 sheet equivalent) x1 000 000	1.20	1.20	0.96	1.20	0.96	0.96	0.72	0.72
Total paper consumption (tonnes)	6.00	6.00	4.80	6.00	4.80	4.80	3.60	3.60
Offset paper (tonnes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
■ Office paper (tonnes)	6.00	6.00	4.80	6.00	4.80	4.80	3.60	3.60

Figure F10: Evolution of paper consumption at Karlsruhe per person

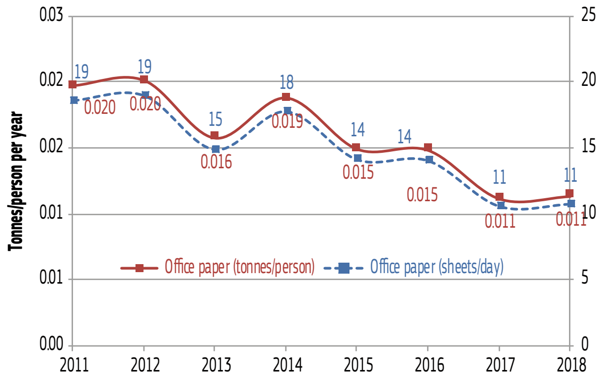


Figure F10 shows that office paper consumption decreased over the years. Since 2013 office paper has the Nordic Swan and EU Ecolabel (EU Flower) designations.

The calculation method was changed in 2015 from counting the ordered amount to the values given by the counters in the printers/copiers but had to be changed back to the purchased amounts (also retroactively for 2015 and 2016) because the printers give only the print numbers. And as differentiation between one and two sided prints is not possible, and thus, these figures are unreliable. For 2019 it is planned to replace the current paper with 80 g/m² by one with a lower grammage (70 g/m²) as a trial.

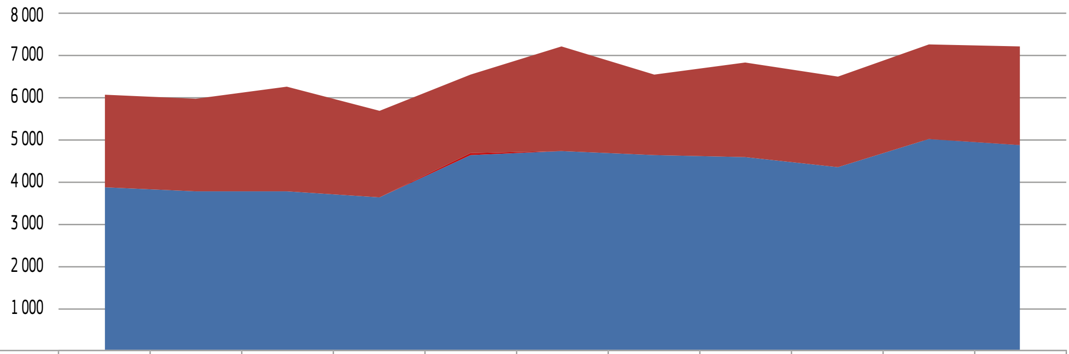
F5 Reducing air emissions and carbon footprint

F5.1 CO_2 emissions from buildings

a) 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
Total (tonnes)	6 068	6 000	6 247	5 698	6 570	7 219	6 546	6 825	6 484	7 253	7 202
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
diesel			3	3	3	3	3	3	3	3	3
electricity	3 868	3 807	3 762	3 630	4 664	4 722	4 660	4 576	4 354	5 030	4 879

Figure F12: CO_2 emissions from buildings energy consumption, per capita and square metre (indicator 2a)

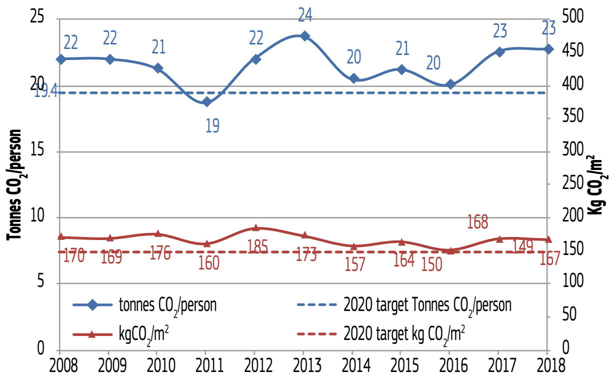


Figure F11 shows that the evolution of CO_2 emissions from buildings is, as expected; strongly linked to energy consumption and with the same trends described in section F4.1. For operational buildings, the **2018 target** was not to exceed 2014 emissions which was not met mostly due to a change in the electricity supplier (cf. below). In common with energy consumption the 2014-2020 target is a 5% reduction. CO_2 emissions remained rather steady over the years.

The rise in emissions since 2011 can be explained mostly by changes in the grid electricity mix. Due to the Fukushima incident the mix of the electricity generation changed significantly (less nuclear energy and more from fossil fuels). The following drop since 2013 is due to a higher percentage of renewable energies and a reduction of fossil fuels in the generation of the supplied electricity by the electricity supplier at that time. The decrease per m² since 2012 is also due to an increase of the surface area of about 22 % due to a new administration wing and two new buildings (new entrance and good's transfer) which were built due to requests of the authorities. The significant rise in 2017 is due to a change of the electricity supplier of the KIT. Unfortunately KIT chose to switch the supplier in 2017 (from EN BW to Stadtwerke Karlsruhe combined with some on-site generated electricity by combined heat and power generation in a block-type thermal power station (15%) and photovoltaics (1%)). The CO_2 conversion factor for this combination increased to 0,346 in 2017 and decreased slightly to 0,313 in 2018

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.

(mainly because of the energy mix of the Stadtwerke Karlsruhe which changed positively for 2018). Due to the reduced CO_2 conversion factor for electricity in 2018, there is a slight decrease of the CO_2 generation in 2018 although electricity and heating consumption went up.

Because the vast majority of the 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 described in section F4.1 will inevitably also reduce emissions.

b) Buildings -other greenhouse gases (refrigerants)

Karlsruhe operates approx. 60 (mostly smaller) 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 2018 there were no losses during normal operations, and there were no "abnormal" operations. The same applies to four electric cabinets which are filled with small amounts of SF_6 as insulating agent (approx. 6 kg). These cabinets are completely closed systems with an internal system pressure of 0,5 bar; thus, there is no possible loss during normal operation. Other greenhouse gases (like CH_4, N_2O and PFCs) are not used on the site and 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 2018. The **2019 objective** is to repeat 2018's performance of no leakage during normal operation.

F5.2 CO_2 emissions from vehicles (indicator 2c)

a) Commission vehicle fleet

Karlsruhe operates a vehicle fleet of 11 vehicles one of these being an electric car. They had a combined CO_2 output of 40,8 t in 2018. This is a significant decrease of 15,6 % compared to 2017. Moreover CO_2 emissions of all cars can be considered as negligible compared to the total CO_2 emissions (e.g. 0,6 % of the total CO_2 emissions in both 2018 and 2017).

b) 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 2015 or 2016 associated with them. Nonetheless, due to an increase in video conferencing facilities from two to nine since 2013, so it could be can assumed that there was some reduction of travel in favour of video conferences.

c) 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 put then on hold due to the lack of staff.

The Environmental Program 2017 describes the following action regarding the vehicles consumption:

Table F10: Important actions promoting more sustainable commuting behaviour

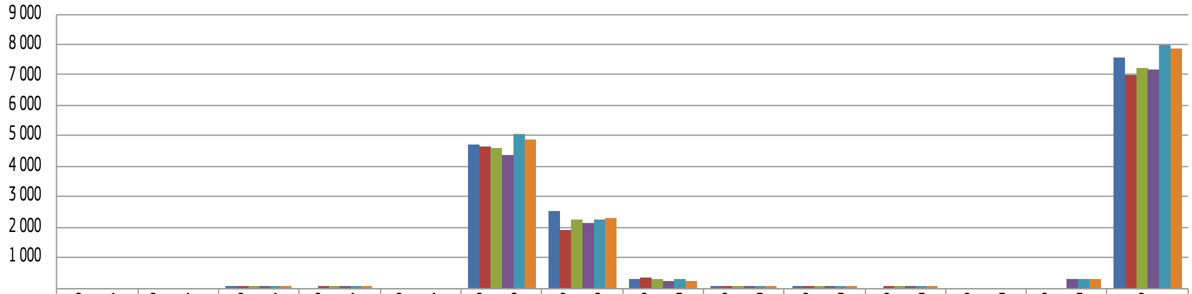
Action	Action type	Status of target achievement	Date
Free tickets for public transport	continuous	implemented	started before 2008
Car-pooling: intranet site for staff	continuous	Car-sharing inter-institutional portal	published on connected 02/15
Encourage staff to get to work by public transport or bicycle	single	Velo Mai	May/June 2018
Equip, maintain and manage service bicycles	Continuous/ single	Regular service (includes also monthly servicing); 10 new bikes purchased in 2018	started in December 2014

d) Emergency generators

The two diesel generators (cf. chapter F4.1 - d)) generate approximately 3,4 t CO_2, even less than the CO_2 emissions of the service cars (0,05% of the total CO_2 emissions).

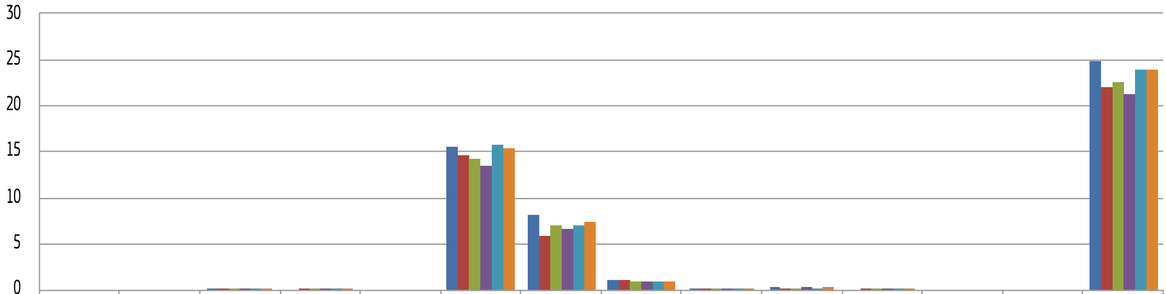
F5.3 Carbon footprint

Figure F13: Carbon footprint elements (Tonnes CO_2)



	Scope 1; Fuel for bldgs: mains gas	Scope 1; Fuel for bldgs: tanked gas	Scope 1; Fuel for bldgs: diesel	Scope 1; Commission vehicle fleet	Scope 1; Refrigerant leaks	Scope 2; External electricity supply	Scope 2; District heating	Scope 3; Business travel: air	Scope 3; Business travel: rail	Scope 3; Business travel: hire car	Scope 3; Business travel: private car	Scope 3; Business travel: air taxi	Scope 3; Commuting	Sum
2013	0	0	3	0	0	4.722	2.494	300	10	62	0	0	0	7 591
2014	0	0	3	51	0	4.660	1.883	322	3	56	39	0	0	7 017
2015	0	0	3	41	0	4.576	2.245	282	6	60	32	0	0	7 246
2016	0	0	3	44	0	4.354	2.126	252	4	75	34	0	273	7 166
2017	0	0	3	48	0	5.030	2.220	281	5	58	37	0	273	7 955
2018	0	0	3	41	0	4.879	2.319	255	5	67	32	0	273	7 873

Figure F14: Carbon footprint elements (Tonnes CO_2/person)



	Scope 1; Fuel for bldgs: mains gas	Scope 1; Fuel for bldgs: tanked gas	Scope 1; Fuel for bldgs: diesel	Scope 1; Commission vehicle fleet	Scope 1; Refrigerant leaks	Scope 2; External electricity supply	Scope 2; District heating	Scope 3; Business travel: air	Scope 3; Business travel: rail	Scope 3; Business travel: hire car	Scope 3; Business travel: private car	Scope 3; Business travel: air taxi	Scope 3; Commuting	Sum
2013	0	0	0.01	0	0	15.48	8.18	0.983	0.03	0.2	0	0	0	24.89
2014	0	0	0.01	0.16	0	14.56	5.88	1.006	0.01	0.17	0.12	0	0	21.93
2015	0	0	0.01	0.13	0	14.21	6.97	0.876	0.02	0.19	0.1	0	0	22.5
2016	0	0	0.01	0.14	0	13.44	6.56	0.778	0.01	0.23	0.1	0	0	21.28
2017	0	0	0.01	0.15	0	15.62	6.89	0.871	0.01	0.18	0.12	0	0	23.86
2018	0	0	0.01	0.13	0	15.39	7.32	0.804	0.01	0.21	0.1	0	0	23.98

Figures F13 and F14 show that buildings energy consumption either through electricity or district heating are the most important components of the carbon footprint. Commuting and business air travel are the next significant components but these are far below the buildings energy consumption.

Table F11: Contributions to carbon footprint (Tonnes CO_2/person and % of total) for components exceeding 1%

	Tonnes CO_2/p						% of total measured					
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Total measured carbon footprint	**24.89**	**21.93**	**22.50**	**21.28**	**23.86**	**23.98**	**100**	**100**	**100**	**100**	**100**	**100**
◆ of which electricity for buildings	15.48	14.56	14.21	13.44	15.62	15.39	62.2	66.4	63.2	63.2	65.5	64.2
◆ of which district heating	8.18	5.88	6.97	6.56	6.89	7.32	32.9	26.8	31.0	30.8	28.9	30.5
◆ of which business travel (air)	0.98	1.01	0.88	0.78	0.87	0.80	4.0	4.6	3.9	3.7	3.7	3.4
◆ of which commuting	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Sum of these components	**24.64**	**21.45**	**22.06**	**20.78**	**23.39**	**23.51**	**99.0**	**97.8**	**98.0**	**97.7**	**98.0**	**98.1**

F5.4 Total air emissions of other air pollutants (SO_x, NO_x, PM)

Karlsruhe's non CO_2 emissions to air are no significant environmental aspect. It does not operate heating installations, hence, there are no processes generating either NO_x or SO_x. VOC 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 2018 and also no **2019 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.

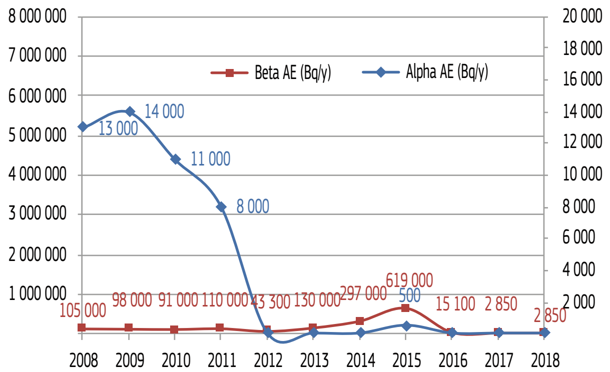
F5.5 Nuclear emissions

JRC-Karlsruhe does not make its own measurements relating to potential radioactive emissions to the surrounding environment but participates in KIT Campus Nord's surveillance program. Of course, there are constant measurements made by JRC-Karlsruhe but these are only 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 F15. The fluctuations in the values can mostly be attributed to the measuring method.

Figure F15: Exhaust air: declaration to authority on aerosol emissions



Note: maximum values on the y axes are only 20% of the permitted maxima for beta and alpha emissions (40 000 000 Bq/y, and 100 000 Bq/y respectively)

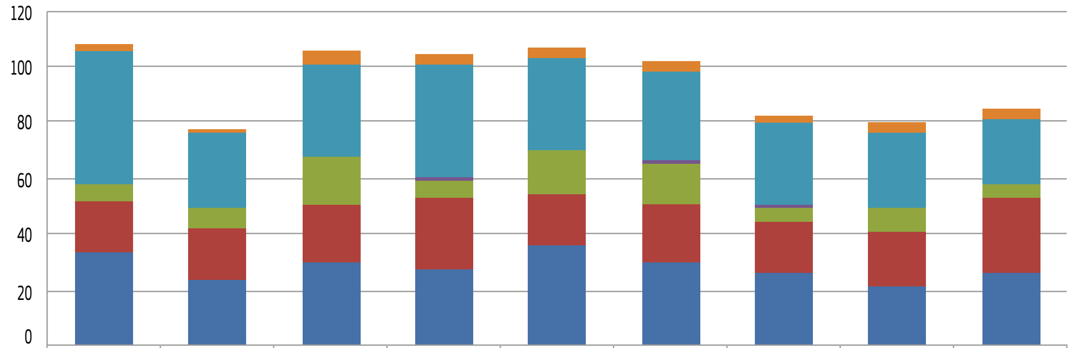
Owing to the already low values, a further reduction in nuclear emission is practically unachievable. Karlsruhe's **2019 target** is, nonetheless, to maintain this very good level of performance, given that site policy is to keep emissions as low as reasonably possible, regardless of the authorised limits.

In 2011, as a consequence of the mediation process regarding the construction of the new laboratory wing, Karlsruhe 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

Figure F16: Evolution of total non-hazardous waste in Karlsruhe (tonnes)



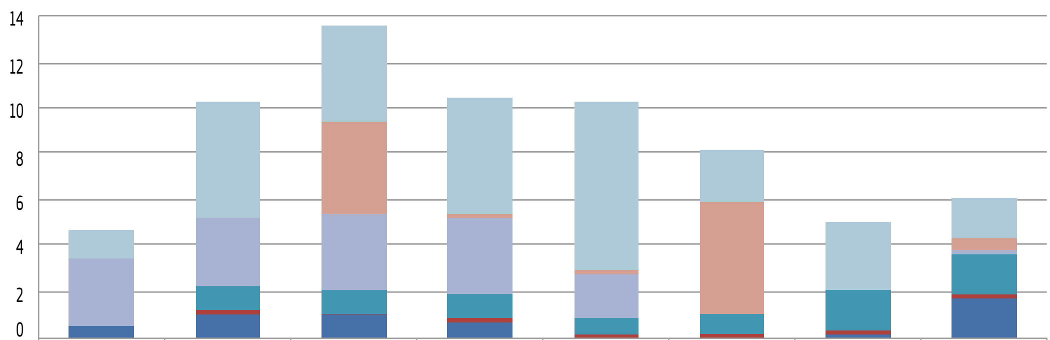
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	107	78	106	104	107	102	82	80	84
Total (tonnes/person)	0.37	0.26	0.35	0.34	0.33	0.32	0.25	0.25	0.27
Plastic	2.4	2.4	4.9	3.0	4.1	3.3	1.6	3.9	3.9
Metal (scrap)	47.0	26.6	32.7	40.8	32.9	32.8	29.9	26.7	23.1
Glass	0.2	0.0	0.6	0.6	0.0	0.8	0.8	0.0	0.0
Wood	6.7	7.1	16.6	6.9	15.4	14.4	5.6	8.3	3.8
Paper and cardboard	18.0	18.0	20.8	25.7	18.0	20.6	18.0	19.3	27.3
Municipal waste	33.2	23.8	30.3	26.7	36.1	30.1	26.0	21.6	26.2

Figure F16 shows a decreasing trend in waste generation since 2012. Most waste data are provided by the waste contractor. Some household and paper waste is disposed 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]. 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 F16.

The 2014-2020 target of 5% waste reduction will be achieved through strengthening awareness of the established procedures and through 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. Nonetheless the data show that in 2018 per capita waste generation was already well ahead of the 2020 target.

F6.2 Hazardous Waste

Figure F17: Evolution of total hazardous waste in Karlsruhe (tonnes)



	2011	2012	2013	2014	2015	2016	2017	2018
Total	4.65	10.32	13.58	10.51	10.26	8.23	5.07	6.02
Total (tonnes/person)	0.015	0.035	0.045	0.033	0.032	0.025	0.016	0.019
Electrical equipment (WEEE)	1.18	5.20	4.27	5.20	7.25	2.32	3.03	1.72
Insulating glass fibre	0.00	0.00	3.86	0.18	0.30	4.88	0.00	0.46
Asbestos from dismantling works	3.00	2.82	3.38	3.32	1.84	0.00	0.00	0.25
Lead-acid battery	0.00	1.19	1.02	0.90	0.70	0.91	1.79	1.79
Flourescent lamps	0.00	0.13	0.13	0.21	0.17	0.12	0.11	0.09
Mixed chemical waste	0.47	0.98	0.92	0.70	0.00	0.00	0.14	1.71

[10] Görner, Hübner - Abfallwirtschaft und Bodenschutz; Springer; 2002

Figure F17 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, 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. In 2017 as well as in 2016 there was no asbestos disposed; in 2018 there was a small amount of 250 kg. Although most of the renovation works removing asbestos elements are completed some small amounts as in 2018 might appear from time to time. 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. As with non-hazardous waste, the site in 2018 reported hazardous waste generation demonstrating reductions well below the 2020 target.

F6.3 Waste sorting

Table F12: Percentage of waste sorted at the JRC-Karlsruhe

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Percentage of waste sorted	69.8	71.2	73.9	77.2	69.2	73.2	71.2	74.6	71.0
Percentage of waste not sorted	30.2	28.8	26.1	22.8	30.8	26.8	28.8	25.4	29.0

The percentage of waste sorted has been varying for several years around 70%. As the waste generation is depending to a large extent on the research as well as renovation and construction activities which are not predictable there is no specific target set for the percentage of waste sorted. The aim is to remain in this range. In addition Karlsruhe’s 4.8% proposed increase of this parameter for 2014-20 is in line the Commission wide proposal.

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 used by the Commission for this Environmental Statement and consequently leads to different values. According to the criteria given in this ordinance the percentage sorted is approx. 98%.

F6.4 Radioctive 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 (Kerntechnische Entsorgung Karlsruhe GmbH, the official collecting facility for low and middle radioactive waste in Baden-Württemberg).

Table F13a: Nuclear waste

Year	2011	2012	2013	2014	2015	2016	2017	2018
Waste volume	168	112	179	152	108	127	127	74
evolution (%)	0	– 33	60	– 15	– 29	18	0	– 42
Activity (TBq)	5	2	13	2	10	9	9	8
evolution (%)	0	– 60	550	– 85	400	– 10	0	– 11

In addition to the usual handling of nuclear waste, non-contaminated waste from the controlled area can be cleared acc. to § 29 StrlSchV (*Strahlenschutzverordnung*; German Radiation Protection Ordinance) 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.

Table F13b: Nuclear waste water

Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Chemie-III-Abwasser (m^3)	3	6	9	10	6	3	3	3
evolution (%)		100	50	11	– 40	– 50	0	0

F7 Protecting biodiversity

The total area of the site occupied by impermeable surfaces including buildings, parking lots, paved roads and paths etc. is approx. 72.000 m^2; equivalent to 221 m^2 for each staff member. The built surface area from 2012 to 2015 was about 68 000 m^2. It increased in 2015 by approx. 3.500 m^2 due to the new buildings already mentioned as well as new walkways, driveways, parking lots and container positions in the vicinity of these buildings and, since 2018 again by about 500 m^2 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. A large part of this area is natural forested area like the surrounding forests providing a natural habitat for any kind of species (cf. figure F18). There was no related target for 2018 and there also is no related target for 2019.

Figure F18: Aerial view of the site including "natural" parts

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 except 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 or noise). JRC-Karlsruhe ensures that during site developments, environmental considerations

are taken into account. Consequently there were no specific targets in 2018 and there are also no specific **targets for 2019**.

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. A staff training campaign was conducted in 2015 on this subject and again in 2016. In 2018 26 % of contracts exceeding 60 000 EUR included such criteria. Out of these 30% could be classified as "green", the remaining 70% as "light green" (using the classification recommended by the court of auditors). Hence, the 2018 target of incorporating GPP criteria in more than 3% of contracts was reached. The **2019 target** is to again exceed 3%.

Moreover, there is a new JRC 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 ITU 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

Karlsruhe is a nuclear installation under German legislation and as such is bound in a tight regulatory framework under the Atomic Energy Act (Atomgesetz, last updated in November 2015) and its Ordinances (Rechtsverordnungen) such as those for Radiation Protection (Strahlenschutzverordnung) and for X-Ray Devices (Röntgenverordnung) both of which were last updated in December 2014). 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]

Another aspect of Karlsruhe's status as nuclear installation according to German legislation is the fact, that for safety or security relevant technical installation only reliable and time-tested components may be used ((§9, para 3, nr. 3 AtG). More detailed subordinated regulations even 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 who also provide an update twice yearly, most recently in November 2018.

Karlsruhe operates under the close scrutiny and constant surveillance of the Competent Supervisory Authority which is the Ministry of Environment of Baden-Württemberg (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 November 2018.

F9.2 Prevention, risk management and emergency preparedness

As an installation subject to German nuclear legislation the whole 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 Environment of Baden-Württemberg) before becoming effective. The supervisor undertakes inspection visits regularly at least monthly.

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;
- 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.

A summary of the actions is included below:

Table F13: Internal communication actions at the JRC-Karlsruhe

Action description	**Organisation**	**Dates in 2018**	**Participants** (numbers when applicable)
Corporate Actions performed at site level			
EMAS Results 2017 *(publication of Environmental Statement 2018 – data 2017)*	Centrally organised (Commission wide)	Early January 2018	Internal staff
EMAS Week 2018	Centrally organised (Commission wide)	May 2018	Internal staff
Earth Hour 2018	Centrally organised (Commission wide)	24/03	
EMAS Sustainable@work Week: *How sustainable are you?*	Centrally organised (Commission wide)	28/05 – 01/06	Internal staff
The second edition of the Sustainable Commission Awards	Centrally organised (Commission wide)	28/05	Internal staff
Less waste, more action campaign	Centrally organised (Commission wide)	November 2018	Internal staff
Competition on the most innovation best-practices on waste reduction	Centrally organised (Commission wide)	01/11 – 23/11	Internal staff

Action description	**Organisation**	**Dates in 2018**	**Participation at Karlsruhe site level**	**Participants** (numbers when applicable)
Local Actions at Karlsruhe site				
Velo May	Centrally & locally organised	18/05-19/06	Organized together by Fit@work team (AMC 8 at Ka) & EMAS team	Internal staff
Biker breakfast	Karlsruhe site	06/06	In the context of Velo May	Internal staff
Mobility Day	Centrally & locally organised	21/09	In the context of the mobility week including a lottery with some EMAS gadgets	Internal staff
Continuous awareness via slides on info-screens on the EMAS ('EMAS internal communication -info screens')	Karlsruhe site (partially based on centrally provided slides)	2018	Awareness	Internal and external staff
Dialogue with internal stakeholders	Karlsruhe site	2018	questions received and answered via the JRC-Karlsruhe Connected page	Internal staff (1 question)
Insertion in the "Laufzettel" of the Bueromaterial recycling	Locally organised	Oct 2018	Recycling of stationery upon leaving service	Internal staff

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 Environment 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 Environment 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.

External dialogue also involves, in addition to local communities and stakeholders, international stakeholders through activities such as site visits and information campaigns. In this context, the following are some of the

persons and interest groups who visited Karlsruhe in 2018 along with some of the (at least partially) environmentally related activities undertaken:

Young academics

1. Visit of SCK-CEN students to JRC
2. Visit of students – KIT (Karlsruhe Institute of Technology)
3. European Summer School on Nuclear Decommissioning

Visit of multiplier/journalists

4. Filmteam Myriam Tonelotto – Forensics Video
5. Euronews video
6. Targeted Alpha Therapy video
7. Art Spaces exhibition

JRC/EU Internal

8. Visit of Dir. R – Ph. Duponteil
9. Visit of Horizon Scanning Workshop
10. Visit of A5 representative for Science & Art
11. Visit of the STC (Scientific and Technical Committee) of EURATOM
12. Visit of ESK (European School KA) pupils to JRC
13. Visit of ESK pupils to Brussels
14. Connected Community Managers Workshop

Member States

15. Visit of the Croatian delegation
16. 10 Years Clearinghouse
17. Training for DG ENER inspectors (EUSECTRA)
18. Celebration for the Austrian presidency

International (organisations)/IAEA

19. Several trainings: APEX-EUSECTRA Training: IAEA EC support program to the IAEA
20. Counter Nuclear Smuggling Workshop
21. IAEA General Conference
22. IAEA Safeguards Symposium

On Cooperation

23. Visit of Prof. Blaum, Director of the Max-Planck-Institute for Nuclear Physics
24. Visit of EURAC Bozen University Researchers
25. CEA visits
26. Visit of the University of Bologna, Italy
27. Visit of participants of the CETAMA (Commission d'ETAblissement des Méthodes d'Analyse) working group
28. Visit of participants of the SAMOFAR (Safety Assessment of the Molten Salt Fast Reactor) meeting

With local/regional political stakeholders:

29. Visit of the European School Karlsruhe Directors

30. Participation to the ESK Open Day

31. EFFEKTE 2018 – Strahlen in der Fächerstadt – Filmscreening und Podiumsdiskussion zum Thema Atomkraft beim EFFEKTE-Wissenschaftsdienstag im Dezember

32. Visit of EURES delegation (Agentur für Arbeit Karlsruhe-Rastatt)

33. GEDOK Ausstellung Karlsruhe

Moreover, there were 19 training courses (300 participants) in the context of The European Nuclear Security Training Centre (EUSECTRA) at Karlsruhe site and also outside the site (cf. table F14).

Table F14: EUSECTRA training courses

Nr.	Event Title: Description	Type of event	Location/ Venue	Date	Participant profile	Country(ies)/ Region	Collaboration/ Coordination
1	Nuclear Forensics Workshop Georgia	Nuclear Forensics Workshop	Tblisi	29/01-02/02	Experts	Georgia	
2	ITDB Workshop 1	International supported event	JRC-Karlsruhe	27-28/02	National focal points for IAEA ITDB	Austria, Croatia, Denmark, Estonia, Netherlands, Portugal, Slovakia	
3	APEX IAEA Task Force	Safeguards training	Vienna, IAEA HQ	05-09/ 03	Safeguards inspectors	IAEA + Euratom	IAEA
4	APEX IAEA Task Force	Safeguards training	JRC-Karlsruhe	12-16 /03	Safeguards inspectors	IAEA + Euratom	IAEA
5	ITDB Workshop 2	International supported event	JRC-Karlsruhe	13-14/ 03	National focal points for IAEA ITDB	Bulgaria, Hungary, Lithuania, Poland, Romania, Sweden, UK	
6	TAXUD 1 - FLO	Detection training	JRC-Karlsruhe	19-23/ 03	FLO	Cyprus, Czech Republic, Estonia, Hungary, Portugal, Slovenia	DG TAXUD
7	RADAR Course	Safeguards training	JRC-Karlsruhe	16-20/ 04	Safeguards inspectors	Euratom (DG-ENER)	DG-ENER
8	TAXUD 2 - T3	Train the trainers for detection training	JRC-Karlsruhe	23-27/ 04	FLO trainers	Belgium, Ireland, Italy, Netherland, Spain, Turkey	DG TAXUD
9	CNS Workshop	International hosted event	JRC-Karlsruhe	15-17/ 05	Experts	23 participating conutries	US/DoS
10	BMWG Gamma Imaging Study	International hosted event	JRC-Karlsruhe	28/05-01/06	Experts	Australia, Finland, France, USA, JRC Ispra	
11	Bundeskriminalamt Testing of Equipment	Event on request of MS	JRC-Karlsruhe	29/05	Experts	Bundeskriminal-amt + Mirion Technologies	
12	TAXUD 3 - FLO	Detection training (FLO)	JRC-Karlsruhe	04-08/ 06	FLO	Belgium, Bosnia and Herzegovina, Germany, Greece, Lithuania, Romania	DG TAXUD
13	BfS Training	Taylored training for federal radiological agency (BfS)	JRC-Karlsruhe	18-22/ 06	Experts	BfS	

Nr.	Event Title: Description	Type of event	Location/ Venue	Date	Participant profile	Country(ies)/ Region	Collaboration/ Coordination
14	NSDD FLO Kenya	Detection training (FLO)	JRC-Karlsruhe	02-06/ 07	FLO	Kenya	DoE
15	NSDD FLO Iraq	Detection training (FLO)	JRC-Karlsruhe	03-07/ 09	FLO	Iraq	DoE
16	ITDB Workshop 3	International supported event	JRC-Karlsruhe	05-06/ 09	National focal points for IAEA ITDB	Belgium, Cyprus, Czech Republic, Ireland, Latvia, Spain	
17	NDA Refresher Course	Safeguards training	JRC-Karlsruhe	14-21/ 09	Safeguards inspectors	IAEA + Euratom	IAEA
18	BfS Training	Taylored training for federal radiological agency	JRC-Karlsruhe	08-12/ 10	Experts	BfS	
19	TAXUD 4 - T3	Train the trainers for detection training	JRC-Karlsruhe	05-09/ 11	FLO trainers	Finland, Germany, Luxembourg, Poland, Slovakia, Sweden, Netherlands	DG TAXUD

Abbreviations used: APEX: Additional Protocol Exercise; ITDB: Incident and Trafficking Database; FLO: Front Line Officer training; CNS: Counter Nuclear Smuggling Workshop; BMWG: Border Monitoring Working Group; TAXUD: DG TAXUD (Taxation et Union Douanière); BfS: Bundesamt für Strahlenschutz (German federal radiological agency)

F11 Training

F11.1 Internal training

Internal training partially includes also includes external staff working on the premises.

Table F15: Internal trainings at the JRC-Karlsruhe

Description	Organisation	Dates in 2018	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	12 (internal staff)
Annual Radiation protection and safety instruction	Karlsruhe site	Nov-Dec	Health, Safety, Environment	all internal and external staff
Workshop: "2018 updates - Legal Arbeitssicherheit und Umweltschutz"	Karlsruhe site	29/11	Limited to staff in relevant functions	19 (internal staff)
Measuring Training	Karlsruhe site	6 dates Jan - Mar	Special training for physical protection staff	Physical protection staff

Introduction to EMAS is part of the Newcomers training to Quality management systems in JRC-Karlsruhe. Sessions are organised on almost quarterly basis.

In November 2018 a workshop "Current developments in legislation regarding Arbeitssicherheit und Umweltschutz" was held for the colleagues in the EMAS relevant functions like in the years before.

The specialised trainings: Laboratory Responsibles and Dangerous Substance Managers should be repeated on a 2-year basis. Therefore, there were none in 2018.

F11.2 External training

N.a.

F12 EMAS Costs and saving

Table F16: EMAS administration and energy costs for buildings in the EMAS area

	Costs:									Change in
	2010	2011	2012	2013	2014	2015	2016	2017	2018	last year
Total Direct EMAS Cost (EUR)	0	0	0	81 000	71 000	72 000	72 000	74 000	79 000	5000
Total Direct Cost per employee	0	0	0	266	222	322	324	322	317	-5
Total buildings energy cost (Eur)	1 841 430	1 699 400	1 669 420	1 824 280	1 667 240	1 839 040	1 769 470	1 779 927	1 865 560	85633
Total buildings energy cost (Eur/person)	6 263	5 572	5 583	5 981	5 210	5 711	5 461	5 528	5 885	357
Total water costs (Eur)	14 201	10 432	10 550	12 239	14 806	14 777	13 717	13 211	13 328	117
Water (Eur/person)	48	34	35	40	46	46	42	41	42	1
Total paper cost (Eur)	NR	NR	7 080	5 664	7 080	5 664	5 664	4 248	4 248	0
Total paper cost (Eur/person)	NR	NR	24	19	22	18	17	13	13	0

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	2010	2011	2012	2013	2014	2015	2016	2017	2018
kWh of energy provided by one litre diesel (1)	10.89	10.89	10.89	10.89	10.89	10.89	10.89	10.89	10.89
kWh of energy provided by one litre petrol (2)	9.42	9.42	9.42	9.42	9.42	9.42	9.42	9.42	9.42
Paper Density (g/m2)	80	80	80	80	80	80	80	80	80
Kgs CO_2 from 1 kWh of electricity (3)	0.245	0.235	0.317	0.338	0.315	0.289	0.281	0.346	0.313
Kgs CO_2 from 1 kWh district heating (5)	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Kgs CO_2 from 1 kWh diesel (4)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Kgs CO_2 from one litre of diesel (6)					2.5	2.5	2.5	2.5	2.5
Kgs CO_2 from one litre of petrol (7)					2.28	2.28	2.28	2.28	2.28
Annual cost of one FTE (EUR) (8)	132 000	132 000	132 000	132 000	132 000	134 000	134 000	138 000	148 000

Data sources
(1) www.carbontrust.com
(2) www.carbontrust.com
(3) EN BW (2010 – 2016); KIT/Stadtwerke Karlsruhe (since 2017)
(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 Statement 2019

2018 results

Annex G: JRC-ISPRA

EMAS
Verified environmental management

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Cover illustration: Aerial view of Ispra site. Ispra Site Development Plan in support of the JRC Strategy 2030

Environmental Statement 2019

2018 results

Annex G: JRC-ISPRA

FOREWORD

The European Commission (EC) site in Ispra is the host of 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 167 ha site is located on the Eastern shore of Lago Maggiore and has a relevant woodland coverage. 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. It is regarded as the premium standard for environmental excellence. Since early 2012, we committed to the EMAS scheme, building on and extending the ISO 14001 certified management systems. 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, be they 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.

Using the motto "Ispra goes smart" we are preparing a new strategy for the development of the site from now 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.

Implementing the vision means cutting drastically our carbon footprint by maximising the use of renewable energy, enhancing the energy efficiency of our buildings and commuting more sustainably.

This report presents the EMAS results for the Ispra site during 2018 and is an important element in the annual EMAS audit cycle, it details our environmental core indicators creating multi-annual comparability within and between organisations. It is a transparent communication of our performance to authorities and the general public and so paves the way for our ambitious strategy.

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 policy-making 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 Atomica" (CNEN). Subsequently, under the agreement between the Italian government and the European Atomic Energy Community (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 installations located within the site are in the process of pre-decommissioning (see Chapter G2.1b)).

To date, following the re-organisation of the JRC in July 2016, the Ispra site hosts a large variety of scientific, technical and support services, with all of the Directorates of the JRC being represented physically on the site, either in full including the Director's office, or headquartered on another JRC site with at least one or several Units, or parts thereof, located in Ispra. Please consult the JRC's organigram for more details, at: *https://ec.europa.eu/jrc/en/about/organisation*.

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 on the JRC-Ispra site of staff and intramuros contractors falls short of 2,300 people, of whom almost 1,750 are Ispra site staff. The site hosts over 40,000 visitors a year.

G1 Overview of core indicators at Ispra

JRC-Ispra has been reporting on EMAS parameters since 2014 with data mostly stretching back at least to 2011. The variation of the core indicators, including performance trends and targets, is shown below.

Table G.1 – Historical data, performance and targets for core indicators proposed for Commission level reporting

Physical indicators:	**Historic data values**					**Performance trend (%) since:**				**Target**	
(Number, desciption and unit)	2011 [1]	**2014**	2016	2017	2018	2011	2014	2016	2017	2020*	
										Δ % [2, 3]	value [2]
1a) Energy bldgs (MWh/p)	53.22	**44.32**	43.32	42.86	42.16	**-20.8**	-4.9	-2.7	-1.6	-5.6	41.84
1a) Energy bldgs (KWh/m²)	502	**404**	385	376	368	**-26.6**	**-9.0**	-4.3	-2.0	-5.6	381.7
1c) Non ren. energy use (bldgs) %	93.1	**95.5**	94.8	94.3	93.5	0.5	-2.1	-1.4	-0.9	-5.0	90.7
1d) Water (m³/p)	1 517	**735**	830	777	800	**-47.3**	**8.8**	-3.7	2.9	-5.0	698
1d) Water (L/m²)	14 297	**6 705**	7 372	6 808	6 983	**-51.2**	4.1	**-5.3**	2.6	-5.0	6 370
1e) Office paper (Tonnes/p)	0.02	**0.017**	0.014	0.013	0.012	**-48.8**	**-30.8**	**-13.7**	**-9.8**	-20.0	0.014
1e) Office paper (Sheets/p/day)	22	**16.5**	14.2	13.6	12.2	**-45.4**	**-26.2**	**-13.7**	**-9.8**	-20.0	13.2
2a) CO_2 buildings (Tonnes/p)	12.39	**10.44**	10.17	10.11	9.89	**-20.2**	**-5.3**	-2.8	-2.2	-5.6	9.853
2a) CO_2 buildings (kg/m²)	117	**95.2**	90.3	88.6	86.3	**-26.0**	**-9.3**	-4.4	-2.6	-5.6	89.9
2c) CO_2 vehicles (g/km, manu.)		**191.0**	189.6	182.9	165.3		**-13.5**	**-12.8**	**-9.6**	-5.1	181.3
2c) CO_2 vehicles (g/km, actual)	346	**343.4**	323.4	373.7	317.2	-8	**-7.6**	-1.9	**-15.1**	-5.1	325.9
3a) Non haz. waste (Tonnes/p)	0.474	**0.491**	0.389	0.507	0.546	**15.1**	**11.1**	**40.4**	**7.6**	NA	NA
3b) Hazardous waste (Tonnes/p)	0.057	**0.021**	0.027	0.027	0.021	**-63.0**	-1.6	**-21.7**	**-23.2**	NA	NA
3c) Separated waste (%)	71.3	**81.5**	79.1	81.3	85.8	**20.4**	5.3	8.5	5.6	9.3	89.1
Economic indicators (Eur/p)											
Energy consumption (bldgs)		**1 775**	1 079	1 294	1 495		**-15.8**	**38.6**	**15.5**	-5.0	1 687
Water consumption		**162**	183	132	96		**-40.6**	**-47.5**	**-27.3**	-5.0	154
Non haz. waste disposal	120	**115**	133	149	119	-1	3.9	**-10.2**	**-19.9**	-5.0	108.9

Note: (1) Earliest reported data; (2) compared to 2014; (3) EMAS Annual Action Plan 2019 (% values)
* Target for % improvement for the period 2014-2020
NA: Not applicable

The overall progress of the core KPIs towards the targets set for 2020 having 2014 as baseline reference value are quite positive in most areas and in particular for building energy consumption (point *1a)*, *kWh/m²*), office paper consumption (both points *1e)*), building CO_2 emissions (*point 2a), kg CO_2/m²)* and for vehicles CO_2 emission (both points *2c)*) where 2020 targets have already been met. To be noted that all core KPIs have been improving since 2011 and often improvement is significant. A detailed analysis of the relative causes of these indicators is described in the dedicated Chapters.

The midterm review of Commission and site's level environmental core indicators against initially set targets for 2014-2020 has resulted in the raising of several core indicators, particularly where the 2020 objective had been reached. The paper consumption target was further improved (-9% to -20%) even if end of year results showed that the target has already been exceeded (-30.8%).

JRC-Ispra has proactively requested in last year's call for tender for electricity from the Italian grid to be supplied at least with a 60% supply of renewable energy. Since October 2018 the energy supplied is 100% renewable.

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.

Table G.2 – EMAS baseline parameters

	2011	2012	2013	2014	2015	2016	2017	2018
Population: total staff (internal and external)	2 087	2 110	2 223	2 337	2 296	2 258	2 277	2 285
Total no. operational buildings	422	423	421	419	409	410	402	402
Useful surface area for all buildings, (m²)	221 444	222 148	223 077	256 077	253 428	254 356	259 828	261 713

The JRC-Ispra population has a fluctuating trend which is not always predictable. In 2017, in order to standardise data with the rest of the EC EMAS family, the actual staff calculation method was changed, accounting only for the site's internal staff and external staff having a desk-office position. This new calculation methodology as shown here above has been applied to all previous years, as well. This methodology has influenced negatively the core indicators as they have staff numbers as the denominator.

The site's usable surface area was increased in 2018 by a total increase of about 0.7%, particularly due to the completion of a three storey building of 1528 m², namely the "Centre of Advanced Studies", which hosts both internal and external scientists.

G2 Description of JRC-Ispra activities[1], context and key stakeholders:

G2.1 Site setting and activities

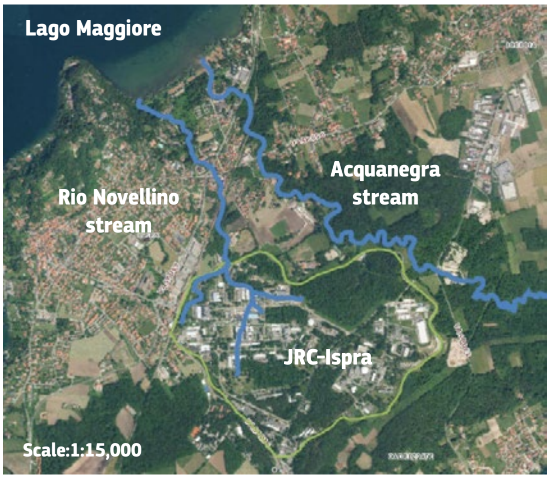
Figure G.1 – Geographical overview of JRC-Ispra site (source Google Maps)

The Ispra site occupies about 167 hectares, and is located about 70 km North West of Milan, in Italy, as shown in Figure G1. The site is in a hilly area between Lakes Maggiore and Varese, at an altitude of approximately 230

1 Corporate NACE codes associated with the JRC-Ispra site activities are: 99.00 - Activities of extraterratorial organisations and bodies; 71.2 - Activities de contrôle et analyses techniques; 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.

m above sea level. The site contains several ponds and many hectares of groves comprising mainly pines, birches, oaks, acacias and chestnut trees.

Figure G.2 - Location of Rio Novellino and Acquanegra Stream (source Regione Lombardia – Geographic Viewer)

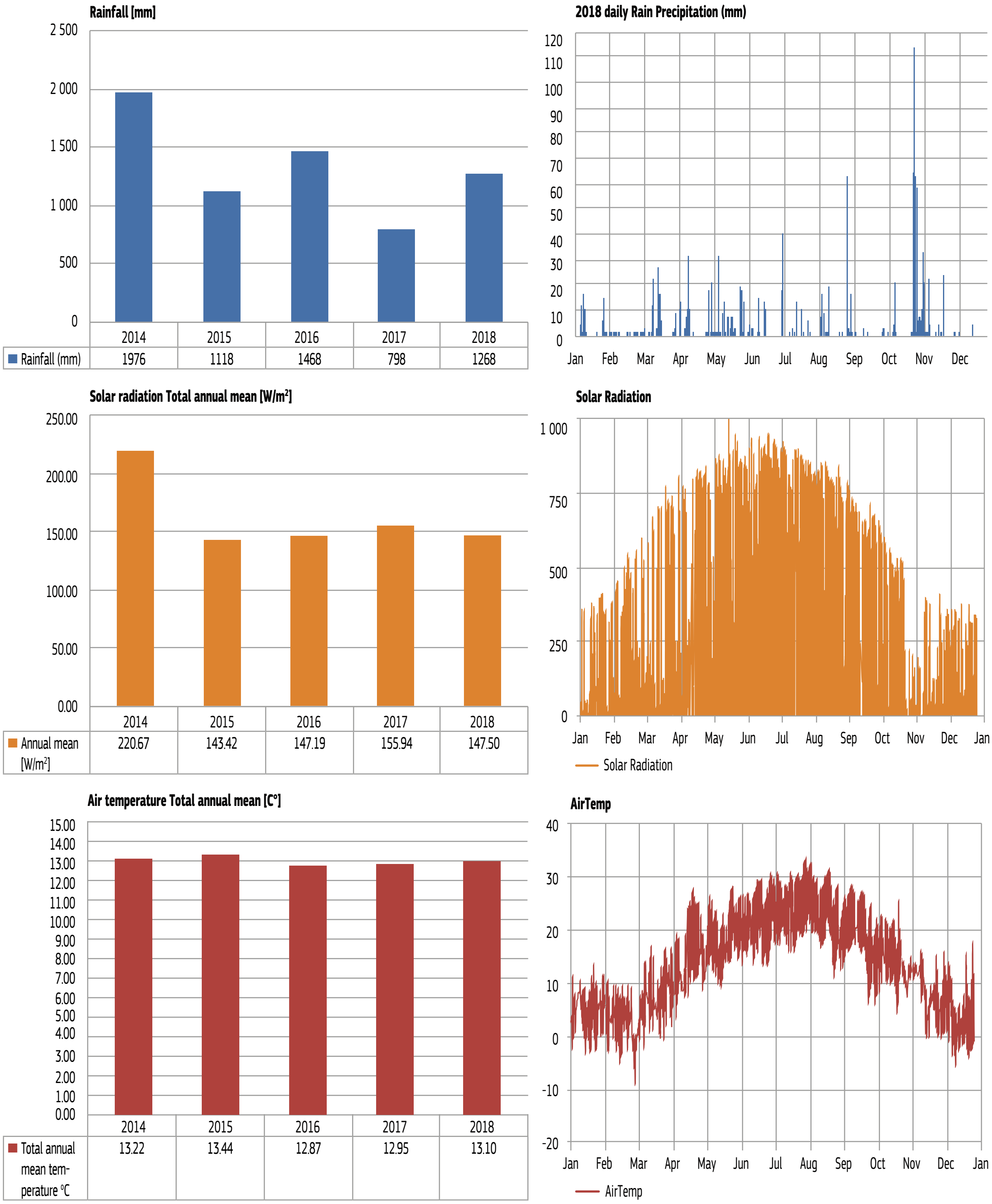


The main surface water courses that flow in the vicinity of the site are the Rio Novellino, a stream which has its source within the site and flows mainly NW bound, and the Acquanegra, Stream which flows alongside the north-eastern boundary. Both streams discharge into "Lake Maggiore".

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 1 500 mm, August and September are usually the wettest months when rainfall can exceed 150 mm in just a few days. Figure G.3 shows the annual trend of the main meteorological data[2].

[2] Source: Atmosphere – Biosphere – Climate Integrated monitoring Station:http://abc-is.jrc.ec.europa.eu/.

Figure G.3 - Main meteorological data at JRC-Ispra (rainfall, solar radiation and air temperature)



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 the higher speeds can be registered.

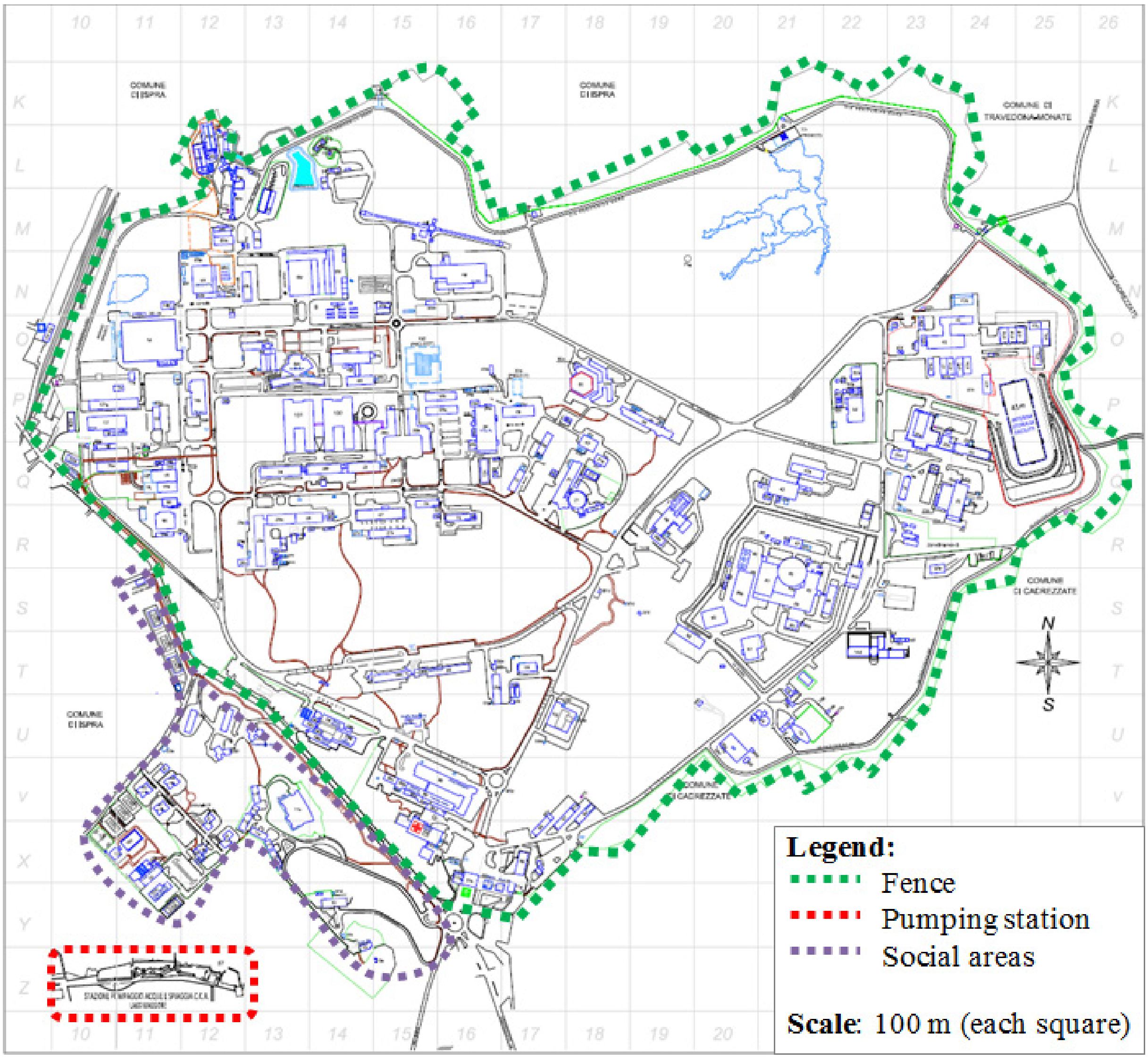
Core based activities and utility plants of the Ispra site are located inside the fence, as shown in Figure G.4. Some facilities are outside the fence, such as the water pumping station located on the Lake Maggiore shore, about 3 km from the Ispra site, and the social areas (the JRC apartments and guest quarters; about sixty flats and twenty lodgings; the Club House; childcare and sports facilities; building 51 that currently is subject to relocation of activities. All these premises are within the EMAS scope.

The following activities, even if hosted on the Ispra site, are excluded from the EMAS scope:

- the Italian Fire Brigade station;
- the *Carabinieri* offices;
- the Italian Post office;
- the travel agency;
- the bank office;
- ENEA building (a subsidiary site of the Italian National agency for new technologies, Energy and sustainable economic development).

Within the boundaries of the site there are over 400 buildings out of which approximately 140 are technical buildings (gas cylinder cabinets, transformer cabinets, etc.) and only 80 are permanently occupied by staff. There are some new buildings, but most of the structures are more than twenty years old. About 60% of the buildings are from the 1960s, 15% from the 1980s and about 20% from the 1990s. Only a few buildings have been built more recently in order to create a high density zone, in which scientific activities are concentrated. In particular, two new energy efficient buildings (buildings 100 and 101), hosting 250 staff each, and the related heat recovery pumps have notably improved the overall energy efficiency of Ispra infrastructure. This shall further improve when building 102, a Nearly Zero Energy Building (NZEB), shall be finalised and relative staff reallocation and building demolition shall be accomplished. The JRC-Ispra site map can be seen in Figure G.4.

Figure G.4 – The JRC-Ispra site map



a) 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.3 – 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
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

b) Nuclear installations

Activities for the development of a nuclear research centre in Ispra started in 1958. In 1959 the first reactor (Ispra-1) became operational. Over the years further research installations and labs were built including ESSOR ("ESSais ORgel[3]"), the second nuclear reactor; ECO ("Esperienza Critica Orgel") the third research reactor which has already been dismantled. The nuclear installations occupy about 18 hectares which are fenced and have controlled access within the JRC-Ispra site. This area is largely covered by woods and only the 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, when trees are stripped bare.

The facilities still operating are:

- ADECO – "Atelier Démantèlement Eléments Combustibles ORGEL", Laboratory for the dismantling of nuclear fuel elements ORGEL.
- Dry wells - old nuclear material and waste store.
- PERLA – Performance Laboratory.
- PUNITA - Pulsed Neutron Interrogation Test Assembly.
- SGRR – "Stazione di Gestione dei Rifiuti Radioattivi", Radioactive waste management.

Currently the long term shutdown[4] nuclear installations are:

- Ispra 1 and ESSOR nuclear research reactors.

[3] ORGanique-Eau Lourde

[4] Shutdown: an interruption of nuclear activity. Therefore it does not necessarily imply that nuclear facilities have been decommissioned.

- Cyclotron: a type of particle 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 in 2014.
- 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).

An example of complete decommissioning is the RadioCHemistry Laboratory –RCHL. This lab has been progressively shutdown in 1990s. The decommissioning programme was completed in 2010 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).

c) The Decommissioning programme

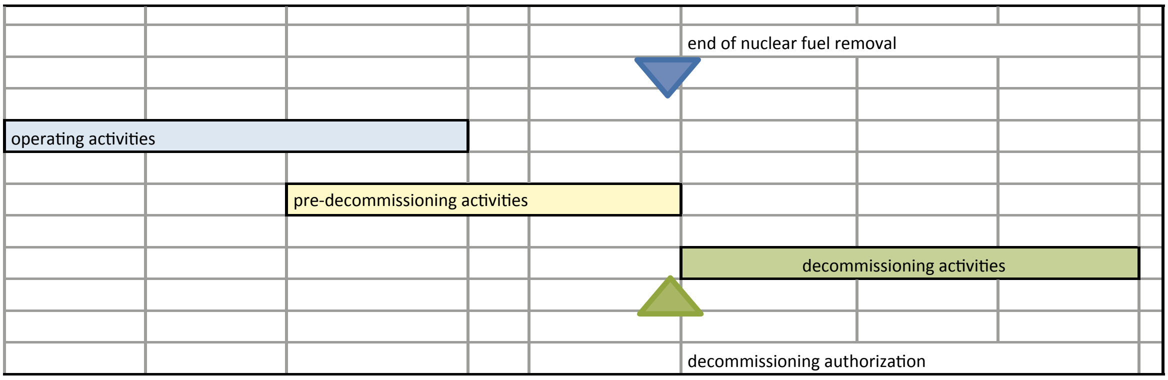
The site's nuclear plants and most of nuclear research installations are currently either undergoing or in preparation for decommissioning[5] which has the ambitious goal of restoring the site to its original condition (also called "green field" status) in most of the former nuclear areas by 2038. The programme includes the following steps:

1. removal of nuclear materials;
2. dismantling installations and removal of the radioactive waste;
3. reduction of any residual radioactivity and a final radiological survey;
4. re-establishing "green field" status having no radiological constraints.

The decommissioning programme, as well as all the nuclear activities performed on the JRC-Ispra site, are implemented under Italian legislation and inspected by the Italian nuclear safety authority (I.S.P.R.A.). The decommissioning programme, to be completed by 2038, has a budget of approximately 750 million Euro. The evaluation of the environmental impacts associated with decommissioning of nuclear plants (both power or research reactors) is subject to 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») to start the EIA process. The preliminary and voluntary EIA phase, also called Scoping, defines the steps 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[6] and Regione Lombardia a positive evaluation on the Scoping report and the guidelines for the preparation of the EIA document also called EIS (Environmental Impact Study).

[5] 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.

[6] http://www.va.minambiente.it/it-IT/Oggetti/Info/1571



Pre-decommissioning is an intermediate stage between the operating and decommissioning phases (see figure on the left).

The main objective of the Ispra site Decommissioning and Waste Management Programme[7] is to decommission the shutdown nuclear facilities and to manage the resulting waste together with the old waste.

SGRR, the Radioactive waste management facility, is the supporting facility for the characterization, treatment, conditioning and storage of radioactive waste coming from decommissioning activities. This facility is located in the designated zone known as "Area 40". SGRR plant includes:

- STEL ("Stazione Trattamento Effluenti Liquidi"), plant for low and intermediate activity lightly 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") has been built in 2013, 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.

A settlement agreement between European Commission and Italian Government has established that, since 1st January 2018, the decommissioning of Ispra-1 reactor will be the charge of the Italian Government. The radioactive waste produced by the dismantling of Ispra-1 will be managed by the JRC and temporarily stored within the JRC-Ispra site (ISF).

d) 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[8]):

- 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 Nuclear Security Training Centre (EUSECTRA);
- European Reference Laboratory for Air Pollution (ERLAP);
- European Solar Test Installation (ESTI)
- Greenhouse gas monitoring facilities;
- JRC air pollution observatory;
- Marine Optical Laboratory;

[7] For further information please refer to: http://dwm.jrc.ec.europa.eu
[8] Further details can be found on the JRC internet, currently on: https://ec.europa.eu/jrc/en/research-facilities

- Nanobiotechnology Laboratory;
- NGS-Bioinformatics infrastructure;
- Vehicle Emissions LAboratory (VELA).

e) Site Development Plan 2030 (SDP2030)

The SDP2030 is a holistic vision document 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 infra-structure to foster inspiration and sharing, while keeping the site safe and secure;
- **Efficient** – lean and modernise the site's support services.

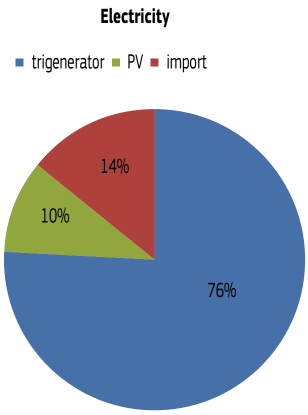
Throughout the SDP2030, one can read our vision for modern near-zero energy buildings that will host our research facilities and staff, a modern energy trigeneration plant, a fully modern grid and renewable energy forms that will reduce to the minimum our need for non-renewable energy.

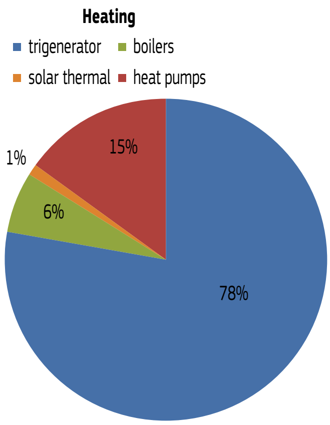
The SDP2030 describes our vision for efficient and sustainable forms of transportation inside the site, in efficient connection with the transportation offered by local authorities outside the site.

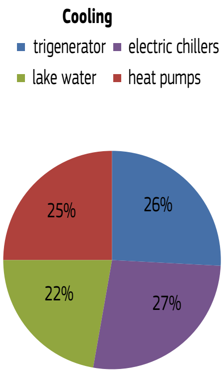
With particular regard to the energy needs, the following three scenarios for 2022, 2027 and 2030, respectively, have been established:

Scenario 2022:

- *Electricity*: photovoltaic panels (2 MW peak power), new tri-generation plant (using 15% biogas), external supply (60% green sources);
- *Heating and cooling*: as 2016, new heat pumps (centralised and in new buildings);
- First phase of *buildings renovation* plan completed and *efficiency measures* implemented (16% savings compared to 2016).





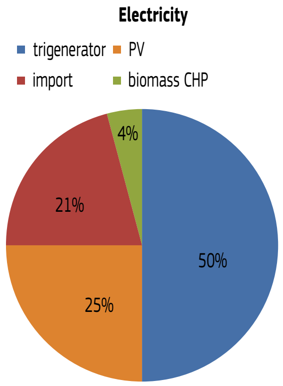


Electricity ***Heating*** ***Cooling***

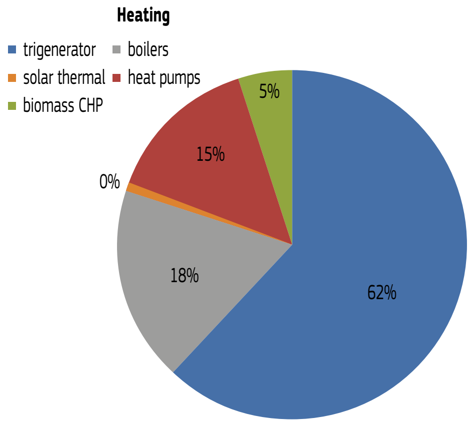
Scenario 2027:

- *Electricity*: photovoltaic panels (to get 5,5 MW peak power), new tri-generation plant (using 20% biogas), external supply (70% renewable sources);
- *Heating and cooling*: as 2016, but 20% biogas, new heat pumps (centralised and in new buildings); bio-mass tri-generation plant;

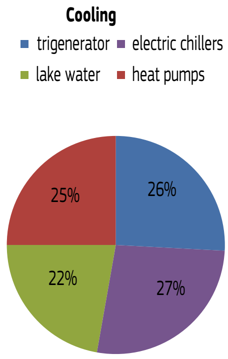
- First phase of *buildings renovation* plan completed and *efficiency measures* implemented (16% savings compared to 2016).



Electricity



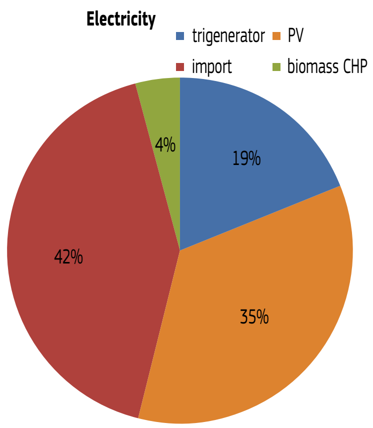
Heating



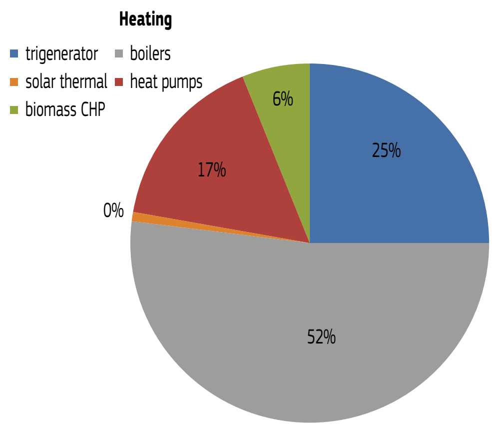
Cooling

Scenario 2030 (tri-generation plant for backup and integration):

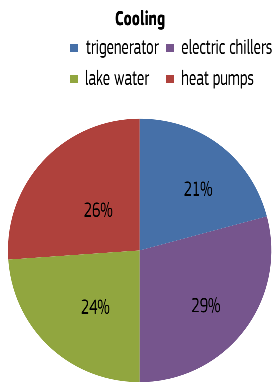
- *Electricity*: photovoltaic panels (to get 7,5 MW peak power), new tri-generation plant (using 20% biogas), external supply (80% renewable sources);
- *Heating and cooling*: boilers (20% biogas), new tri-generation plant (using 20% biogas), heat pumps, biomass cogneration plant;
- *Cooling*: electric chillers (80% green electricity), new tri-generation plant (using 20% biogas), lake water, heat pumps, biomass cogneration plant;
- Second phase of *buildings renovation* plan completed (additional savings).



Electricity



Heating



Cooling

Concerning the mobility plan inside the site, the site management is currently studying all possibilities for enhancing the use of sustainable means of movement and transportation, encouraging in particular walking, cycling, use of electrical vehicles, and introducing a shuttle bus that will be going around the site, offering lifts to visitors and colleagues at appropriate times and places.

The site management has offered service bicycles and a dedicated maintenance service. There is a plan for further development of the bicycles using technology for better exploiting their use. For example, the bicycles will be equipped with trackers that will allow us calculate the kilometers ridden and the preferred paths. This will allow the site management to understand if and where more infrastructure is needed in order to maximise safety for bicycles. In addition, the SDP2030 mentions specifically a one-way system inside the Ispra site and the subsequent allocation of one road lane to the cyclists and other environmentally-friendly commuters.

G2.2 Context – risks, and opportunities

Fully understanding the context in which an organisation operates providing a high-level understanding of the important issues and circumstances that may influence the way an organisation manages its environmental responsibilities. JRC-Ispra defined the external and internal circumstances that influence its targets by using the PESTLE (Political, Economic, Social, Technological, Legal, Environmental) and the ASCPF (Activities, Strategic direction, Culture & employees, Processes & systems, Financial) criteria, respectively.

The main risks identified in the context analysis are related to economic aspects (e.g. higher budget needs for energy provision), social aspects (alarmism due to possibly incorrect communications, such as *fake news*) and control over the processes managed by the contractors. JRC-Ispra is already implementing actions finalised to improve its environmental performance, in particular linked to the implementation of the Ispra Site Development Plan. These actions target, among many aspects, the improvement of the energy management of the site including increasing efficiency of buildings and facilities and the promotion of sustainable mobility.

The analysis of the internal context highlighted good involvement and participation of staff in promoting environmental actions and identified the opportunity to further improve staff competence and awareness through targeted training courses scheduled in 2019.

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.

The JRC-Ispra internal stakeholders include staff, mostly management as well as the Unions, whereas the JRC-Ispra external stakeholders are:

- neighbouring Municipalities (Ispra, Brebbia, Cadrezzate, Travedona Monate);
- other Municipalities;
- other Public Administration (e.g. Regione, Provincia, 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);
- EU citizens.

G3 Environmental impact of JRC-Ispra activities

This section considers the site's significant environmental aspects. An analysis of environmental aspects has been made using a specific procedure[9] under which significant environmental aspects have been identified and these are summarised in Table G.4. 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).

On top of this, JRC-Ispra updates its site Organisational Environmental Footprint (OEF) study regularly which analyses, with a scientific and recognised method[10], the impact of all direct and indirect activities. The OEF results help to identify the JRC-Ispra site's environment priorities and act as a decision support tool for management.

Table G.4 also shows the indicators that are most pertinent to the significant environmental aspects, along with actions that have been defined and validated by the European Commission EMAS Steering Committee, and which are referenced in the following sections.

The Commission services in Ispra undertook a full update of the environmental aspects in 2018, the results of which are summarised in the table below.

Table G.4 – Summary of significant environmental aspects at JRC-Ispra

Aspect group	**Environmental aspect**	**Environmental impact**	**Activity, product or service**	**Indicator**
1) Resources	Electricity (Indirect) & fossil fuel consumption	Reduction in natural resources	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
	Use of chemicals and consumables, including paper		For office activities, printing, training and communication requirements	(1e) Office paper consumption (1f) Offset paper consumption
	Water consumption		For catering, sanitary and technical installations	(1d) Water usage in EMAS perimeter

9 P01, "Identification and evaluation of environmental aspects", Environmental Management system

10 The OEF is based upon the Commission Recommendation 2013/179/EU of 9 April 2013 – Annex III "Organisation Environmental Footprint (OEF) Guide"

Aspect group	Environmental aspect	Environmental impact	Activity, product or service	Indicator
2) Air	CO_2, NO_x, CO emissions	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, NO_x)
	HCFC gas emissions	Depletion of the ozone layer	Used in refrigerators and cooling systems	(2b) Refrigerant gases
	Radioactive atmospheric release[11]	Air pollution	Generated by nuclear controlled areas	Gaseous radioactive effluents
2) Local aspects	Dust and noise	Noise and air pollution	Generated by building renovation/ repairs, staff travel and Commission car fleet	Indicator 2c / mobility plan
3) Waste	Hazardous and non-hazardous waste production	Air, water and/ or soil pollution, biodiversity risks	Medical laboratories, sanitary installations, cleaning, maintenance, office activities, IT and catering, non-nuclear scientific laboratories	(3a) Total non-hazardous waste (3b) Total hazardous waste (3c) Percentage of waste sorted
	Nuclear waste[12]	Pollution	Generated by nuclear controlled areas	Quantity of waste
3) Water	Wastewater discharge from wastewater treatment plant Soil and groundwater contamination	Risk of eutrophication, water and soil pollution	Sanitary and technical installations, wastewater treatment plant, scientific laboratories, site management and infrastructure, nuclear controlled areas	3d) Wastewater discharge
	Radioactive release in wastewater [13]	Water and soil pollution	Generated by nuclear controlled areas	Liquid radioactive effluents
4) Bio-diversity	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)	4a) Built surface area
5) (indirect) public procurement	Environmental performance of contractors. Sustainability and impact of products and services selected[14].	Environmental impact caused by third parties	Integration of environmental clauses in contracts: influence of contract through 'sustainable' purchases Life cycle approach.	5a) Contracts >60k with «eco» criteria 5b) Green products in office catalogue
5) (indirect) financing	Indirect environmental aspects linked to programmes to be financed[15]	Environmental impact caused by third parties	Taking the environment into account in project selection and evaluation	5a) Contracts >60k with «eco» criteria 5b) Green products in office catalogue

11 The radioactive release in the environment (air and water) is authorised and monitored by the Italian authority (Italian Supervisory Authority) to whom JRC-Ispra sends annually a detailed report.

12 It should be noted that nuclear waste is currently not disposed as preparatory work is on-going.

13 See previous note.

14 For example: transport, use of natural resources, the lifecycle of the product, recycling, waste management, etc.

15 These may include damage to local biodiversity and natural resources and emissions from construction/development projects, etc.

Aspect group	Environmental aspect	Environmental impact	Activity, product or service	Indicator
6) Environmental risks (legal compliance and emergency preparedness)	Load losses, malfunctions, leakages, spills of chemicals, gas, waste, etc.	Air, water and/ or soil pollution, health risks	In the context of delivery, storage and use of chemicals/fuel used for maintenance of the technical installations, waste management, storage and fire prevention	Emergency planning, legal compliance: 6a) EMAS registered buildings

The analysis of significant environmental aspects identified risks, opportunities and actions to be implemented. The main risks identified were:

- increasing cost of energy purchase;
- lack of respect for JRC-Ispra Environmental Policy;
- increasing cost of waste management;
- possible damage to JRC-Ispra reputation.

The main opportunities are:

- renovation of building's energy consumption installations;
- reduction of costs for waste management;
- reduction of costs for procurement of goods, by implementing full circular economy principles.

The main actions considered to manage risks and opportunities are:

- implementation of the Ispra Site Development Plan;
- increase communication to staff of energy saving behaviours;
- promote waste reduction activities;
- improve waste separation on site.

G4 More efficient use of natural resources

G4.1 Energy consumption

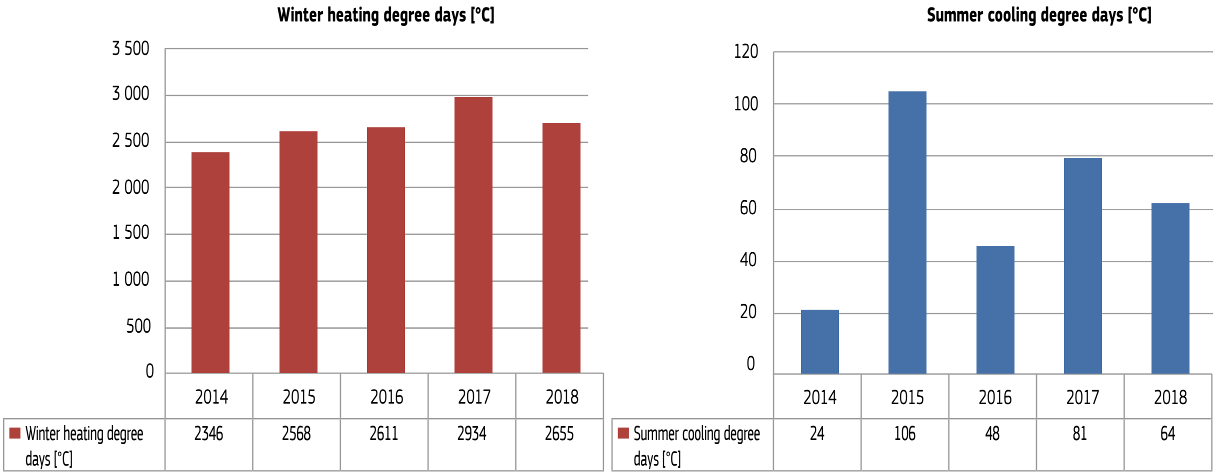
Buildings energy consumption data should be considered in the context of climatic conditions. Analysis of degree data[16] presented below suggests that:

- during the 2018 winter period climatic conditions have been milder than in 2017 and therefore less heating was needed to satisfy the site's winter heat demand (-1.5% natural gas used than 2017);
- during the 2018 summer period climatic conditions have been less warm than in 2017.

[16] 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.

Figure G.5 – Annual winter heating degree days and summer cooling degree days at Ispra, 2014-2018



a) Buildings [17]

Electrical energy consumed by the JRC-Ispra site is provided mostly by the internal tri-generation natural gas plant and, and complemented by:

- electric energy purchased from the grid (this is an important backup power supply for the Ispra site, in case of a reduction of energy production of the site tri-generation plant);
- on site photovoltaic (PV) plants producing a relatively small amount of renewable electric energy which, in terms of peak value, is constantly increasing.

The tri-generation plant has been in permanent operation since September 2004. It is connected to a thermal and cooling pumping station and related networks for heating and air conditioning for most of the buildings. 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 either provided 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.

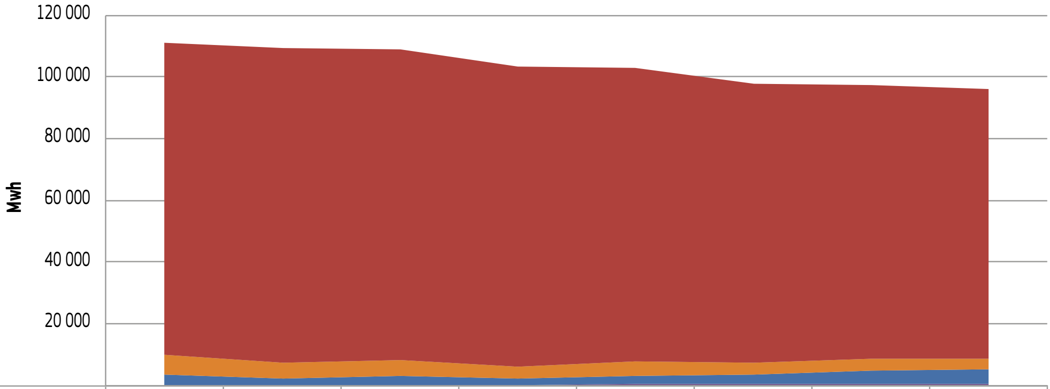
The canteens and the Club House of the site are supplied with methane gas directly from the distribution network for cooking purposes, as are the sports centres and the residencial areas located outside the fence.

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 (the latter is used for building heating and cooling).

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.

[17] For *energy consumption of JRC-Ispra building* we consider the total energy consumption of plants, installations, buildings, facilities, laboratories and, generally speaking, all energy consumption devices excluding only the JRC-Ispra vehicle's fleet.

Figure G.6 – Annual buildings energy consumption (MWh) (core indicator 1a)



	2011	2012	2013	2014	2015	2016	2017	2018
Total energy consumption (Mwh) purchased or produced on site	111 076	109 507	108 983	103 555	103 142	97 809	97 595	96 333
mains supplied gas	101 028	101 954	100 544	97 609	95 413	90 333	89 145	87 558
cooling energy form heat exhange with lake water	6 480	5 140	5 140	3 610	4 800	3 900	3 717	3 636
electricity puchased from the grid	3 502	2 328	3 236	2 232	2 493	3 033	4 052	4 504
electricity generated on site from PV	13.2	14.7	17.0	52.2	391	431	594	544
diesel and petrol for laboratories and facilities	52.8	70.1	45.3	51.8	44.3	102.1	78.4	91.3
heat energy from thermal solar panels	0.0	0.0	0.0	0.0	0.0	10.9	8.1	0.0

Figure G.6 shows the regular decrease of global site energy consumption since 2011 thanks to several energy efficiency improvement actions concluded in the last years; these effects will also be seen in the years to come. The main actions which are on-going are listed hereunder:

a) to implement a remote monitoring system for the site generated renewable electricity produced from photovoltaic panels. The system will be fully operational by the end of 2019 (ref. 2017/210);

b) to apply the BREEAM environmental standards to the project and construction of selected JRC building. In 2018:

   a. building 102 has obtained the intermediate "excellent" certification level;

   b. the call for tender for the new canteen was launched requesting the BREEAM certification, level "Excellent";

   c. the final BREEAM certificate for building 27b was "excellent" level (the original objective was "good" level). This is the first BREEAM building rated "excellent" in Italy (ref. 2017/100);

c) to implement the building's demolition plan which foresees the progressive removal of the old non performing buildings (ref. 2017/200). 3 buildings were demolished in 2018;

d) continuing the substitution of old lamps in buildings, streets and in technical tunnels (about 86 LED installed in 2018). Where possible, LED lighting systems were coupled with presence sensors for automatic light switch on (ref. 2017/104);

e) continuing the installation of automation devices regulating building's heating and cooling on the basis of the effective needs (ref. 2017/102 and 2017/105). In 2018 new operational logic systems for energy saving on air conditioning systems and for electrical energy saving were installed in buildings. 4, 24,44, 46CAS, 58 as well as in all new buildings and refurbishments. Furthermore, smart lighting systems were installed in building 46i and building 58;

f) continuing the implementation of an automatic energy management system to monitor energy consumption of single buildings (ref. 2017/209). This currently allows monitoring end-user buildings/facilities energy consumption (see Figure G. 7):

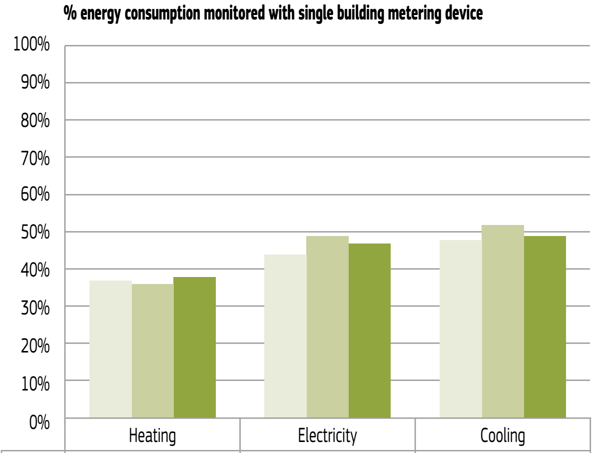
   a. 38% of global site heat consumption (corresponding to 63 monitoring points[18]);

   b. 47% of global site electric energy consumption (corresponding to 83 monitoring points);

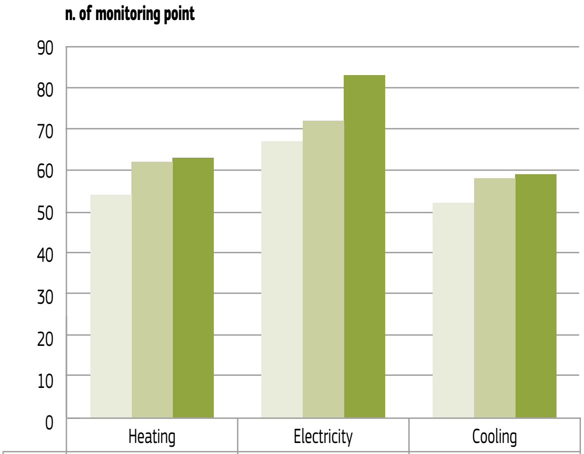
   c. 49% of site global cooling energy consumption (corresponding to 59 monitoring points).

[18] For technical reasons, monitoring points at end user do not always correspond to readings of single buildings.

Figure G.7 – Monitoring of energy consumption progress



	Heating	Electricity	Cooling
2016	37%	44%	48%
2017	36%	49%	52%
2018	38%	47%	49%



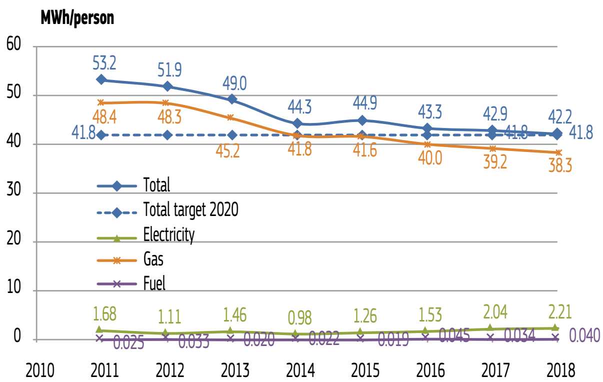
	Heating	Electricity	Cooling
2016	54	67	52
2017	62	72	58
2018	63	83	59

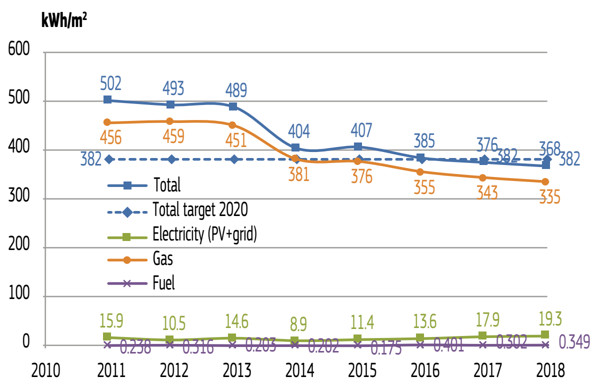
To be noted that the 11 new monitoring points for electrical energy does not include new buildings and therefore replies to the need of having more detailed and split information on the monitored buildings.

On top of the above mentioned actions, in 2018 care was also dedicated to the nuclear area where several actions have been carried out to improve the efficiency of the most significant HVAC plants and to reduce electrical energy consumption.

This proactive approach to energy management permitted JRC-Ispra to achieve, in advance, its 2020 energy efficiency targets in terms of per square metre total annual energy consumption (Figure G.8 - Evolution of total annual energy consumption for buildings).

Figure G.8 - Evolution of total annual energy consumption for buildings[19]





The consumption of natural gas of the tri-generation plant slightly decreased in 2018 (-1.5% compared to 2017[20]) on account of both the weather trend (see Figure G.3) and the improvement of energy efficiency of buildings.

Table G.5 - Evolution of electric energy consumption breakdown for buildings

	2011	2012	2013	2014	2015	2016	2017	2018
Total electric energy consumption [MWh]	32 886	32 131	32 576	31 394	31 013	30 316	29 935	30 549
Share of electricity from tri-generation plant[MWh]	29 371	29 788	29 323	29 110	28 128	26 852	25 288	25 501
Share of electricity purchased from the grid [MWh]	3 502	2 328	3 236	2 232	2 493	3 033	4 052	4 504
Share of electricity generated from PV [MWh]	13	15	17	52	391	431	594	544

19 To be noted that cold energy from heat exchange with lake water has not been accounted for within figures G.8 and G.9 as it is included in the total annual energy consumption (continuous blue line).

20 Referring to the total annual consumption of natural gas measured in m3 under Standard conditions (1 atm and 288.15 Kelvin degrees).

Table G.5 shows the breakdown of electric energy consumption. There is a slightly higher electrical energy demand (+2.0% respect to 2017, i.e. +601 MWh) which is mainly accounted by a slightly higher purchase of electricity from the grid (+439 MWh) and a slight increase in energy production by the tri-generation plant (+213 MWh).

The production of electricity from photovoltaic plants installed on the site has reduced by 8.4% due to lower measured solar irradiation in 2018 as compared with 2017 (see Figure G.3). In 2018 the PV plant of building 46i has been installed and, consequently, 14.1 kWp have been added.

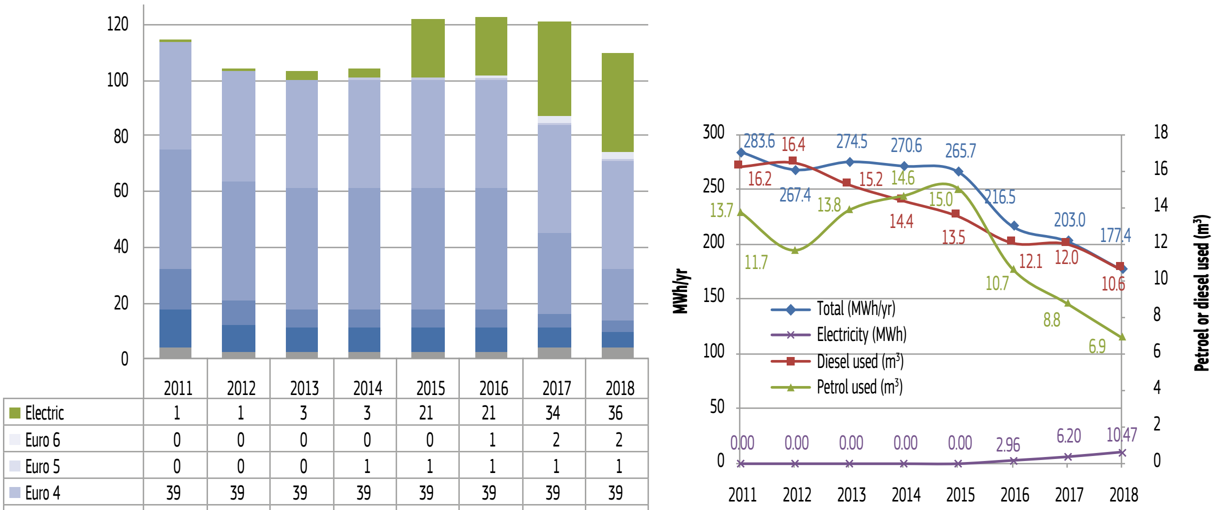
Specific initiatives have been planned and delivered yearly, such as participation in the yearly "M'illumino di meno" campaign (see Chapter G10.1 Internal communication).

The **2018 target** is to keep a constant positive trend of total energy savings and start the implementation of Ispra Goes Smart project, in particular by implementing the Ispra Site Development Plan.

b) Vehicles

JRC-Ispra service vehicles has a fleet of 110 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 section *a)*).

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
Electric	1	1	3	3	21	21	34	36
Euro 6	0	0	0	0	0	1	2	2
Euro 5	0	0	0	1	1	1	1	1
Euro 4	39	39	39	39	39	39	39	39
Euro 3	43	43	43	43	43	43	29	18
Euro 2	14	9	7	7	7	7	5	4
Euro 1	14	10	9	9	9	9	7	6
Euro 0	4	2	2	2	2	2	4	4

The left-hand-side graph Figure G.9 shows the breakdown of the vehicle fleet by Euro standard. The standard is imposed on manufacturers of engines of vehicles sold in the EU, with each successive standard being more stringent than the previous one, particularly with respect to emissions. The number of site vehicles has fallen under a policy of reduction and rationalisation put in place in 2009. Older, less efficient and more polluting vehicles with Euro 0[21] and Euro 1 engines are still required for some special purposes such as towing mobile laboratories and firefighting. However, they are seldomly used and their impact is therefore limited. As the number of electric vehicles (EVs) progressively increases to populate the JRC-Ispra vehicle fleet, the number of petrol/diesel-powered vehicles has been/will be proportionally dismissed. Overall, the fleet has increased its efficiency for the following reasons:

- the vehicles with engines classified at least as Euro 4 (including EVs) increased from 62.8% of the total in 2017 to 70.9% in 2018 thanks to the dismission of 13 vehicules Euro 3 or lower last year and to the purchase of 2 futher EV, summing up to 36 EV (20 cars and 16 vans);
- the overall number of the fleet has been reduced.

[21] We refer to Euro 0 standard for conventional purposes, referring to vehicles either of standard prior to Euro 1 or non classified vehicles, such as escavators or operating machinery. The latter have been acquired in 2017.

The right-hand-side graph also shows the volumes of petrol and diesel used for the internal fleet and the corresponding total energy[22]. The total energy has reduced by 12.6% since 2017 contributing to a total reduction of about 37.5% from 2011 to 2018.

To put the above figures in context, it should be noted that the total annual vehicle energy consumption represents only 0.18 % of that for buildings.

12 recharging points have been progressively activated as of April 2016 for internal EVs (2 of which were installed in 2018). The relative monitoring systems allow us to monitor the EV's electrical consumption (10.5 MWh in 2018 with a 30.6% increase since 2017) and their indirect upstream CO_2 emissions. The monitoring also helped us understand that some recharges were unaccounted for due to the fact that ordinary schuko-sockets were being used. A corrective action was put in place, providing appropriate communication to interested staff and applying stickers to remind staff about the internal recharge policy. This action is on-going and shall be further monitored to ensure that only reliable data is collected.

In an effort to promote sustainable mobility, JRC-Ispra has put in place a fully operational service bicycle policy which is now fully operational and comprises of a dedicated service which manages 137 service bicycles (of which 21 are electric), a service bicycle repair shop and many dedicated bicycle fostering events (see Chapter G10.1 Internal communication). 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 on-going: bicycle locks have been removed from all non-electric service bicycles.

The actions contained in the Commission's 2019 Global Annual Action Plan for vehicles addressing the energy saving targets are summarised below.

Initial year / ref.#	**Action Description**	**Action Type**	**2019 objective** **2018 results**
2015 / 132	Multi annual renovation of the fleet with additional electric and hybrid vehicles	Multi-stage	2019 objectives: a new call for tender will be launched to buy further 9 EVs. 5 EVs to be put into service. 2018 results: 5 EVs have been bought. 7 EVs purchased in 2017 were put into service. Comment: 2018 results are beyond the 2018 objectives.
2014 / 128	Fully implement «Policy on JRC-Ispra Service Bicycles»: operative repair shop, inventory of service bicycles, common identification plates.	Single	2018 results: all actions addressing service bicycles have been finalised and communicated to staff.
<2014 / 129	Install charging stations for electrical vehicles	Multi-stage	2019 objective: 2 public (open to staff) charging station to be installed outside the JRC-Ispra fence.
2017 / 302	Implementing a site plan for sustainable mobility	Multi-stage	Continuing implementation of the JRC-Ispra mobility action plan. Revision of JRC-Ispra mobility plan.

c) Renewable energy use in buildings and vehicles

The JRC-Ispra tri-generation plant is being fueled 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.

The installations which can produce energy (heat, cold or electric) from renewable sources within the site are:

- The cooling systems which use lake water. This historical heritage concerns specifically INE buildings. For specific and limited technical needs other JRC buildings also use this;
- Water – water heat pumps in a specific building to cover the 60% of thermal needs;
- PV panel systems installed, with a global PV peak capacity of 530.3 kWhp, at the end of 2018 (+2.8% in comparison to 2017);

[22] More precisely, it includes external refueling for service cars during missions, but not fuel consumption for VELA laboratories' activities, "operating machinery", lifter, generator and other little machinery.

- a small geothermal heat pump for the heating and cooling of 4 residences. This first small plant is foreseen to be followed by more significant geothermal plants which will be built on-site from 2020 and then monitored in time.

Table G.6 – Renewable and non-renewable energy use in the buildings[23]

Energy source	2011	2012	2013	2014	2015	2016	2017	2018
i) Total electricty from renewables - purchased from the grid (MWh)	1 177	1 059	1 199	976	983	698	1 208	2 057
ii) Total electricity from renewables (%)	33.6	45.5	37.1	43.7	39.4	23.0	29.8	45.7
iii) Total electricty from non renewables (MWh)	2 325	1 269	2 037	1 257	1 510	2 335	2 844	2 447
iv) Total electricity from non renewables (%)	66.4	54.5	62.9	56.3	60.6	77.0	70.2	54.3
v) mains supplied gas (% non renewables)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
vi) mains supplied gas (MWh non- renewable)	101 028	101 954	100 544	97 609	95 413	90 333	89 145	87 558
vii) site generated renewables (PV) (% renewable)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
viii) site generated renewables (PV, MWH renewable)	13.2	14.7	17.0	52.2	391.4	430.9	594.1	543.9
ix) site generated renewables - lake water heat exchange, (MWh)	6 480	5 140	5 140	3 610	4 800	3 900	3 717	3 636
x) site generated renewables - Solar panel, (MWh)	0.0	0.0	0.0	0.0	0.0	10.9	8.1	0.0
Total renewables (MWh)	**7 670**	**6 214**	**6 356**	**4 638**	**6 175**	**5 040**	**5 527**	**6 237**
Total renewables (%)	**6.9**	**5.7**	**5.8**	**4.5**	**6.0**	**5.2**	**5.7**	**6.5**
Total non renewables, (MWhr)	**103 406**	**103 293**	**102 626**	**98 917**	**96 967**	**92 770**	**92 068**	**90 096**
Total non renewbles (%)	**93.1**	**94.3**	**94.2**	**95.5**	**94.0**	**94.8**	**94.3**	**93.5**

The 2018 increase in the total renewable energy consumption compared to 2017 is due to a major share of green energy supplied by AGSM Energia: from October 2018, 100% of their energy comes from renewables sources only.

There is no longer any production of solar thermal energy due to the panels of both buildings 100 and 101 being broken, and in building 100 they were replaced with PV panels. In 2018 the total energy from renewable sources coming from the grid was 55.1%[24].

JRC-Ispra will further increase its renewable site energy consumption in the next few years by:

- installing other PV systems of more than 1000 kWp (370kWp by the end of 2019);
- installing heat pumps (geothermal,lake water, ground water sources).

[23] For the 2018 values the limitations to the energy mix indicated in footnote 24 are to be considered.

[24] This was calculated taking into account the site's energy suppliers. ENEL, for the first 9 months of 2018 and AGSM Energia, for the last 3 months of 2018 are the main suppliers and feed most of the JRC-Ispra site, except for the residential and social areas. This computation can only be made when the suppliers provide their energy mix, i.e. usually in June of the following year. Before that date, the previous year's energy mix is used.

G4.2 Water consumption

The JRC water supply is obtained from a pumping station which is located on the shore of Lake Maggiore about two kilometres from the Ispra site, but still part of the JRC-Ispra EMAS scope. It delivers water through three steel pipes to a treatment station within the Ispra site boundary. The water is initially treated with chlorine dioxide to eliminate microorganisms and then passes through a series of sand filters. The pre-treated drinking water then undergoes a second disinfectant phase with chlorine dioxide in order to ensure treated water can reach the distribution network. From the filtering station, the water distribution network branches into three different lines which run for about 74 km underground within the centre and comprises of:

a) a low pressure drinking water circuit: mostly for staff use (canteen, toilets, etc.);

b) a high pressure drinking water circuit;

c) a cooling water circuit for technical purposes: this supplies many utilities, such as building's cooling plants, all fire extinguishing circuits, the evaporative towers serving the tri-generation plant. Two different networks are used for:

i) a closed circuit supplied by the tri-generation plant;

ii) an open circuit supplied directly by the water pumped from the lake. This is then discharged into the sewage system and received mainly in the site wastewater treatment plant and partially in the sewerage system that collects rain water and discharges it outside the site into the Acquanegra Stream.

During the last few years most of the site's buildings have been connected to the closed cooling circuit, reducing the need for lake water uptake. Currently, the main buildings that are still cooled with lake water in an open circuit are those in INE (with a peak flow during the summertime approaching 100 m^3/h).

When INE and other laboratories were built, the lake was an obvious source of water for HVAC cooling. As a significant amount of the site's energy and cooling water consumption is dedicated to ensuring nuclear safety (including maintaining nuclear plant and existing radioactive waste within confinement systems, safety devices, and systematic controls, along with monitoring of the site and the surrounding environment), further reductions in water consumption will be challenging.

In 2006, JRC-Ispra signed an agreement to supply water, upon request, to the Brebbia Municipality, especially during summer months and for emergency purposes (fire extinguishing). The total amount of water distributed to the Municipality was insignificant in relation to the site's hydrological balance and typically less than 1400 m^3/year. Lombardy Regional Decree n. 9082 was signed on 15th October 2012 regulating the abstraction of water from Lake Maggiore.

Figure G.10 – Evolution of total annual water consumption (indicator 1d)

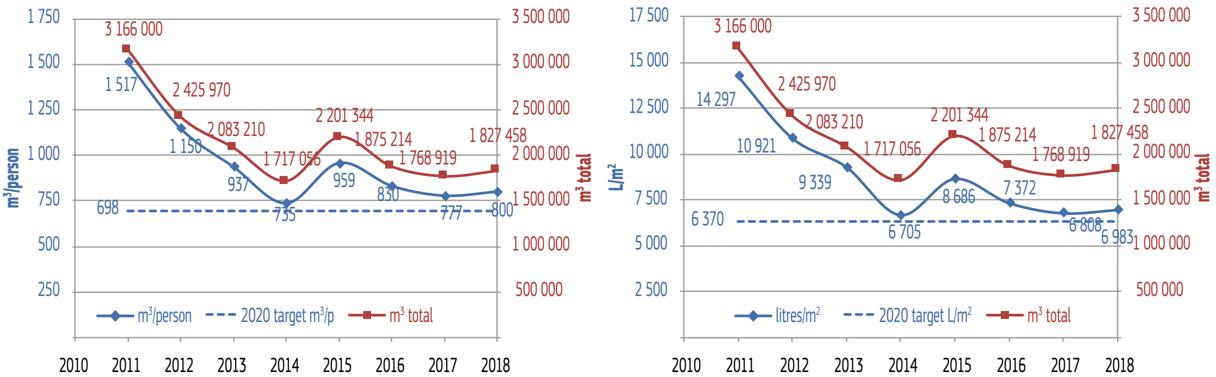
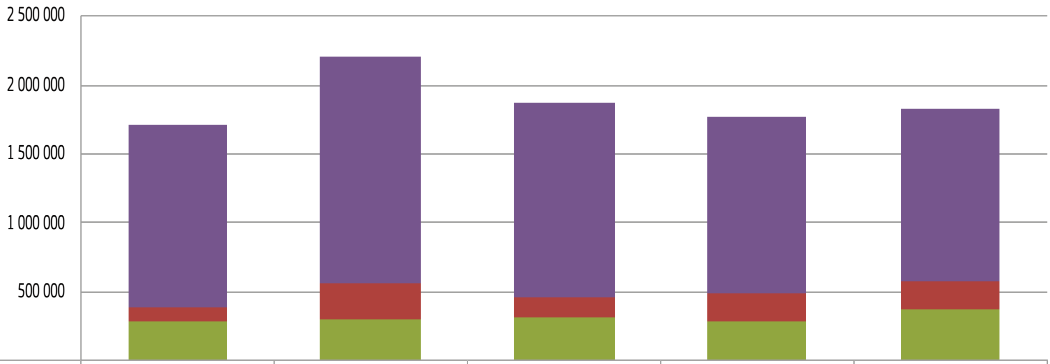


Figure G.11 – Water consumption (m³) breakdown for different uses in 2014 - 2018



	2014	2015	2016	2017	2018
Total site water consumption (m³)	1 717 056	2 201 344	1 875 214	1 768 919	1 827 458
Share of cooling water consumed by JRC (m³)	1 326 586	1 641 749	1 407 017	1 280 615	1 255 665
Share of cooling water consumed by INE (m³)	97 604	263 757	159 120	206 122	198 601
Total site drinking water consumption (m³)	292 866	295 838	309 077	282 182	373 192

Figure G.10 shows how water consumption has evolved since 2011 to 2018, with an overall reduction of about 42% in this time frame. This notable result was accomplished by implementing the following actions aiming at reducing water consumption and losses in the distribution system:

- In 2018 some pipes broke, accounting for a 32.3% increase in drinking water with respect to 2017. These were duly repaired in November 2018;
- a regulation system was installed at the pumping station in 2013, allowing for automatic regulation of the lake water pumps' function and avoiding water overflows from site water reservoirs: the potential benefits of this were seen in 2014, the only year when this was running most of the time as there were no extraordinary events hindering its correct use;
- the connection of buildings to the closed cooling circuit continued and is in progress;
- at the end of 2015 an INE water cooling battery was replaced resulting in a reduction of water consumption amounting to approximately 40% between June and September (from 263,757 m³ in 2015 and to 159,120 m³ in 2016); as can be seen in Figure G.11. Increase of water consumption in 2017 and 2018 is due to the use of water for a longer period of time, respectively 109 and 112 days (whereas in 2014, 2015 and 2016 the water cooling was used for 77, 96 and 87 days, respectively);
- the installations of new water consumption metering devices dedicated to the canteens and to the Social Areas (monitoring started in October 2017). In 2018, 44808 m³ of drinking water were supplied to external areas.

The 2018 summer temperatures were lower than those of 2017 (see Figure G.5); the fact that there was only a small decrease in the share of water used by JRC for cooling purposes is explained on account of the fact that some technical plants were converted to producing cooling energy.

The lake water, following the tri-generation processing, is to be considered as a renewable source of energy. An analysis is on-going to understand whether it is best to use more lake water, as the latter is taken and returned without affecting significantly its quantity and quality, or to use more energy, implying increasing relative emissions of pollutants and CO_2 into the atmosphere. These aspects are also considered within the Ispra Site Development Plan project.

G4.3 Office and offset paper

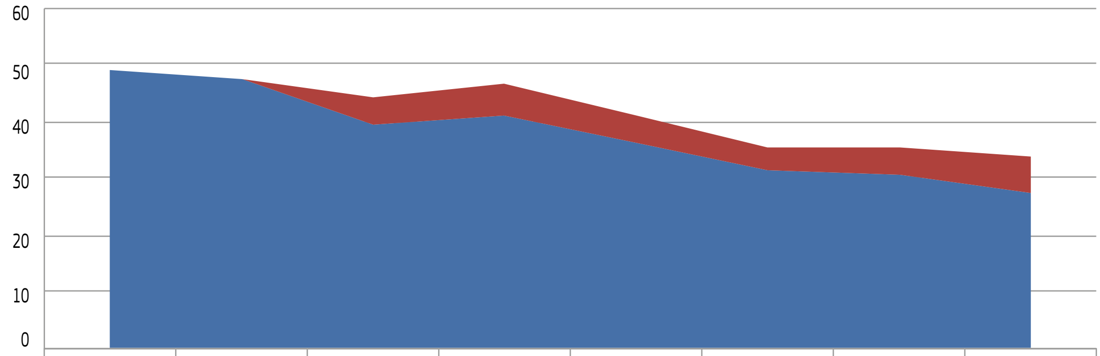
While *Office paper* is paper used for everyday printing in offices, *offset paper*[25] is the paper used by the internal print shop for the production of reports, leaflets, etc. and also for printing specific items such as leaflets, for the European School in Varese, as well as other JRC sites. An environmentally friendly printing policy limits single

[25] JRC-Ispra's offset paper consumption was measured separately from office paper consumption from 2013 onwards. Previously it was included within the office paper figures

orders to the internal print shop to a maximum of 200 copies: possible further limitations are under study for 2019.

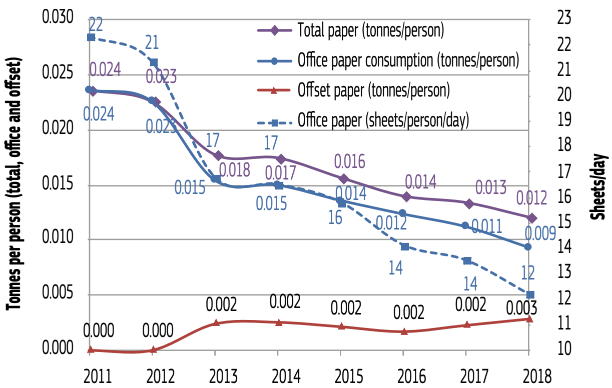
The evolution of office and offset paper at JRC-Ispra and per capita breakdown is presented below:

Figure G.12 – Evolution of paper consumption at JRC-Ispra (totals)



	2011	2012	2013	2014	2015	2016	2017	2018
Office (A4 sheet equivalent)x1 000 000	9.85	9.52	7.89	8.16	7.67	6.74	6.51	5.89
Total paper consumption (tonnes)	49.16	47.49	44.59	46.53	40.72	35.30	35.52	33.92
Offset paper (tonnes)	0.00	0.00	5.21	5.82	4.82	3.76	5.06	6.37
Office paper (tonnes)	49.16	47.49	39.37	40.71	35.90	31.54	30.46	27.55

Figure G.13 – Evolution of paper consumption at JRC-Ispra (tonnes/person and sheets/person/day) (core indicator 1e)



Total paper consumption has decreased by 31% since 2011, mainly due to increasing use of e-signature workflows, including for procurement purposes. New printers allowing secure print via enabled badges were installed on site in 2018. For 2019 it is foreseen to introduce the use of 70 g/m^2 paper, to reduce the weight of consumed paper. In terms of number of sheets per person per day, there has also been a considerable reduction between 2011 and 2018 as there has been a drop from 22 to 12, respectively.

This very positive performance exceeds JRC-Ispra's initial core indicator target set at a 9% reduction of paper consumption between 2014-2020. Following the 2018 mid-term review for core indicators, JRC-Ispra raised this target to a conservative 20% value.

G5 Reducing carbon footprint and air emissions

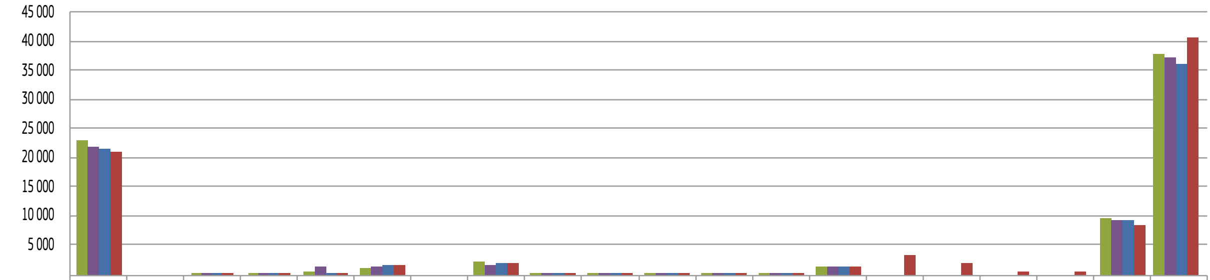
G5.1 Carbon footprint

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.

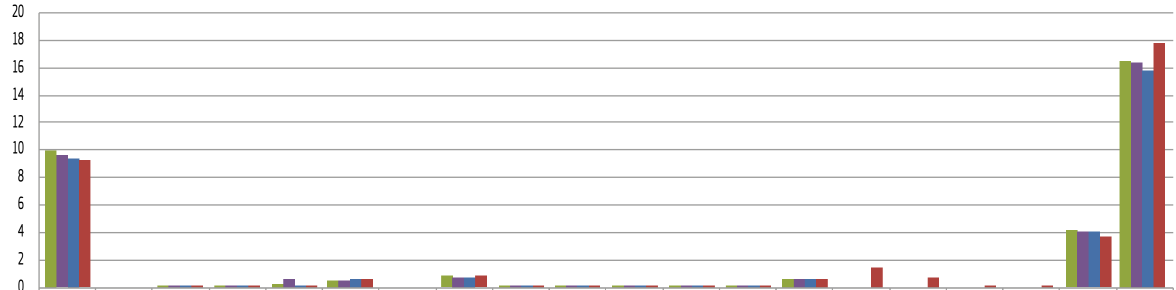
- **Scope 2** emissions: CO_2 eq emissions that are generated indirectly, particularly by consuming electricity on-site.
- **Scope 3** emissions: CO_2 eq emissions that are a consequence of the activities of the organisation but occur from sources not controlled by JRC-Ispra itself, including emissions associated with business travel and commuting to work (private car, motorcycle, public transport). The supply chains of all emissions are also calculated: e.g. Fixed Asset Buildings, Fixed assets-IT, Service and supply contracts, Own Waste (calculated for the first time in 2018) and "Other upstream emissions" including, i.a., electricity supply from photovoltaic installations.

Figure G.14 – Carbon footprint emissions (Tonnes CO_2)



	Scope 1; Fuel for bldgs: mains gas	Scope 1; Fuel for bldgs: tanked gas	Scope 1; Fuel for bldgs: diesel/ petrol	Scope 1; Commission vehicle fleet	Scope 1; Refrigerant leaks	Scope 2; External electricity supply	Scope 2; District heating	Scope 3 - Business travel: air	Scope 3; Business travel: rail	Scope 3; Business travel: hire car	Scope 3; Business travel: private car	Scope 3; Business travel: JRC navette	Scope 3; Commuting: JRC bus service	Scope 3; Commuting: Other home work-trips	Scope 3; Fixed assets-buildings	Scope 3; Fixed assets-IT	Scope 3; Service and supply contracts	Scope 3; Own waste	Scope 3; Other upstream emissions	Sum -Total carbon footprint
2015	22 997	0	14	87	513	993	0	2 046	28	13	135	236	115	1 274					9 480	37 932
2016	21 771	0	33	70	1 410	1 157	0	1 683	23	11	111	233	115	1 294					9 217	37 129
2017	21 504	0	25	65	161	1 500	0	1 723	23	11	114	238	115	1 305					9 209	35 994
2018	21 133	0	30	55	10	1 432	0	1 847	25	12	121	244	112	1 312	3 260	1 745	400	405	8 551	40 695

Figure G.15 – Carbon footprint elements (Tonnes CO_2/person)



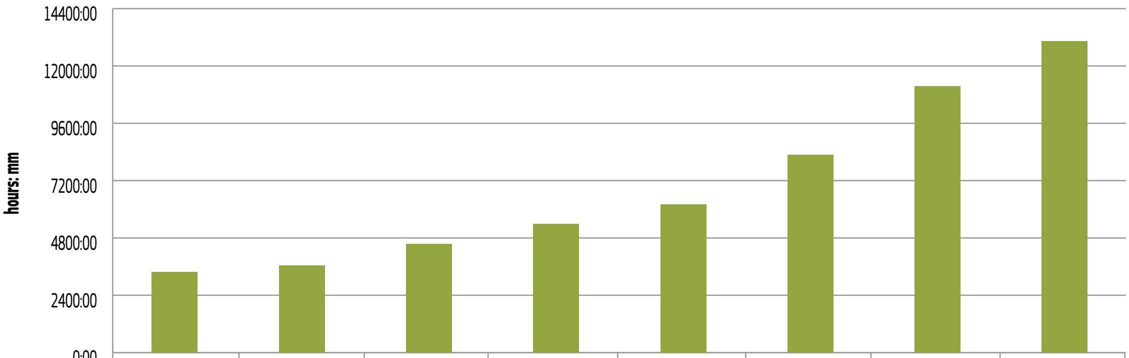
	Scope 1; Fuel for bldgs: mains gas	Scope 1; Fuel for bldgs: tanked gas	Scope 1; Fuel for bldgs: diesel/ petrol	Scope 1; Commission vehicle fleet	Scope 1; Refrigerant leaks	Scope 2; External electricity supply	Scope 2; District heating	Scope 3; Business travel: air	Scope 3; Business travel: rail	Scope 3; Business travel: hire car	Scope 3; Business travel: private car	Scope 3; Business travel: JRC navette	Scope 3; Commuting: JRC bus service	Scope 3; Commuting: Other home work-trips	Scope 3; Fixed assets-buildings	Scope 3; Fixed assets-IT	Scope 3; Service and supply contracts	Scope 3; Own waste	Scope 3; Other upstream emissions	Sum -Total carbon footprint
2015	10.02	0	0.01	0.04	0.224	0.43	0	0.891	0.01	0.01	0.06	0.1	0.05	0.555					4.13	16.52
2016	9.64	0	0.01	0.03	0.624	0.51	0	0.745	0.01	0	0.05	0.1	0.05	0.573					4.082	16.44
2017	9.44	0	0.01	0.03	0.071	0.66	0	0.757	0.01	0	0.05	0.1	0.05	0.573					4.044	15.81
2018	9.25	0	0.01	0.02	0.005	0.63	0	0.808	0.01	0.01	0.05	0.1	0.05	0.574	1.427	0.764	0.175	0.177	3.742	17.81

Unlike other Commission sites, and in relation to business travel (Scope 3), JRC-Ispra's contractor does not supply directly the distance travelled per type of journey nor estimate emissions due to business travel. When a reliable data set is acquired, possibly within the next framework contract, it will be used to calculate Scope 3 business travels. Estimations for previous years also need to be further analysed. The data provided in 2018 has been upscaled from that of 2017 taking into account the increased number of business travels (n.6867 in 2017 to n.7360 in 2018), using the in-depth 2015 Organisational Environmental Footprint analysis. The biggest share of emissions from business travel derives from aircraft travelling, while commuting emissions are mostly related to the use of cars. For instance, in 2018 long and short haul aircraft trips resulted in 1,847 tonnes CO_2 eq while the use of cars for employees commuting produced an overall amount of 1,312 tonnes CO_2 eq.

The 2018 Scope 3 JRC-Ispra commuting mode split has been calculated by means of the 2016 JRC-Ispra Transport Survey. The results of this and the JRC-Ispra commitment to sustainable mobility can be further seen in Chapter G5.3.

JRC-Ispra provides facilities such as videoconferences (VCs) or Personal Video Systems (PVS) to contain the number of business travels. Accordingly, new KPIs have been introduced based on use of VCs, as PVSs cannot be monitored as they are subject to a privacy policy. From the figures below it is evident that KPI are increasing for call durations per year (Figure G. 16) even if in 2018 there was a reduction of 2 VC rooms due to refurbishment works.

Figure G.16 – Videoconference call duration per year per person



	2011	2012	2013	2014	2015	2016	2017	2018
I-1701c JRC-Ispra call duration by Video rooms [hours:mm]	3322:05	3654:41	4522:40	5317:06	6214:46	8248:48	11034:44	12841:00

G5.2 CO_2 emissions from buildings

Buildings account for about 56% of JRC-Ispra's calculated CO_2 emissions in 2018, and include those from energy consumption and from refrigerant losses as described below.

a) Buildings (energy consumption)

CO_2 emissions are generated through combustion of the main energy sources:

i. operation of tri-generation plant, i.e. production of electricity and hot water for heating the residences and sports centres;

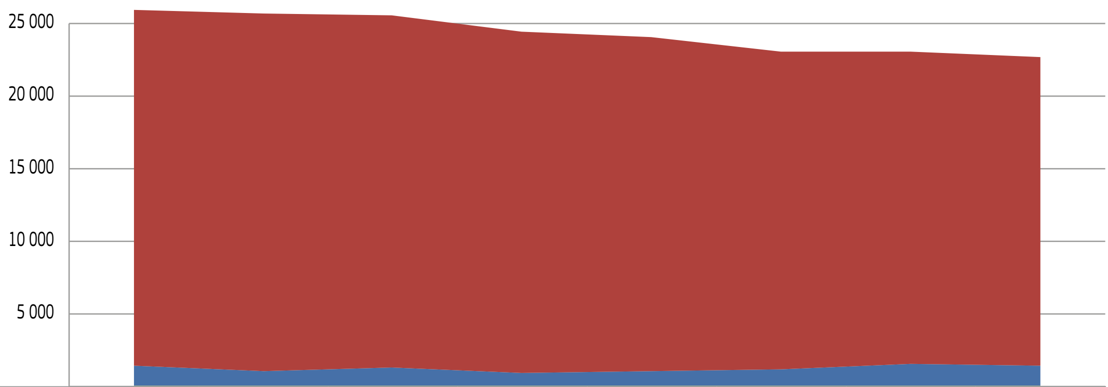
ii. upstream combustion produced by the external supplier to produce electricity supplied to the grid;

iii. petrol and diesel used for laboratory activities and specific facilities, including fuel consumption of VELA activities, operating machinery, lifter, generator and other small machinery. This contribution was monitored starting from 2016;

iv. cooking in the canteen and Club House.

Total CO_2 emissions from buildings energy consumption are shown below (Figure G.17 and Figure G.18) together with per capita and per square metre (Figure G.18). Total CO_2 emissions have been decreasing steadily since 2011, due largely to a reduction in emissions associated with gas consumption.

Figure G.17 – CO_2 emissions from buildings heating in the EMAS perimeter, tonnes / year (indicator 2a)



	2011	2012	2013	2014	2015	2016	2017	2018
Total (tonnes/year)	25 851	25 651	25 534	24 388	24 004	22 962	23 030	22 595
mains gas	24 408	24 632	24 252	23 519	22 997	21 771	21 504	21 133
electricity	1 425	996	1 267	852	993	1 157	1 500	1 432
diesel and petrol (laboratories and facilities)	17	23	15	17	14	33	25	30

Figure G.18 – CO_2 emissions from buildings heating in the EMAS perimeter, tonnes / person / m² (indicator 2a)

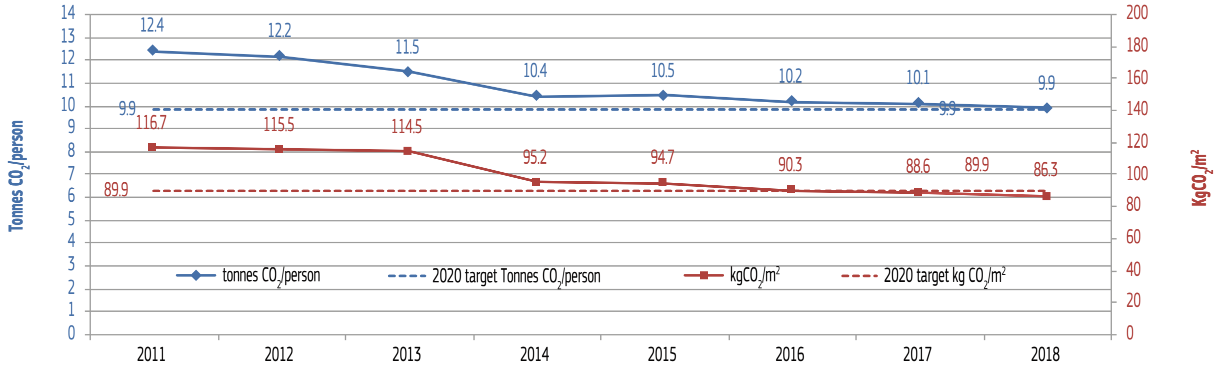


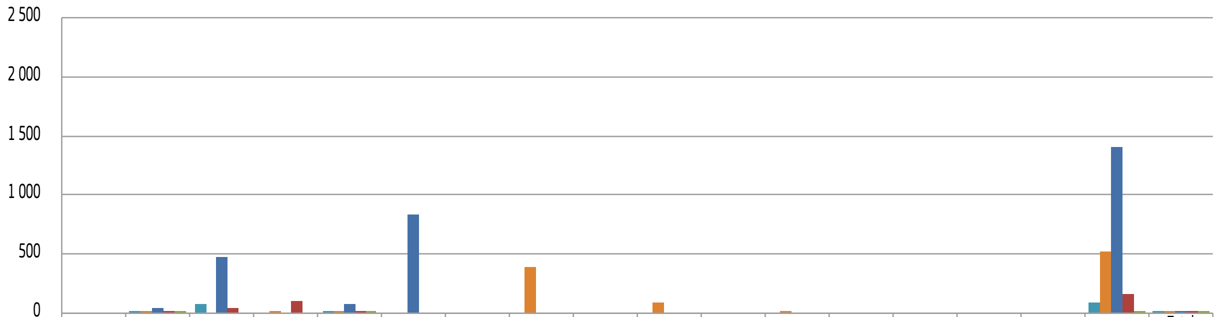
Figure G.18 shows that, as with energy consumption, per capita CO_2 emissions have slowly decreased in the last few years and, overall, have decreased by 20.2% with respect to 2011. The 2020 CO_2 emissions target per square metre has been reached prior to 2017.

JRC-Ispra has proactively decided to apply the 2020 EU Climate and Energy package objectives[26], which target a 20% reduction in CO_2 emissions by 2020, but adopting 2010 as a baseline rather than 1990 because the construction of the tri-generation plant would have meant that the 2020 targets were already met. This commitment was formalised in the Site Energy Management Policy, signed on May 2012 by all Directors having staff on the Ispra site. The measures introduced to reduce energy consumption described in section G4.1 will also reduce CO_2 emissions.

b) Buildings – other greenhouse gases (refrigerants)

Figure G. 19 shows JRC-Ispra's recorded losses of cooling gases in 2018.

Figure G.19 – Losses of refrigerants in JRC-Ispra EMAS perimeter (indicator 2b)



	R22	R410A	R134A	R404A	R407C	R507A	R422D	R23	R427A	R508B	NAF S III	R227A	SF6	R12	R600A	R290A	Total (t CO_2 e)	Total Tonnes CO_2e/ person
2014	0.00	8.26	78	0.00	5.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	92.07	0.039
2015	0.00	12.38	0.00	16.15	6.48	0.00	0.00	384.4	0.00	91.09	0.00	2.64	0.00	0.00	0.00	0.00	513.15	0.224
2016	0.00	36.21	468	0.00	77.08	828.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1 410.1	0.624
2017	0.00	21.29	39.46	98.5	2.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	161.35	0.071
2018	0.00	7.01	0.00	0.00	3.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.33	0.005

No losses were recorded for the following gases: R422D, R427a, NAF S III, SF6, R12, R600a, R290a.

10.33 tonnes of CO_2 eq were lost in 2018 from:

- 1 machine installed in an office;
- 3 machines in laboratories;
- 4 machines in technical rooms.

[26] Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. For further information, please refer to; https://ec.europa.eu/clima/policies/strategies/2020_en

This value is significantly lower than the losses recorded in 2017 and in 2016 by a factor of 10 each year! The actions put in place (including to improve accounting for losses of refrigerant gases and relative training) were very successful!

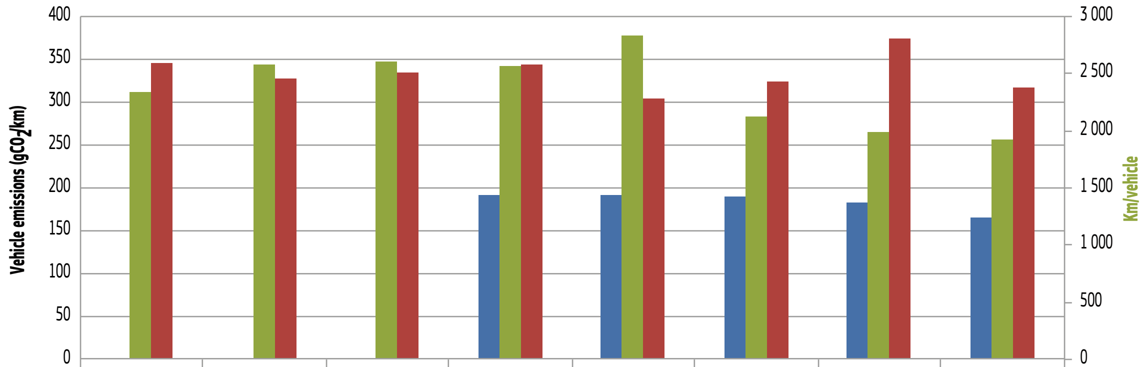
In 2015 the F-Gas register was extended to additional installations including those for fire prevention and this newly achieved standard will continue to be kept. Since 2017 the census has been further extended to Club House equipment and monitoring now also encompasses HCs (Hydro Carbon) of new equipment, which are replacing HFCs having a lower GWP value.

G5.3 CO_2 emissions from vehicles

a) Commission vehicle fleet

Fuel consumption was used to calculate JRC-Ispra's internal vehicle fleet emissions. A theoretical value was calculated using data from the vehicle manufacturer data available in the vehicles' log books and is increased by a nominal 5% to take into account older vehicles for which manufacturer information on CO_2 emissions was not available. 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
gCO_2/km (manufacturer)	0	0	0	191	191	190	183	165
gCO_2/km (actual)	346	327	334	343	304	323	374	317
kms/vehicle	2 334	2 578	2 606	2 561	2 837	2 125	1 988	1 916

In 2018, the theoretical (manufacturer) vehicle emissions decreased by 9.8% with respect to 2017 and by 13.6% with respect to 2014, thus already going well beyond the 2020 target of -5.1%. This was a consequence of EVs replacing old conventional service vehicles (see section G4.1).

Actual vehicle fleet emissions[27] were reduced by 15.2% with respect to 2017 which can be understood by the fact that, for a similar amount of kms/vehicle, there is a better perfomance granted by newer and more efficient vehicles.

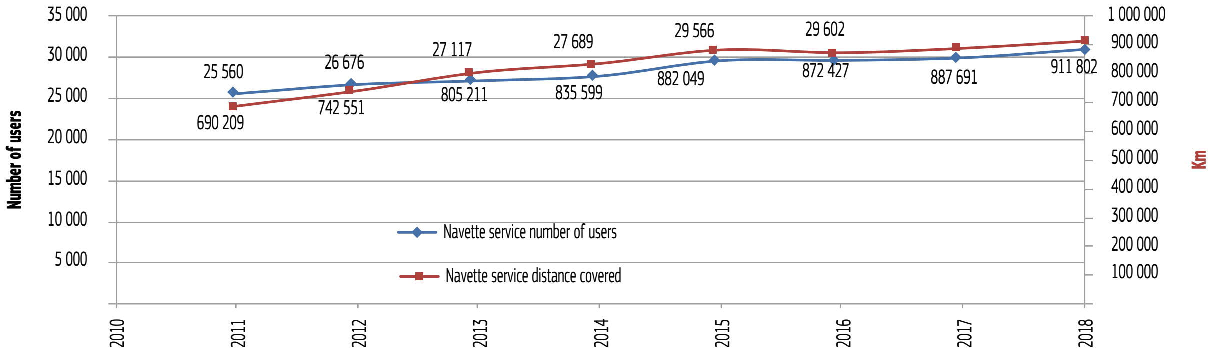
As an internal target for 2019, JRC-Ispra foresees a further 5% reduction of the site's vehicle fleet's CO_2 emissions (tonnes) with respect to 2018, with the exception of EVs (these are calculated seperately as scope 1 "Commission vehicle fleet"). In 2020, an additional 5% reduction of the vehicle fleet's CO_2 emissions with respect to 2019 shall be targeted following the successful completion of an on-going call for tender to purchase 6 light vans and 3 large vans, which shall replace the same number and type of conventional vehicles.

b) Missions(business travel) and local work based travel (excluding Commission vehicle fleet)

The Logistics Unit manages a contractor taxi service ("navette") for transporting staff from the site to the most important transport interchanges (chiefly Malpensa and Linate airports and Milan railway station). Usage is shown below in Figure G.21.

[27] This indicator excludes EVs given that their CO_2 upstream contribution is already accounted for within the total site CO_2 direct emissions indicator. The resulting upstream EV charging is 2.7 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.

Figure G.21 – Navette service users and covered distance (km)



Data shows an increase of about 21% in the number of people using the Navette service in 2018 compared to 2011. During the last few years, staff have taken more flights to and from Milan airports, resulting in the navette service covering a 32% greater distance in 2018 than in 2011. Requests to use the navette service depend on JRC core activities and, consequently, there are currently no specific actions planned relating to reducing the navette service use. On average, in 2018 the coefficient of use of the shuttles is 2.69 persons / trip (this includes both 8-seater vans and 3-seater cars).

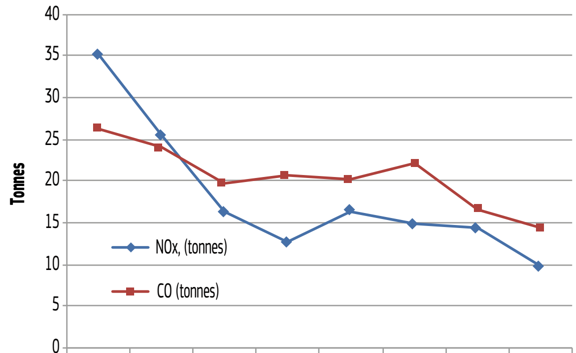
c) Commuting

Public transport is barely available and not practical for commuting to JRC-Ispra. The Ispra Site Manager is fostering actions with relevant stakeholders both to improve safe commuting to work by bicycle and also to enhance the access of public transport towards the Ispra site. For more information on the "Bicycle to work" project, see Chapter G10.2 External communication and stakeholder management".

The site has provided a free bus service since the 1980s mostly covering Varese Province, and also reaching out as far as Milan. Staff predominantly drive to work; "Small ads", a dedicated tool within the internal intranet site, helps staff promote carpooling amongst colleagues.

G5.4 Total air emissions of other air pollutants (CO, NO_x)

Figure G.22 – Evolution of annual air emissions from the tri-generation plant



	2011	2012	2013	2014	2015	2016	2017	2018
NOx, (tonnes)	35	25	16	13	16	15	14	10
CO (tonnes)	26	24	20	21	20	22	17	14

JRC-Ispra estimates the quantity of air pollutants emitted by the tri-generation plant by means of instrumentation providing continuous analysis of NO_x and CO concentrations. As the 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 at 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.

Thanks to the maintenance performed and the possibility to reach optimum load rate conditions, NO_x and CO emissions dropped in 2018 compared to 2017 values (-31.9% and -13.1%, respectively). This notable result is explained by the possibility to have functioning back-up engines and therefore to safely plan maintenance.

For energy supply, as explained hereafter, JRC-Ispra critically depends on its trigeneration plant. In 2018, although the average CO emission value recorded was 124 mg/Nm^3 for the entire trigeneration plant, i.e. well below the 300 mg/Nm^3 threshold, on two occasions, between 3rd of April to 9th of May 2018 and between 30th of June to 29th of July, one of

the four engines exceeded its threshold limits, touching average values of 406 mg/Nm^3 and 385 mg/Nm^3, respectively. This said, during these periods, the overall average values of the entire trigeneration plant were below the threshold.

The causes for this were due to many unfortunate factors concurring at the same time:

- the four engines of the trigeneration plant are close to their end of life and, therefore, their performance is not reliable at all times and there is often need for additional maintenance to the four engines. Even if a call for tender for a new trigeneration plant had been timely carried out, which could not be assigned, causing a considerable delay towards solving this issue;
- during both the above-mentioned occasions only two engines were running at the time due to out of order and extraordinary maintenance reasons;
- in general terms, at least two engines need to be running in any moment in time in order to grant the proper functioning of the trigeneration plant. Should this not be the case, in case of a blackout from the grid there could be a complete shutdown as a consequence which is not acceptable particularly for safety reasons;
- In both occasions, one of the two running engines exceeded the threshold values and, from the above, could only be turned off when the extraordinary maintenance of the engine subject to extraordinary maintenance was concluded.

To be noted that the following actions have either been accomplished or are on-going to solve this issue:

- in September 2018 one of the engines was fully refurbished in order to grant high reliability in the transition phase that will be concluded as soon as the new trigeneration plant shall be constructed;
- a new call for tender has been assigned to design a new trigeneration plant with top quality environmental performances. The relative call for tender is expected to be launched by the end of 2019.

The **2019 target** is to not exceed 2018 air emission levels. A significant decrease of NOx and CO emissions can only be achieved through the repowering[28] of the present tri-generation plant which is currently foreseen in 2023. A call for tender for writing the technical specification for retrofit of the tri-generation plant was launched in 2018.

G5.5 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, Brebbia and Capronno, Rio Novellino
Feed	Fodder, Vegetables, Fruit	Ispra, Brebbia, Capronno, Angera farms
	Fish	Lake Maggiore
	Honey	Brebbia
	Milk	Ispra, Brebbia, Capronno farms
Ambient dose	Dosimeter	JRC perimeter stations, City Hall of: Angera, Besozzo, Brebbia, Cadrezzate, Taino, Travedona

[28] Repowering is the process of replacing older power stations with newer ones that either have a greater nameplate capacity or more efficiency which results in a net increase of power generated.

Within the framework of operation and pre-decommissioning of its nuclear and radioactive facilities and installations, the site is authorized to discharge low quantities of gaseous and liquid radioactive effluents (**FdS**), through authorized 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 releases is shown in following table with values from the dedicated website[29] of I.S.P.R.A., the relevant Competent Body.

Table G.7 Gaseous radioactive effluents

Year	Gaseous radioactive effluents		Percentage of authorized limit
	type	[Bq]	[%]
2018	Tritium	2.08×10^{11}	5.7
2017	Tritium	1.87×10^{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.

Table G.8 Liquid radioactive effluents

Year	Liquid radioactive effluents		Percentage of authorized limit
	type	[Bq]	[%]
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	$1.67 * 10^{8}$	

Although the total tritium activity discharged by air during 2018 is of the same order of magnitude as that discharged in previous years, the percentage of use of the discharge formula is significantly greater because the discharge partly took place within the SGRR facility, and its relative weight in the discharge formula is higher with respect to that of other facilities. The total activity discharged, both liquid and air, remains however well below the authorised limits and the overall releases resulted in negligible doses for the population, quantified well under 1 microSv/year[30], even under conservative assumptions. **The 2019 target** is to keep discharges well under the authorized 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

[29] http://www.isprambiente.gov.it

[30] 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.

and European directives. In order to improve the communication and transparency of data concerning nuclear activities, the monitoring and publishing of additional KPIs are under evaluation.

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.

In this context, in 2007 JRC-Ispra replaced the old liquid effluents treatment plant (called STRRL, Radioactive liquid effluent treatment facility) with a modern treatment plant for liquid effluents (called STEL, Liquid effluent treatment plant facility) based on more environmentally friendly physical phenomena such as precipitation and flocculation whose operational provisions foresee more restrictive limits for authorized releases. 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.

G6 Improving waste management and sorting

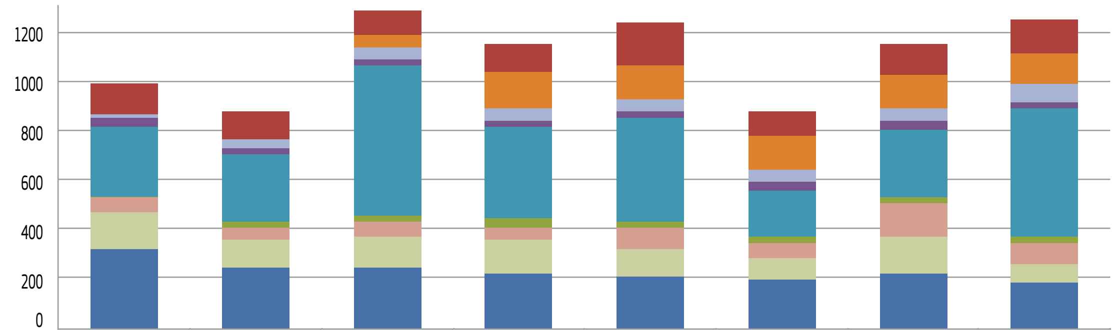
JRC-Ispra produces many different types of waste which vary according to the site's activities of which are sorted as much as possible. The Logistics Unit manages all the activities of conventional waste collection, handling and disposal by means of external suppliers specialised in waste management.

The 2018 *kill plastic* campaign was of particular relevance as it addressed a topic of notable concerns nowadays and on which the Commission is actively committed. In an effort to *do as you preach*, and possibly go beyond, JRC-Ispra kicked-off 15 actions going beyond regular waste management: the suppression of Single Use Plastic (SUP) used both by our catering services and staff was targeted either directly or indirectly, e.g. by promoting the use of water bottles for collecting water coming from water dispensers. All these actions were formally communicated and shared with the EC EMAS registration governing body. 8 of these actions were already completed by 2018. Where reusable materials could not be used and SUP could not be substituted, investments were made to buy biodegradable and compostable SUP. JRC-Ispra's waste management contractor was asked whether biodegradable and compostable SUP could be digested within his anaerobic organic waste treatment plant. Following a negative reply, he was asked to test these. The test result showed that indeed such items are 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. More information on this can be found in Chapter G10.1 Internal communication.

G6.1 Non-hazardous waste

The evolution of non-hazardous waste production is shown below in Figure G.23.

Figure G.23 - Evolution of total non-hazardous waste production in JRC-Ispra (tonnes)



	2011	2012	2013	2014	2015	2016	2017	2018
Total	989.8	883.1	1 285.7	1 147.8	1 235.4	877.8	1 155.4	1 247.3
Total (tonnes/person)	0.47	0.42	0.58	0.49	0.54	0.39	0.51	0.55
Other	120.68	116.11	95.42	108.13	172.94	101.93	132.90	133.62
Street cleaning	0.00	0.00	57.80	151.28	137.24	135.17	127.79	124.44
Organic waste	19.47	34.18	37.67	44.08	48.06	51.71	59.02	68.95
Plastic	31.32	27.62	32.98	33.09	27.43	25.81	29.43	26.68
Metal (scrap)	283.30	274.87	601.43	370.79	416.10	196.24	271.24	527.30
Glass	4.90	24.54	24.86	31.07	21.08	23.63	30.67	23.23
Wood	58.73	51.09	62.00	50.27	84.54	57.07	137.97	76.58
Paper and cardboard	153.25	109.04	130.10	137.59	113.60	90.43	138.26	82.96
Mixed urban waste	318.16	245.68	243.44	221.53	214.38	195.78	228.08	183.50

The data shown in Figure G.23 underlines that it is difficult to define trends and set targets over the years for the total non-hazardous waste produced and also for most of the single types of non-hazardous waste as these depend strongly both on the number of staff present on site and on certain activities, such as maintenance, construction or demolition of buildings. Relevant fluctuations are therefore visible. This said, there was 7.9% increase with respect to 2017 on account of the increasing of metal waste (+94.4%) produced by demolition activities. To be noted that there is a yearly decreasing trend in almost all the other categories thanks to the improvement of waste separation and the relative "kill plastic" campaign (see Chapter G11.1).

All categories of non-hazardous waste produced in 2018 have decreased, in particular there was a reduction of both plastic (-9.3%), and paper and cardboard (-40%), which are key waste for which several actions have been put in place. The reduction of paper waste can also be liaised with the reduction in use of toners (-15%). On the other hand, there was an increase in the production of organic waste (+ 16.8%). This is accountable by the fact that further organic waste sorting was introduced in the JRC-Ispra canteens in the framework of the European Week for Waste Reduction and also the fact that there has been an increase of number of meals served at the canteen and at the Club House (+8% respect 2017).

These promising results will need to be consolidated in the coming years particularly targeting the reduction of unsorted waste, which remains the most produced non-hazardous waste.

Following an in-depth analysis over the use of water dispensers which kicked-off in 2016, 12 additional water dispensers, on lease, have been installed on-site mainly to reduce the use of single use plastic bottles.

The importance of this proactive initiative has also been confirmed by the Commission itself and its plastic strategy report. In 2018, 148,777 litres of drinking water were distributed from water dispensers and installed in the canteens and in the Club House. This led to 297,554 PET bottles being saved or, equivalently, to 7,439 kg of plastic waste not being produced[31].

JRC-Ispra is also trying to maximise the sustainability of its waste streams by adopting circular economy management criteria. The following good practises have been established:

- recycling and reusing furniture or scientific equipment (mainly chemical hoods and safety cabinets) inside the JRC-Ispra site. Approximately 94% of the furniture was reused in 2018 and about 78% in the last 4 years as a result of the following removals. The trend is growing notably (2015: 70%);
- Donating the scientific equipment and recyclable ICT assets (PCs are replaced every 5 years) to non-profit organisations having humanitarian, social, educational, training, charitable or environmental purposes. In 2018, 20 PCs and 10 monitors were donated (memories bleached) to non-profit organisations. This action has high potential for further development. Three scientific-technical donations were also made to a total of 26 instruments:
  - 14 cabinets for chemical products;
  - 10 extractor hoods;
  - 1 tablet press;
  - 1 Vacuum laminator;
- Fully reducing the use of plastics in catering in the canteens, cafeteria, Club House, at meetings and conferences. JRC-Ispra kicked-off 15 actions targeting directly or indirectly the suppression of Single Use Plastic (SUP) used both by our catering services and staff. These were formally communicated and shared with the EC EMAS registration governing body. 8 of these actions were already completed by 2018.
- In 2018 the JRC-Ispra sent out 761.4 tons of mixed wood material (branches, tree trunks, trunks) allowing to recover energy for district heating by means of a cogeneration plant and another 150 tons (roots, ground, etc.) destined for further processing, thus granting a new use for material that would have otherwise become waste.

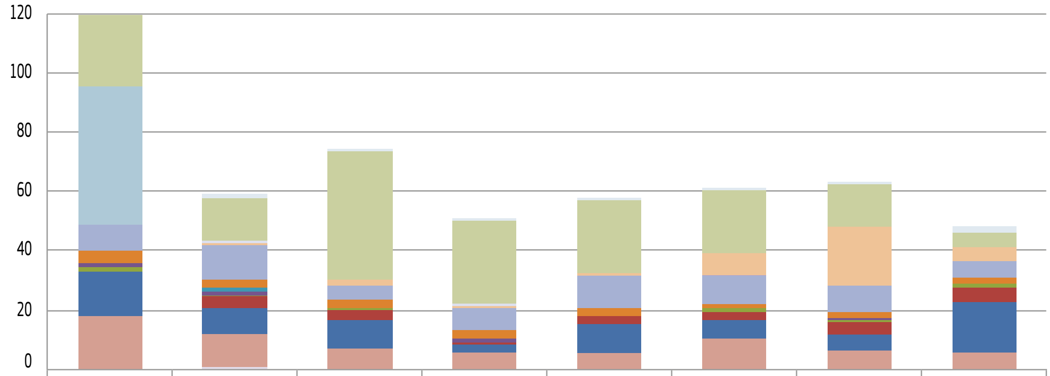
Major actions still not presented within the text are included in the Commission's EMAS Annual Action Plan for non-hazardous waste management are reported hereafter.

31 By considering a weight of 25g per each 500ml bottle.

Initial year / ref.#	Action description	Action type	2019 objective 2018 results
2015 / 161	Increase the percentage of recycled urban waste	Continuous	2019 objectives: follow-up on waste separation in the canteen. Revise the separation system in the cafeteria and Club House, and also that for meetings. Improve the distribution of external waste containers, to enable a better separation of waste. 2018 results: an improved system for the separation of waste has been introduced at the canteen. An improved separation system for waste produced during events has been tested (Christmas party event). The percentage of recycled urban waste decreased from 81.3% in 2017 to 78.4% in 2018. Continuing action. Improve operative processes to increase waste separation, communication to staff and activities/actions on waste reduction and separation by 2%.
2015 / 162	Increase awareness of waste management (reduction and separation)	Continuous	2019 objectives: re-propose courses on special waste management. Introduce course on office waste separation, possibly both courses should be held in two languages, Italian and English. Continue to propose activities to raise awareness on the importance of correct waste management. 2018 results: courses on special waste management were held. Activities to increase awareness on the importance of waste separation took place: information disseminated during the European week for Waste Reduction, a Waste sorting game was made, a talk on the site's efforts to promote environmentally-conscious behaviour and reduce waste that goes to landfill. Continuing action. Communications in Connected, activities to raise awareness on waste reduction and separation.
2016 / 168	Clarification of the procedures for managing the waste management in classified areas from a documentary point of view as well as for refurbishment and reorganisation	Single	2019 objectives: apply the E-type procedure to dismiss 50 tons as conventional waste. 2018 results: over 53 tons of E-type materials are produced (rather than 70) and processed: 48 tons disposed as conventional waste, 5 tons are classified as not conventional waste therefore destined to clearance process. Apply the radiometric check procedure to dismiss 198 tons of conventional waste/material produced in nuclear installations.
2017 / 307	Installing water dispensers on site.	Multi-stage	2019 objective: monitoring: ◆ the amount of water erogated ◆ the quality of the service, ◆ whether further water dispensers are needed. 2018 results:12 water dispensers were installed as scheduled. 2018 objective: launching the call for tender for installation and maintenance of water dispensers.

G6.2 Hazardous Waste

Figure G. 24 - Evolution of total hazardous waste in JRC-Ispra (tonnes)



	2011	2012	2013	2014	2015	2016	2017	2018
Total	119.25	59.33	74.12	50.14	57.19	60.91	62.61	48.27
Total (tonnes/person)	0.06	0.03	0.03	0.02	0.02	0.03	0.03	0.02
Other	0.00	1.35	0.72	0.24	0.09	0.21	0.08	2.29
Electrical equipment WEEE	24.02	14.96	43.19	27.96	25.01	21.60	14.19	4.45
Waste containing PCB	0.00	0.08	0.00	0.87	0.00	0.00	0.00	0.00
Waste belonging from buildings and streets maintenance	0.00	0.89	2.04	0.17	0.11	7.39	19.92	5.36
Asbestos material	46.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mercury containing objects	0.24	0.00	0.04	0.01	0.00	0.02	0.05	0.00
Lead-acid battery	8.99	11.62	4.71	7.63	11.10	9.58	8.83	5.34
Medical waste	3.64	2.72	2.58	3.02	2.60	1.55	1.97	1.87
Spray cans	0.00	1.49	0.00	0.04	0.00	0.08	0.06	0.26
Solvent	1.74	1.34	0.42	1.19	0.00	0.00	0.88	0.00
Paint	1.41	0.10	0.60	0.31	0.32	1.39	0.54	1.23
Filters	0.00	4.01	3.28	0.24	2.92	2.52	4.20	4.48
Waste oil	14.93	9.10	9.77	2.63	9.28	6.33	5.46	17.63
Laboratory mixed waste	18.01	10.92	6.59	5.83	5.36	10.02	6.00	5.17
Batteries	0.00	0.75	0.18	0.00	0.38	0.22	0.42	0.19

Hazardous waste production depends largely on site specific research activities carried out in the laboratories, specific maintenance requirements[32] and changes in site use such as removal of laboratories. In fact, there was a decrease in the total quantity of hazardous waste (-22.9% compared to 2017), because, unlike 2017, no particular laboratory demolition or refurbishment activities were carried out.

The average cost of disposal decreased in 2018 by about 2% with respect to 2017, thanks to better sorting and classification of the waste produced. For example, the hazardous Waste Electrical & Electronic Equipment has decreased by about 69%.

The action addressing hazardous waste management is as follows:

Initial year / ref.#	**Action description**	**Action type**	**2019 objective** **2018 results**
2017 / 306	Optimise the operational control of the new storage of special waste in order to maintain low quantities of waste stored (especially hazardous or flammable waste).	Continuous	2019 objectives: continue with periodic controls of the DT2 store, and also of site yards in cooperation with the Building Infrastructure Contacts. Maintain or even increase the frequency of waste disposal from both the intermediate stores and the DT2. 2018 results: periodic controls have been made. New control check list implemented.

[32] To be noted that from 2012 responsibility for asbestos disposal was transferred to the contractor.

G6.3 Waste sorting

Table G.9 – Percentage of waste sorted at the Commission in JRC-Ispra

	2011	2012	2013	2014	2015	2016	2017	2018
Percentage of waste sorted	71.3	73.9	82.1	81.5	83.4	79.1	81.3	85.8
Percentage of waste not sorted	28.7	26.1	17.9	18.5	16.6	20.9	18.7	14.2

Table above 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 2018 there was a notable increase (5.5%) due to a better waste separation and reduction in mixed waste. However, additional efforts need to be put in place in order to reach the 2020 target of +9.3% with respect to 2014.

G6.4 Wastewater discharge

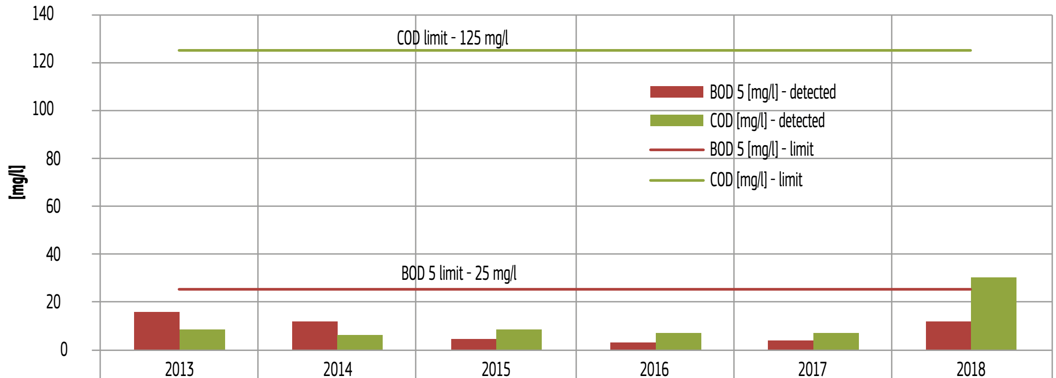
JRC-Ispra site's wastewaters include discharges produced by flush toilets (both from JRC buildings, external residencies and Club House) and discharges produced by the canteens, laboratory sinks, etc. as well as part of the urban wastewater from the Municipality of Ispra[33]. These are conveyed by a 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 (rain water 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 depuration process used is of a biological type (biodisc) followed by sedimentation and UV rays treatment. 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 for water quality, reported periodically to Italian authorities via the "Sistema Informativo Regionale Acque" database. Figure G. 25 and Figure G.26 show 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.

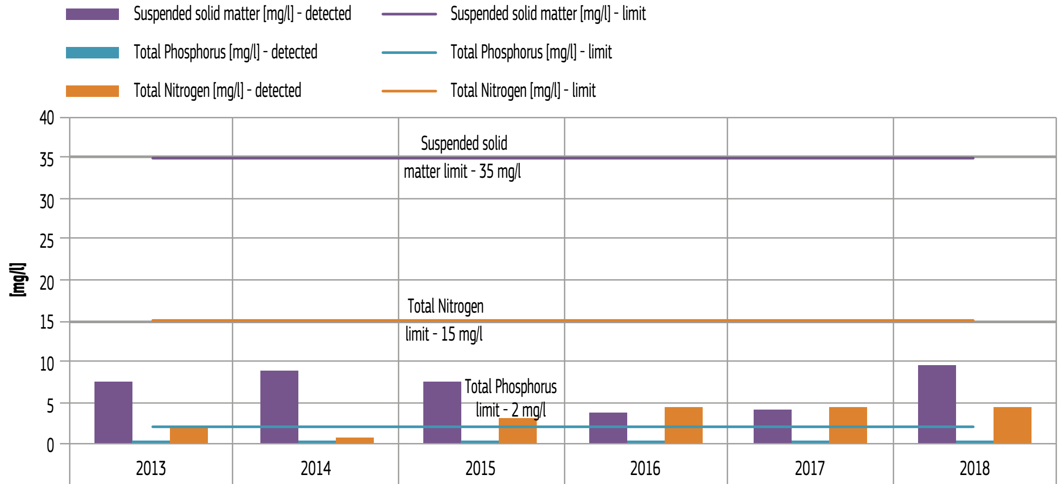
Figure G. 25. Annual average concentration value of BOD_5 (daily average, detected monthly) and COD (daily average, detected monthly) at the wastewater treatment plant discharge point with respect to the Italian threshold limits (mg/L).



	2013	2014	2015	2016	2017	2018
BOD 5 [mg/l] - detected	15.83	11.82	4.48	3.18	3.53	11.38
COD [mg/l] - detected	8.75	6.16	8.44	7.28	7.11	30.08
BOD 5 [mg/l] - limit	25	25	25	25	25	25
COD [mg/l] - limit	125	125	125	125	125	125

[33] 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).

Figure G.26. Annual average concentration value of Suspended solid matter (daily average, detected monthly), total Phosphorus (annual average, detected monthly) and total Nitrogen (annual average, detected monthly) at the wastewater treatment plant discharge point with respect to the Italian threshold limits (mg/L).



	2013	2014	2015	2016	2017	2018
Suspended solid matter [mg/l] - detected	7.68	8.77	7.63	3.91	4.01	9.48
Total Phosphorus [mg/l] - detected	0.48	0.32	0.34	0.49	0.42	0.38
Total Nitrogen [mg/l] - detected	1.98	0.77	3.14	4.43	4.61	4.29
Suspended solid matter [mg/l] - limit	35	35	35	35	35	35
Total Phosphorus [mg/l] - limit	2	2	2	2	2	2
Total Nitrogen [mg/l] - limit	15	15	15	15	15	15

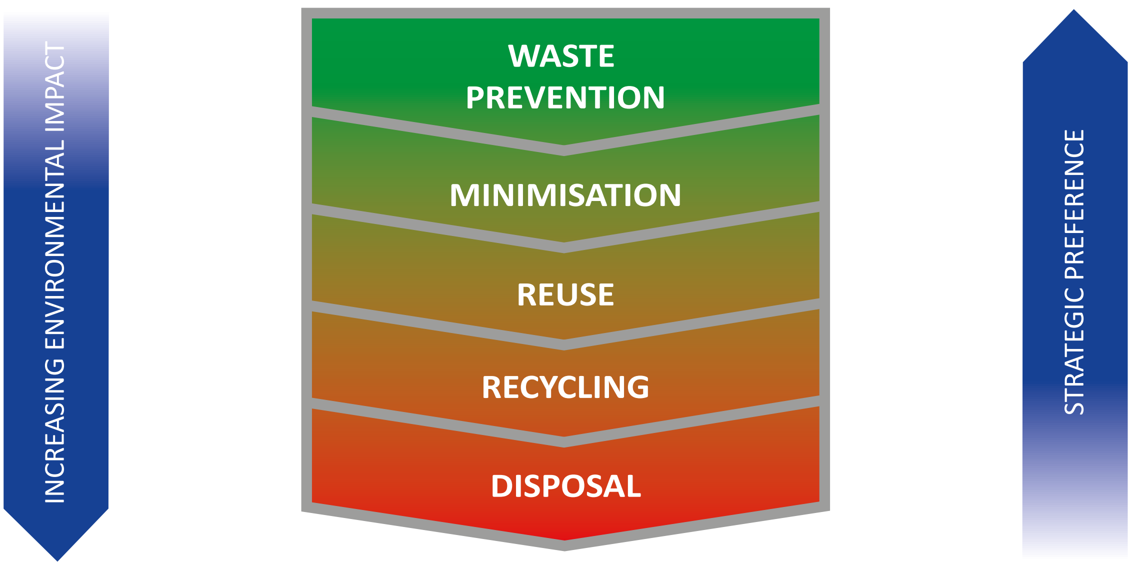
In addition to the analysis carried out monthly to demonstrate compliance with the applicable limits[34], further analytical checks are performed on a voluntary basis every two months to verify that the wastewater is also below the limits indicated within Table 3[35]. No exceeding of the limit values has been registered in 2018.

About 2.9 million cubic metres of wastewater were treated in 2018 of which about 14% come from the Municipality of Ispra. The total volumes of water discharged in the Novellino stream decreased by 23.4% with respect to 2017 due to the following reasons:

- less water was treated from JRC-Ispra site (-4.2%);
- the contribution from the Municipality of Ispra was significantly reduced (-65.4%).

A multi-stage project for further separating the "white" and the "black" wastewaters is on-going in order to improve the entire JRC-Ispra sewage network. A budget has been assigned for works to continue in 2019.

G6.5 Radioactive Waste Management System



34 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"

35 Legislative Decree 152/06, Part 3 of Annex 5, Table 3, "Emission limits for industrial wastewater discharging into surface waters"

Significant quantities of radioactive waste are accumulated on site from prior on-site activities. Even greater quantities of waste are expected to be generated by the decommissioning activities in the next few decades. The Nuclear Decommissioning Unit is developing a management system for radioactive wastes 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[36]. 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.

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").

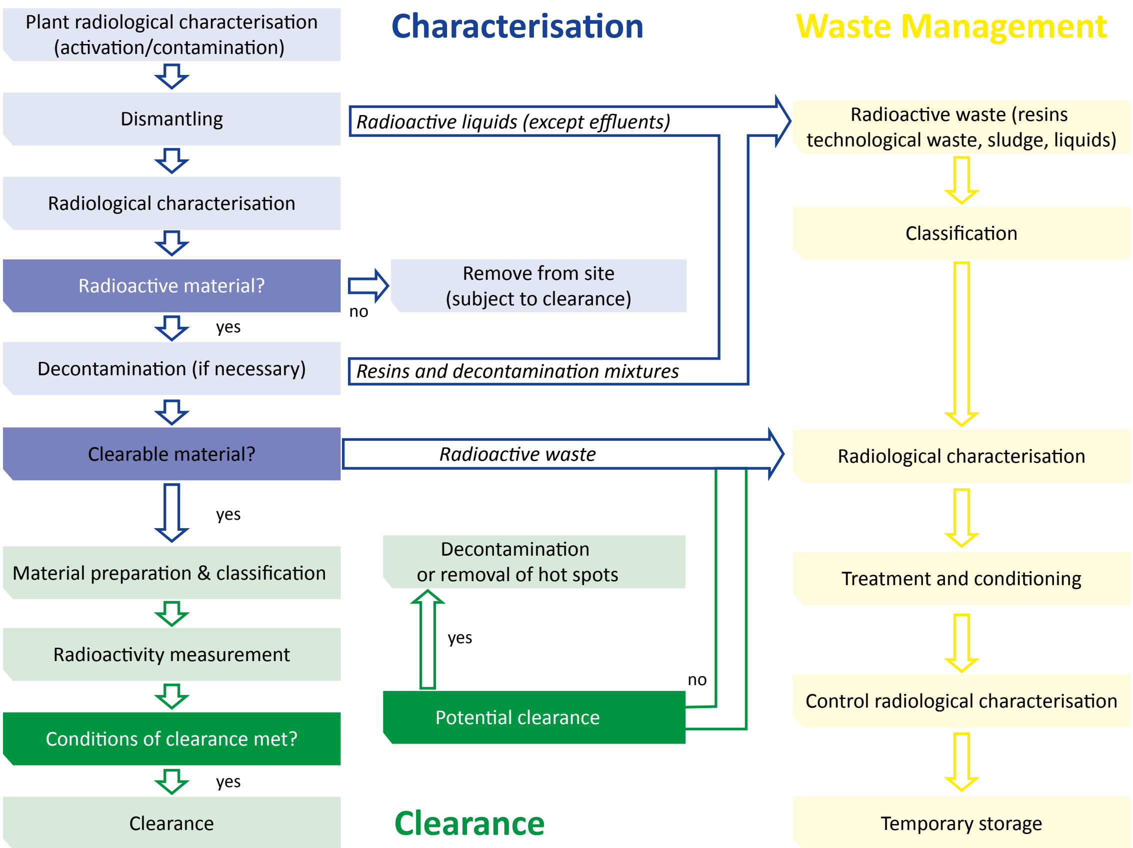
The radioactive waste management system set up at the site includes clearance materials and radioactive waste in accordance with Italian Law (mainly Legislative Decree 230/95). It includes elements related to planning, quality assurance and activity recording.

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.

The radioactive waste management process is summarised in the following schematic diagram:



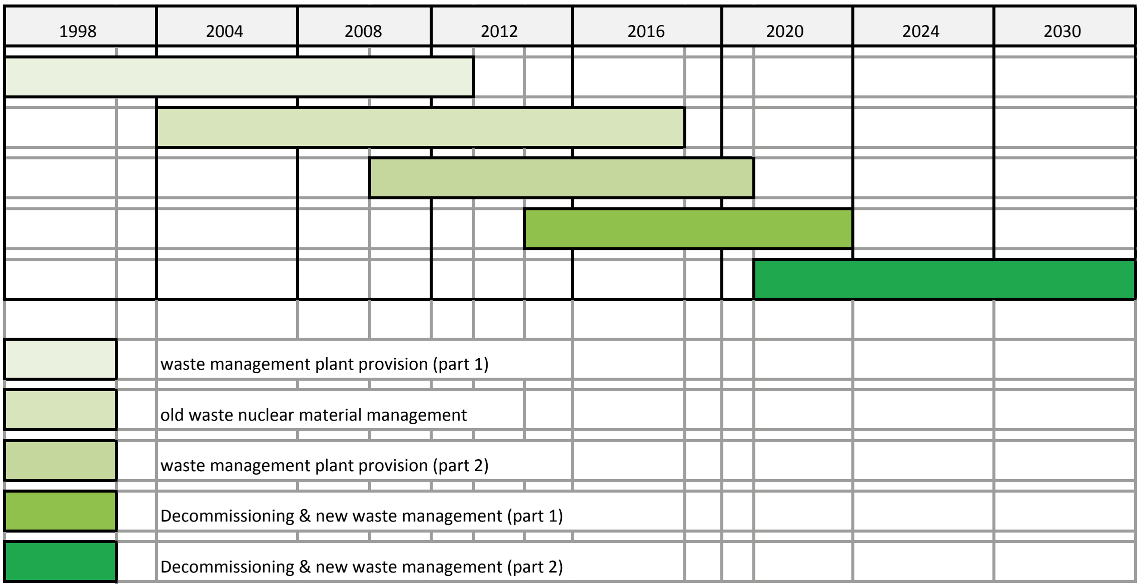
[36] Clearance: the removal of radioactive materials or radioactive objects within authorized practices from any further regulatory control following verification that the content of radioactivity is below the limits established the regulatory authority.

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.

A summary schedule of Decommissioning & Waste Management is illustrated in the figure below:



During the radiometric checking process for the disposal of conventional waste (i.e conventional waste produced within classified areas under Legislative, Decree 230/95), more than 164 tons were processed under 27 specific procedures, in particular:

- Rubble (145 tons)
- Tools and technical (8.7 tons)
- Metallic waste (5.9 tons)
- Electrical material (4.3 tons)
- Old furniture (0.4 tons)

The 2018 results are 17% less than the 2018 target (198 tons) because 14 procedures are still on going and their closures are expected in early 2019. The target for 2019 is an increase between 5 and 8%, i.e. an additional 9-14 tons, compared to 2018.

G7 Protecting biodiversity

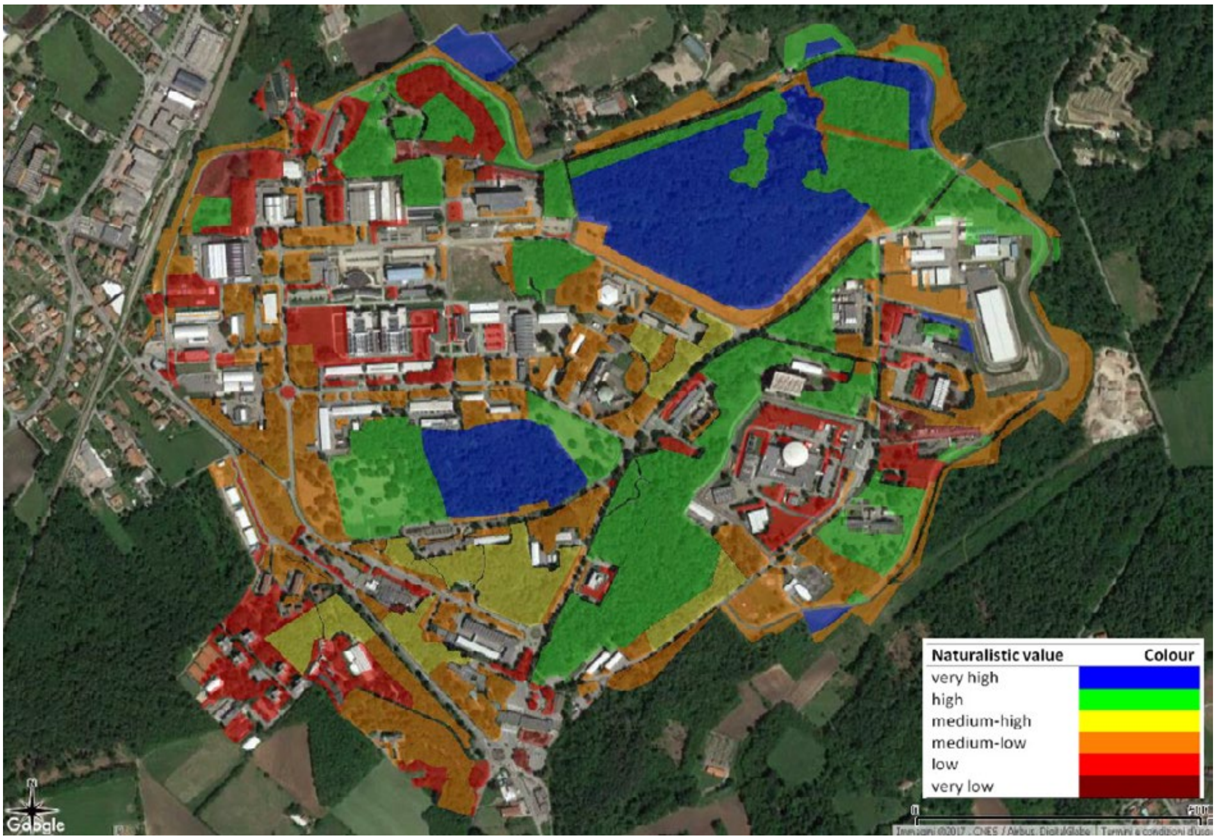
The Ispra site hosts many interesting species of wildlife within its boundaries and aspires to enhance biodiversity and possibly be regarded as a hot spot of biodiversity in the regional area. This is due to the many semi-natural habitats (i.e., man-made and partially managed, but with an abundance of spontaneous plants) and natural habitats (i.e. unaltered communities affected by human intervention occasionally) some of which have remained intact for over 50 years.

As is seen in the figure below, JRC-Ispra site features 33 hectares of natural habitats of conservation covered by the Habitats Directive, including:

- wetlands: surface waters and swamps - EU habitat 3150 Natural euthrophic lakes with Magnopotamion or Hydrocharition-type vegetation
- grasslands: high-diversity plant communities - EU habitat 6230*: Species-rich Nardus grasslands and EU habitat 6510: Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)
- wet woodlands: alder woodland and mixed alder-oak woodland - EU habitat 91E0* Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
- dry woodlands: oak woodland - EU habitat 9190 Old acidophilous oak woods with Quercus robur on sandy plains.

To allow biodiversity to flourish (variety of species and different flowering times), steps have been taken to create new biodiversity areas in 2019 by transforming ca. 50000 m^2 in wildflower meadows, following the demolishing of old buildings. This also implies that maintenance and cutting of grasslands shall be reduced.

Figure G.27 - Distribution of the naturalistic value in JRC-Ispra site



As a symbolic gesture to preserve the site's green areas, over 100 trees have been planted by staff on the Italian Tree Day, 21st November 2017 which has been confirmed in 2018 as a JRC-Ispra recurring event. The following species of trees and scrubs were selected for planting during the 2018 JRC-Ispra Tree Day in accordance with the *Native Trees* section of the "Management of Green Areas" guidelines:

- Acer campestre (tree) – Field maple
- Cornus mas (shrub/bush) – Cornelian cherry, European cornel, Cornelian cherry dogwood
- Fraxinus excelsior (tree) - Common ash or European ash

- Carpinus betulus (tree) - European or common hornbeam
- Quercus petraea (tree) - Sessile oak, Cornish oak or durmast oak
- Prunus padus (tree) - Bird cherry, hackberry, hagberry, or Mayday tree
- Sambucus nigra (shrub/bush) - Elder, elderberry, black elder, Europeanelder, European elderberry and European black elderberry
- Crataegus monogyna (scrub) - Common hawthorn, oneseed hawthorn, or single-seeded hawthorn

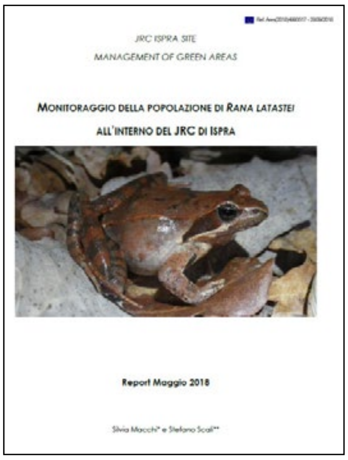
- Ligustrum vulgare (scrub) - Common privet or European privet
- Viburnum opulus (scrub) – Guelder rose
- Prunus spinosa (scrub) - blackthorn or sloe

The semi-natural or natural habitats, that in themselves are worthy of protection, are native lands for several wild species.The introduction of alien species may not only affect the aesthetics of an area, but also the natural ecosystems and possibly human health. Some of these species, including certain fauna are, unfortunately, existing 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 food webs and altering ecosystem conditions; this is reflected in *Target 5 of the EU Biodiversity Strategy Regulation (EU) No 1143/2014* of 22 October 2014 which lays down the EU's obligation to "prevent the introduction of, control or eradicate those alien species, which threaten ecosystems, habitats or species". The latter is implemented on the Ispra site by:

1. removing the ***Prunus serotina*** (black cherry);
2. cutting low the ***Pleioblastus pygmaeus*** (pygmy bamboo) in the «laghetto» area regularly;
3. cutting low the ***Solidago gigantea*** (giant goldenrod) on a regular basis.

A complete list of species and plant communities of conservation concern (to name but a few: ***Rana latastei, Rana dalmatina, Lucanus cervus*** and ***Eleocharis carniolica)*** including their protection measures have been described in the "Management of Green Areas" guidelines, which was recently written to manage green areas in a sustainable manner. To ensure no net loss to the Ispra site ecosystem (Action 7 of the EU Biodiversity Strategy), and to stimulate biodiversity, compensation schemes have been developed in the above-mentioned guidelines.

A standardised annual programme was established in 2016 for monitoring the *Rana Latastei* population, using a *capture - mark - recapture* methodology, to evaluate if any protective additional actions are needed. The population size was estimated in 2018 of being about 146 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.



JRC ISPRA SITE
MANAGEMENT OF GREEN AREAS

MONITORAGGIO DELLA POPOLAZIONE DI RANA LATASTEI ALL'INTERNO DEL JRC DI ISPRA

Report Maggio 2018

Silvia Macchi* e Stefano Scali**

For further improvement, the drafting of work instructions for protected species and compensation schemes is on-going including also mapping relative data on the internal Geographical Information System, accounting for protected species. Preparation of the technical specifications for the framework contract on green area maintenance is on-going and will include following the guidelines of the GPP toolkit "Gardening products and services": this call for tender will be launched in 2019.

To be noted that the built surface on-site has slightly increased during the years by 3.8 % with respect to 2014. This is explained on account of the fact that several new buildings having high energy efficiency have been built and, in due time, demolition of unefficient builings is taking place. This process takes a long time as there are limits on the number of buildings to be demolished yearly.

G8 Green Public Procurement

G8.1 Incorporating GPP into procurement contracts

Green public procurement (GPP) has been recognised as a vehicle to develop sustainable, low-carbon and resource-efficient circular economy and it has been embedded within the JRC public procurement manual (eV.10_2 - March 2019).

Following developments in the Public Procurement Management Tool (PPMT) in 2014, since the beginning of 2015 the categories of goods and services which may potentially be subject to the 19 EU GPP criteria for priority product groups have been flagged based on Common Procurement Vocabulary (CPVs). If goods and/or services belong to these categories, at an early stage of the procurement process PPMT automatically identifies the actor responsible for the environmental issues in a given Directorate/Unit, usually an Environmental Officer who then provides her/his contribution, as needed. This Corporate business rule is implemented at all the JRC Sites.

To facilitate the inclusion of green requirements in public tender documents, a presentation of GPP was made during the last two 2018 Procurement training sessions for all staff involved in procurement and contract management and 6 are already scheduled for 2019, Training is complemented by the use of the Interinstitutional framework contract of the European Parliament's GPP helpdesk for Buying Green.

The Annex on Environmental Clauses which is included in all the contracts to be executed on the Ispra site has been reviewed with the new Environmental Policy.

The adoption of EU GPP criteria is evaluated following five categories[37]

Definition	Toolkit available	Toolkit not available
Green by nature	The primary function of goods, services and works to be procured is green e.g.: construction of a green roof, consultancy services to improve environmental performance	
Not green	Tender documents do not include any reference to environmental considerations or only clauses without impact on the purchasing approach. Examples: A copy of/reference to the general environmental policy of the institution is included or compliance with applicable environmental legislation is required.	
Green	Fully or largely compliant with the core criteria and/or partly compliant with the comprehensive criteria. Where the main 'green' focus is on award criteria, the weighting of environmental criteria as share of the total weighting is 10 % or more.	Tender documents include significant environmental clauses which concern the primary function of the goods, services or works to be procured. Where the main 'green' focus is on award criteria, the weighting of environmental criteria as a share of the total weighting is 10 % or more.
Light Green	Only partly compliant with the core criteria. Where the main 'green' focus of the procedure is on award criteria, the weighting of environmental criteria as a share of the total weighting (for price and quality) is below 10 %.	Tender documents include some environmental clauses but these clauses concern only (a) secondary feature/features of the proposed contract. Where the main 'green' focus of the procedure is on award criteria, the weighting of environmental criteria as a share of the total weighting (for price and quality) is below 10 %.

In 2018, 16% of all framework contracts (direct and framework) worth over 60,000 EUR included eco criteria; the following classifications were applied;

- 1 "green by nature";
- 5 "green";
- 9 "light green" contracts,

for a total value of almost 50,150,000, EUR Both the value and the number of the contracts has increased compared to last year[38].

For 2019 it is foreseen that 100% of contracts qualifying for GPP (i.e. with a toolkit available) will actually be applying green criteria and at least 50% of these contracts shall be classified as "green" or "green by nature".

[37] "How do the EU institutions and bodies calculate, reduce and offset their greenhouse gas emissions?", European Courts of auditor, 2014

[38] To be noted that most framework contracts are awarded periodically, following calls for tender, to grant a necessary service or provision in time. Therefore, statistically, the number of green framework contracts has a limited statistical relevance.

G9 Demonstrating legal compliance and emergency preparedness

G9.1 Management of 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 18 licences issued by the Italian Nuclear Authorities and adheres on a voluntary basis and under its own responsibility, to the environmental prescriptions set within Italian national laws and regulations and/or in laws and regulations of the Lombardy Region. JRC-Ispra has developed a dedicated strategy to issue internal environmental authorisations which are technically equivalent to those issued by Italian Authorities. This strategy has been shared with (and accepted by) the relevant Italian EMAS Competent Body in 2013, as well as with all Authorities during each EMAS Round Table meeting.

Under the framework of the Environmental Management System, developed at the site since 2009, several tools are currently in place to ensure that all legislation applicable to the site activities is checked and implementation monitored. These include:

- the register of legal requirements and obligations;
- a procedure for the management of the legal compliance and environmental requirements applicable to the JRC-Ispra site;
- a Consultation Procedure to authorise all new projects and activities performed on site;
- a Safety and Environmental Inspection performed by the JRC-Ispra Inspector;
- Internal and external EMAS audits and also JRC-Ispra internal combined audits.

On top of this, an ambitious project is on-going in order to implement and verify the legal compliance with respect to applicable environmental legislation. For each relevant environmental aspect, a detailed analysis is carried out in order to check how all environmental requirements are applied on-site, including the relative implementation (who does what). The legal register is updated twice a year. When significant new legislation is issued, timely communication is sent to relevant internal stakeholders.

In addition, in 2017 JRC-Ispra signed a Convention with ARPA Lombardia[39] for legal and technical support on environmental matters and in particular addressing the internal environmental authorisations. These shall be subject to analysis by ARPA in 2018. These have been subjected to an analysis by ARPA in 2018, leading to a report with some suggestions for improvement. JRC is now evaluating how to take these suggestions on board.

G9.2 EMAS registration and compliance with EMAS Regulation

JRC-Ispra has been ISO 14001 certified since 2010 and as been part of the European Commission's EMAS registration since 2015. Excellent results were obtained throughout the four years of third party EMAS verification audits, denoting the great care and commitment by JRC-Ispra towards the environment.

The 2018 internal EMAS audit was particularly successful. Its findings were: 2 best practices, 11 positive points, 4 observations and 6 "scopes for improvement". The EMAS external verification accounted for 13 strong points, 12 "scopes for improvement", 13 observations[40] and the first-ever non-conformity. It should be noted that non-conformities should be seen as a normal finding and actually as an occasion to improve one's organisation. JRC-Ispra monitors the findings of EMAS internal and external audits, and in cooperation with the EMAS Commission's corporate team, ensures that audit findings are appropriately followed up.

G9.3 Prevention, risk management and emergency preparedness

In order to test the preparedness of the JRC and the Italian authorities to respond to nuclear emergencies, the annual nuclear emergency exercise was held in February 2018 in the presence of the local and national authorities. There was a positive outcome with no further improvement actions identified.

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,

[39] ARPA Lombardia is the competent Environmental Protection Agency (i.e. Agenzia Regionale per la Protezione Ambientale)

[40] Main external verification audit findings account for 2 "operational control" and 2 "monitoring and measuring" observations.

including incidents that could have a negative impact on the environment (site and off site), were approved in early 2019 (Ref. Ares(2019)349843 - 22/01/2019). In particular, governance was redefined to align it with the new JRC organisation and procedures for a prompt internal and external communication in case of emergencies were drafted and tested during the nuclear emergency exercise held in February 2018.

In addition, the procedure for the management of emergency exercises and the planning of emergency exercises has been updated to account for all the applicable scenarios, including spillage and release of dangerous substances. The implementation of the new planning started in 2018 and two scenarios entailing an environmental issue were tested in May (nanomaterials repository) and November (incoming water treatment). Collaboration with local authorities to prepare a coordinated response in case of relevant incidental events is in progress (e.g. VVF Varese, i.e. the Fire brigade, and Milano).

G10 Communication

G10.1 Internal 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 at 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.

In 2018 the focus for internal communication was on:

a) raising staff awareness on initiatives to further improve the environmental performance of JRC-Ispra as an EC EMAS registered site;

b) fostering a change in staff behaviour and encouraging them to participate and support site initiatives.

Our intranet 'Connected' was used as a main tool for internal communication campaigns, supplemented by ad hoc staff engagement events. Highlights detailed below

Event	Description/Purpose
M'illumino Di Meno 23 February 2018	Local campaign to support EU wide energy-saving initiative. Awareness-raising action to encourage JRC-Ispra staff to help reduce energy consumption on the site by actively switching off lights, PCs and heating. An energy saving of 7% and a reduction of 12 tonnes of CO^2 was recorded with respect to business as usual conditions. **Communication Action:** Distribution of bon bons and note as a «Sweet Reminder» for staff to participate in energy-saving action; Connected blogpost; Digital signage; PC screen pop-up
JRC Double Winner at Sustainable Commission Awards May 2018	JRC-Ispra colleagues accompanied by JRC Deputy Director-General Maive Rute at the Award Ceremony in Brussels, to receive their awards for best local practice in (i) saving energy and (ii) waste reduction. An event particularly acknowledging the merits of staff engagement. **Communication Action:** Connected blogpost; Digital signage
Be Green and Ride a Service Bicycle & VeloMai May 2018	Dedicated campaign to create awareness and encourage use of our 130 service bicycles, in the margins of the EC Corporate cycling campaign 'VeloMai' **Communication Action:** Events featuring the use of service bicycles such as picnics and safe cycling courses; Posters; Leaflets; Digital signage; Dedicated Connected group with all relevant information on using service bicycles
Eco-talk on veganism and the environment June 2018	Lunchtime eco-talk by DG HR Director Fernando Garcia Ferreiro **Communication Action:** Event; Connected blogpost; Digital sigange
Bicycle-To-Work: From Idea to Reality July 2018	Signing of an agreement between JRC-Ispra and local Italian authorities for the development of a 12km cycling path between Lago di Varese and Maggiore leading to the Ispra site **Communication Action:** *Commission en Direct* dedicated article; Connected blogpost
Sustainable Events Guide Sept. 2018	Promotion of the new Commission guide on organising sustainable meetings and events **Communication Action:** Connected blogpost; Digital signage
The Italian agile frog Sept. 2018	Dedicated talk by external herpetologist on the monitoring and preservation of the endangered amphibian species resident on our site **Communication Action:** Event; Connected blogpost; Digital signage
Kill Plastic 17 – 25 November 2018	Promotion of actions adopted at the Commission's Ispra site to reduce single-use plastic, in support of the EU Plastics strategy, adopted by the Commission in January 2018. The campaign was executed during EU Week for Waste Reduction and promoted actions such as: a) Banning of plastic straws at the Clubhouse b) Elimination of single-use plastic catering at the Visitors' Centre c) Promotion of tap water d) Installation and promotion of water dispensers e) Improved waste separation to reduce plastic ending up in landfill **Communication Action:** Connected testimonials by the leaders of the above actions; Posters; Stickers; Digital Signage; Waste separation staff event. **The 'Kill Plastic' campaign has been nominated in the JRC Excellence Awards 2019, in the category «Best Team Collaboration».**
Ispra and EMAS-related environmental news and achievements Throughout 2018	Various EMAS-related Connected posts to keep environmental issues in the forefront e.g.: Annual Environmental Statement; Environmental organisation at JRC-Ispra; EMAS staff surveys and competitions

The following posters relate to the *kill plastic* campaign. Along with interviews, published on our intranet, these were disseminated daily to JRC staff during the European Week for Waste reduction.

Figure G.28 – Key figures and messages in the "Kill Plastic" Campaign (Nov. 2018)

Figure G.29 – JRC-Ispra colleagues participating in a Safe Cycling course using service bicycles and presentation to staff of the Bicycle-to-Work project (May 2018).

In 2019, further synergies will be sought with the corporate DG HR fit@work team for increasing the impact of communication campaigns with common objectives.

G10.2 External communication and stakeholder management

JRC-Ispra organises an annual EMAS Round Table 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.

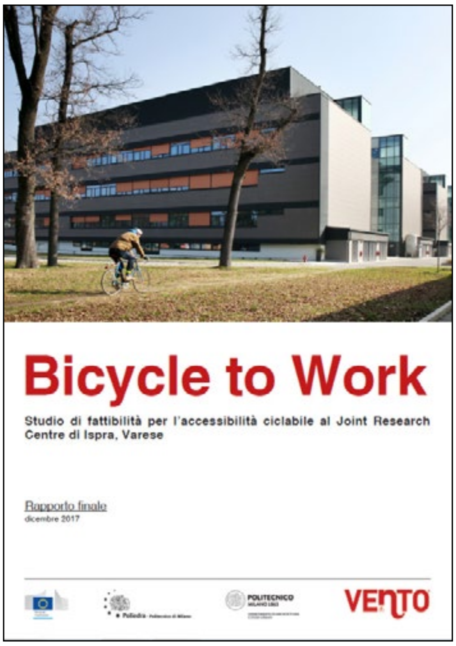
Figure G. 30 - Photo from the V EMAS Round Table

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[41]; 3 NO)
2015 EMAS Round Table	59	23	2	3	8	10 (7 VA; 3 NO)
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)

41 "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.

JRC-Ispra is trying to continuously increase participation of stakeholders to the yearly EMAS Round Table thus granting greater inclusion and transparency, which is consistent with the EMAS requirements.



Within the framework of the 2018 EMAS Round Table, JRC-Ispra underlined its desire to "step-up" and take an active role in leading by example. For instance, with respect to sustainable mobility and to promote bicycle lanes in the neighbouring area, JRC-Ispra had developed the "Bicycle to work" feasibility study drafted along with Politecnico di Milano and Agenda21Laghi. During the EMAS Round Table the "Bicycle to Work" Protocol was signed over by JRC-Ispra to the Province of Varese and the interested town halls (Ispra, Cadrezzate, Travedona Monate and Biandronno). The Protocol states that JRC-Ispra has delivered the above-mentioned feasibility study and now it is up to the Province of Varese and the town halls to find the funding to implement the bicycle lane which will be used not only by JRC staff but also by tourists, for home-school commuting, and connecting the Varese Lake bicycle path to the Lake Maggiore, etc. In due course of time, bicycle mobility in the neighbouring area is expected to boost, also by means of the "Bicycle to Work" route!

Several very positive news press articles, both within newspapers and on the web, have already been released on the bicycle to work project and underlining the very positive collaboration between JRC-Ispra and local authorities.

G11 Training

G11.1 Internal training

In JRC-Ispra internal training focused on newcomers, all of whom attended a specific JRC-Ispra environmental training session lasting 20 minutes, and which included a question and answer session. The 14 sessions encompassed 277 participants.

Six further environmental training courses were delivered to technical staff in 2018. Five of these focussed on waste management particularly including the management of laboratory waste. The remaining training course was addressed to the Environmental Liaison Officers and EMAS requirements were explained to them and also how the JRC-Ispra Environmental Management Systems functions. These six training courses were attended by 72 participants.

In addition to the above, safety training courses are progressively being extended in order to also include relevant environmental aspects, as appropriate.

G11.2 External training

JRC-Ispra does not provide environmental training for contractor staff as specific requirements for this are indicated in the technical specifications of the relevant contracts.

G12 EMAS costs and saving

The following table estimates how costs have evolved while running EMAS and for expenditure on energy, water and waste disposal. The table below shows general savings over the last years and in particular on energy and fuel costs.

Table G. 10 - EMAS costs and virtual savings in JRC-Ispra

	2013	2014	2015	2016	2017	2018	Change in last year
Total Direct EMAS Cost (Eur)	486 799	383 760	368 168	446 200	486 945	491 928	4983
Total Direct Cost per employee	219	164	160	198	214	215	1
Total buildings energy cost (Eur)	4 652 111	4 148 033	3 383 116	2 436 099	2 947 319	3 417 095	469 776
Total buildings energy cost (Eur/ person)	2 093	1 775	1 474	1 079	1 294	1 495	201
Total fuel costs (vehicles) (Eur)	24 854	20 049	19 777	11 180	11 286	9 443	– 1,843
Total energy costs (Eur/person)	11	9	9	5	5	4	– 1
Total water costs (Eur)	374 978	377 752	484 296	412 547	300 716	219 295	– 81 421
Water (Eur/person)	168.7	162	211	183	132	96	– 36
Total paper cost (Eur)	n.a.	50 197	45 619	40 082	39 156	36 645	– 2 510
Total paper cost (Eur/person)	n.a.	21	20	18	17	16	– 1
Waste disposal (non hazardous) - unit cost/tonne	176	233	251	341	293	218	– 75
Waste disposal (non hazardous) - Eur/person	102	115	135	133	149	119	– 30

Buildings energy costs have fallen by 29% since 2013: a reduction of 597 EUR/person from 2013 to 2018, and equivalent for the same reference period to a virtual saving of 1,235,016 EUR per year.

The increase in cost between 2017 and 2018 is related to the increase in the cost of methane (from 25.16 EUR/ MWh to 30.49 EUR/MWh).

Expenditure on fuel cost for service vehicles has also decreased significantly, having fallen by 62% from 2013 to 2018 representing, for the same period, a virtual saving of 15,411 EUR per year.

To be noted that fuel consumption decreased by 16% between 2017 and 2018 (20,788 litres in 2017 with respect to 17.561 in 2018). This implied a total cost decrease in the same period (-11%) even if the actual cost of petrol and diesel per litre increased.

The water unit cost has been looked into in more detail in 2018, leading to an important reduction with respect to 2017 (0.12 EUR and 0.17 EUR, respectively). This value lead to a saving of 27% in terms of expenditure on water consumption compared to 2017 even if the water use increased by 3.3%.

The total cost related to paper consumption decreased by 6% between 2017 and 2018 while the cost of paper per kg has increased (+3.45%), the decrease is linked to lower consumption of paper between 2017 and 2018 (-4.5%). A virtual savings of 13,552 EUR (or 27%) compared to 2014 was achieved.

Regarding the non-hazardous waste, the overall total cost of waste disposal increased on account of the fact that more costly waste was disposed.

To be noted that in the calculation of the total quantities of waste produced, the waste sent for recovery and sold as recyclable material is also included. They are the so-called "ferrous materials"[42] which represent about 160,000 EUR in revenue during the period 2015-2018 (101,250 EUR in 2018). The revenue is not included in the table above.

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, such as the monitoring of the Italian agile frog on-site. It therefore goes well beyond the scope of the EMAS registration itself. The increase from 2017 to 2018 in EMAS costs is accounted mostly for a new reference value to account for average civil servant's costs that the Commission uses as of 2018. The actual consultancy services were reduced in 2018.

[42] 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.

G13 Conversion factors

Parameters and units	2011	2012	2013	2014	2015	2016	2017	2018
kWh from one litre diesel	10.06	10.06	10.06	10.12	10.12	10.12	10.12	10.12
kWh from one litre petrol	8.75	8.75	8.75	8.56	8.56	8.56	8.56	8.56
Paper Density (g/m2)	80	80	80	80	75	75	75	75
Kgs CO2 from 1 kWh of electricity (national average) - upstream	0.407	0.402	0.367	0.359	0.375	0.36	0.36	0.309
Kgs CO2 from 1 kWh of electricity (supplier) - upstream losses, multiply by		0.0257	0.0246	0.0226	0.0233	0.0216	0.0209	0.0179
Kgs CO2 from 1 kWh natural gas (combustion)- convert HHV (invoice value) to LHV multiply by	1	1	1	1	1	1	1	1
Kgs CO2 from 1 kWh natural gas (combustion)- for LLV	0.2016	0.2016	0.2012	0.2010	0.2010	0.2010	0.2012	0.2014
Kgs CO2 from 1 kWh natural gas (upstream)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Kgs CO2 from 1 kWh diesel (combustion)	0.267984	0.2679768	0.2679768	0.2649132	0.2649132	0.2649132	0.2648808	0.2648808
Kgs CO2 from 1 kWh diesel (upstream)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
GWP of R22 (non Kyoto)	1 760	1 760	1 760	1 760	1 760	1 760	1 760	1 760
GWP of R410A	1 920	1 920	1 920	1 920	1 920	1 920	1 920	1 920
GWP of R134A	1 300	1 300	1 300	1 300	1 300	1 300	1 300	1 300
GWP of R404A	3 940	3 940	3 940	3 940	3 940	3 940	3 940	3 940
GWP of R407C	1 620	1 620	1 620	1 620	1 620	1 620	1 620	1 620
GWP of R507A	2 240	2 240	2 240	2 240	2 240	2 240	2 240	2 240
GWP of R422D	2 470	2 470	2 470	2 470	2 470	2 470	2 470	2 470
GWP of R23	12 400	12 400	12 400	12 400	12 400	12 400	12 400	12 400
GWP of R427A	2 020	2 020	2 020	2 020	2 020	2 020	2 020	2 020
GWP of R508B	13 396	13 396	13 396	13 396	13 396	13 396	13 396	13 396
GWP of NAF S III (non Kyoto)	1 497	1 497	1 497	1 497	1 497	1 497	1 497	1 497
GWP of R227A	2 640	2 640	2 640	2 640	2 640	2 640	2 640	2 640
GWP of SF6	23 500	23 500	23 500	23 500	23 500	23 500	23 500	23 500
Kgs CO2 from one litre of diesel (combustion)	2.70	2.70	2.70	2.68	2.68	2.68	2.68	2.68
Kgs CO2 from one litre of diesel (upstream)	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Kgs CO2 from one litre of petrol (combustion)	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26
Kgs CO2 from one litre of petrol (upstream)	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Annual cost of one FTE		132 000	132 000	132 000	134 000	134 000	138 000	148 000

The conversion factors summarised in the table above are generally standard for the all sites except for:

- "kWh of energy provided by one litre diesel" and "kWh of energy provided by one litre petrol": the conversion factors are drawn from the UNFCCCFCCC[43] national register for the reference year;
- "Kgs CO_2 from 1 kWh of electricity (of grid average)": the emission factor is drawn from the report over the disclosure of energy mix of the electricity purchased in 2017 from the Italian electricity suppliers (Terna S.p.A.) in that year. To be noted that, as the report is not available at the time of writing it has been assumed equal to the mix of 2015, i.e. the last published data;
- "Kgs CO_2 from 1 kWh natural gas", "Kgs CO_2 from one litre of petrol" and "Kgs CO_2 from one litre of diesel": the conversion factors are drawn from the UNFCCC national register for the reference year;

[43] United Nations Framework Convention on Climate Change

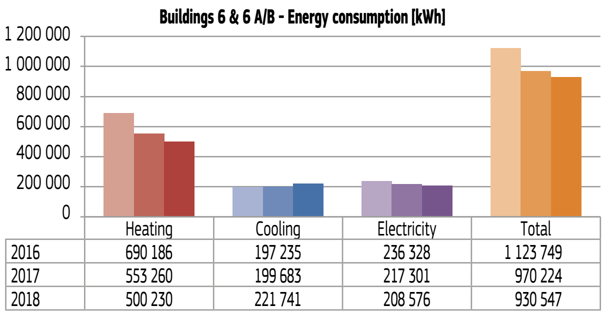
- "Kgs CO_2 from 1 kWh fuels (diesel and petrol)": the conversion factor is calculated as an average value weighted on the specific conversion factors (petrol/diesel) and on the specific site consumptions;
- "Kgs CO_2 from 1KWh of electricity (of EV)": the conversion factor is calculated from the energy mix consumed by the site, considering both self-production of electricity from natural gas tri-generation and the purchase of electricity from the grid, and self-production on site by photovoltaic plant;
- Regarding the Scope 3 carbon footprint upstream emission factor, the Ecoinvent database v3.2 was used, according to the OEF Methodology.

Finally, it is to be noted that where applicable in many graphs, due to excel automatic formatting criteria, numbers were rounded-up to the nearest whole figure.

G14 Site breakdown: characteristics of buildings and performance of selected parameters (indicative data)

JRC-Ispra is continuing the implementation of an automatic energy management system to monitor energy consumption of single buildings (see Chapter G.4.1a)). What follows are some initial examples of on-going monitoring for heating, cooling and electrical energy for sample buildings hosting mainly offices over the recorded three year time span. Data will be further analysed and actions will be decided in due course, including the decision of extending this analysis to other buildings.

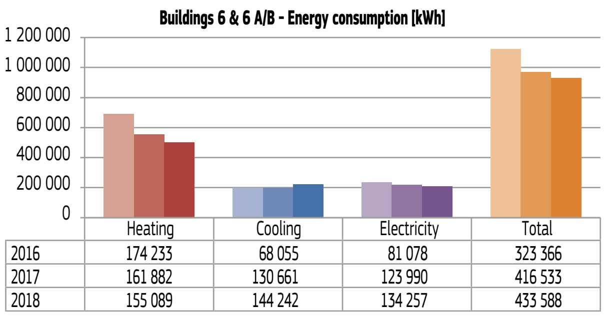
Buildings 6, 6a and 6b, administrative offices



Type energy	2018 vs 2017
Heating	-10%
Cooling	11%
Electricity	-4%
Total	-4%

This building hosts administrative staff including from the Site Management Ispra. There is a strong commitment to lead by example.

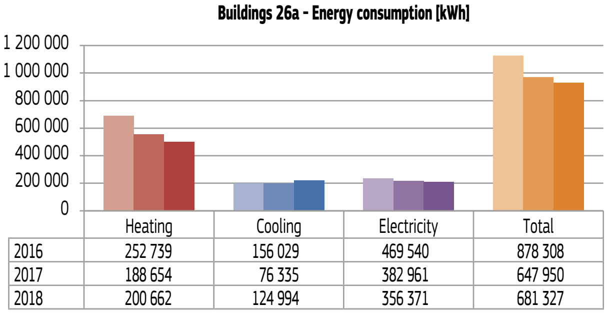
Buildings 18p, central library



Type energy	2018 vs 2017
Heating	-4%
Cooling	10%
Electricity	8%
Total	4%

The increase of energy consumption in 2017 was due to the installation of a new server room requiring greater consumption of electricity and large amounts of energy for cooling.

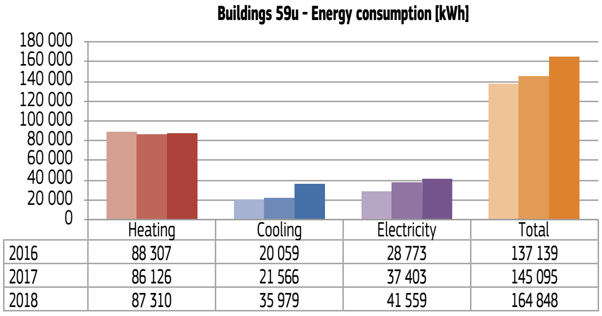
Buildings 26a, offices



Type energy	2018 vs 2017
Heating	6%
Cooling	63%
Electricity	-7%
Total	5%

The building hosts offices belonging to the Directorate B, Growth & Innovation and D, Sustainable Resources.

Buildings 59u, offices



Type energy	2018 vs 2017
Heating	1%
Cooling	67%
Electricity	11%
Total	14%

The building hosts JRC.R.I.4 Infrastructure Unit offices.

The increase of the building's electricity energy consumption in 2017 is mainly due to the installation of a charging station for service EVs as well as an increase in the number of building occupants and visitors. The 2018 value for electric energy consumption can now be seen as a reference value as the contribution of the EV charging station has covered an entire year.

G15 Acronyms

AENOR	Asociación Española de Normalización y Certificación
AIGIS	Analytic Ispra Geographic Information System
ATS-AREU	Agenzia Tutela Salute - Azienda Regionale Emergenza Urgenza *(Regional company for emergency and urgency)*
BLD	Building
BOD	Biochemical Oxygen Demand
BREEAM	Building Research Establishment Environmental Assessment Methodology
CER	Catalogo Europeo Rifiuti (*European Waste Catalogue*)
CHP	Combined Heat and Power
COD	Chemical Oxygen Demand
DG	Directorate-General
D.Lgs	Legislative Decree
EC	European Commission
EIA	Environmental Impact Assessment
EIS	Environmental Impact Study
ELO	Environmental Liaison Officer
EMAS	Eco-Management and Audit Scheme
ES	Environmental Statement
EV	Electric Vehicle
F-GAS	Fluorinated Gas
GPP	Green Public Procurement
GWP	Global Warming Potential
HR	Human Resources
HFC	Hydro-Fluoro-Carbons
HVAC	Heating, Ventilating and Air Conditioning
ICT	Information and Communication Technology
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre
KPI	Key Performance Indicator
LED	Light Emitting Diode
OEF	Organisational Environmental Footprint
PPMT	Public Procurement Management Tool
PC	Personal Computer
PV	Photovoltaic
UNFCCC	United Nations Framework Convention on Climate Change
VVF	Vigili del Fuoco (*Fire brigade*)

European
Commission

Environmental Statement 2019

2018 results

Annex H: DG SANTE at Grange

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URL: http://ec.europa.eu/environment/emas/emas_registrations/emas_in_the_european_institutions_en.htm

Cover illustration: Aerial view of the site

Environmental Statement 2019

2018 results

Annex H: DG SANTE at Grange

Foreword

2018 was the fourth 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 180 or so staff can be delivered in an eco-friendly way.

For the year 2018 we delivered a number of projects:

- The Grange Staff Social Club asked SANTE to have 25 apple trees from heritage varieties and two fig trees planted in the grounds. Once again management was 100% behind the project and gave its agreement to go ahead;
- We agreed with our caterer to replace single use plastic catering items with more sustainable ones (compostable take away cups; compostable glasses for water dispensers; compostable straws; recyclable take away containers) and during the public procurement for a new catering contract this became a contractual obligation;
- We also invited a local NGO to meet Grange staff to inform us of the possibilities for recycling, both domestically and in our professional lives.

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)
Paola Colombo
Director
DG SANTE - Dir. F – Health and food audits and analysis

Contents

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 179 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 abroad and therefore at any one time many staff are on mission. The site is currently certified EMAS compliant and was included in the Commission's EMAS registration in 2015; 2016 and 2017. SANTE is responsible for overseeing site management and the implementation of EMAS on site.

In this document, the European Commission site will be referred 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 proposed for Commission level reporting

Physical indicators	**Historic data values**					**Performance trend (%) since:**				**Target**	
(Number, desciption and unit)	2005 [1]	**2014**	2016	2017	2018	2005	2014	2016	2017	2020*	
										Δ % [2, 3]	value [2, 3]
1a) Energy bldgs (MWh/p)	10.21	**12.69**	12.52	11.58	10.75	**5.3**	**-15.3**	**-14.1**	**-7.1**	-5.0	12.06
1a) Energy bldgs (KWh/m^2)	199	**227**	238	217	192	-3.3	**-15.3**	**-19.1**	**-11.6**	-5.0	215.6
1c) Non ren. energy use (bldgs) %		**92.5**	92.5	91.4	89.9		-2.8	-2.8	-1.6	-5.0	87.8
1d) Water (m^3/p)	30.66	**27.69**	19.76	17.12	18.11	**-40.9**	**-34.6**	**-8.4**	**5.7**	-5.0	26.30
1d) Water (L/m^2)	597	**495**	375	322	324	**-45.8**	**-34.6**	**-13.7**	0.7	-5.0	470.3
1e) Office paper (Tonnes/p)	0.00	**0.010**	0.033	0.020	0.018		**79.4**	**-44.0**	**-7.3**	-5.0	0.010
1e) Office paper (Sheets/p/day)		**9.9**	33.3	20.2	18.7		**88.1**	**-44.0**	**-7.3**	-5.0	9.4
2a) CO_2 buildings (Tonnes/p)	4.37	**5.14**	4.84	4.32	4.03	**-7.6**	**-21.5**	**-16.6**	**-6.7**	-5.0	4.89
2b) CO_2 buildings (kg/m^2)	85	**92.0**	91.8	81.2	72.1	**-15.2**	**-21.5**	**-21.4**	**-11.1**	-5.0	87.4
2c) CO_2 vehicles (g/km, manu.)		**174**	174	174	174		0.0	0.0	0.0	-5.0	165.3
2c) CO_2 vehicles (g/km, actual)		**174**	174	174	174		0.0	0.0	0.0	-5.0	165.3
3a) Non haz. waste (Tonnes/p)	0.000	**0.251**	0.264	0.206	0.253		0.5	-4.4	**22.8**	-5.0	0.239
3b) Hazardous waste (Tonnes/p)	0.000	**0.000**	0.001	0.001	0.050					NA	NA
3c) Separated waste (%)		**95.0**	96.0	94.2	94.8		-0.3	-1.3	0.6	5.2	99.9
Economic indicators (Eur/p)											
Energy consumption (bldgs)		**709**	639	619	633		**-10.8**	-1.0	2.2	-5.0	674
Water consumption		**34.06**	24.30	21.06	22.27		**-34.6**	**-8.4**	**5.7**	0.0	32.35
Non haz. waste disposal										0.0	0.0

Note: (1) Earliest reported data; (2) compared to 2014; (3) EMAS Annual Action Plan 2019

* Target for % improvement for the period 2014-2020

The site increased water consumption (per m^2 and per person) marginally in 2018 compared with 2017. Energy consumption for buildings and CO_2 emissions per square meter have reduced. Energy and water consumption have fluctuated since the site opened. Poor roof insulation and window draughts have been identified as primary causes contributing to our energy consumption (mainly oil). Major roof insulation works took place and were successfully finished end of 2017 and another large-scale joinery project of replacing all problematic windows started in 2018 and still is ongoing.

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
Population: total staff	188	186	189	182	179	180	190	188	179
Total no. operational buildings					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

H2 Description of SANTE Grange's activities, setting and stakeholders

H2.1 Activities

SANTE Grange has about 179 employees, made up of professionals originating from virtually all 28 Member States of the European Union, trainees and IT contractors working on site.

SANTE Grange carries out audits in EU Member States and in countries exporting food, feed, animals or plants to the EU to verify that standards set out in EU legislation are met. It checks how the national authorities in each country ensure that products put on the EU market are safe. SANTE Grange audits also check that national authorities keep important animal and plant diseases under control and that animal welfare rules are respected.

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.

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**
Risk of legal restrictions and/or the establishment of trade barriers, e.g. as a result of UK exit from EU	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 new legal requirements and assess the level of compliance and actions required, if applicable.	2	3	6
Legal changes	Significant changes to environmental legislation (Risk)	2	3	6	Continuous monitoring of potential changes.	1	3	3
Technology failure	Legal or licence breach due to failure of control or abatement technology.	3	5	15	Preventive maintenance. Monitoring and analysis of trends in environmental KPIs.	2	3	6
Waste	Inappropriate segregation, storage, transport or disposal of waste leading to significant impact on environmental media, Commission reputation, cost in fines and/or remediation, risk of moderate to high environmental emergency.	2	5	10	Waste management procedures. Authorised and approved waste management contractors for collection and treatment. Aramark waste management procedures and actions.	1	3	3

External issues and circumstances affecting Grange's environmental performance

These have been analysed using PESTLE[1] criteria, and both risks and opportunities identified, and reference to actions are presented below:

PESTLE	
Issue	**Impact/Action/Opportunity**
Political	
◆ Strong pro-European Union sentiment across political parties and state bodies ◆ EU taking a greater role in setting and driving policy, e.g energy ◆ Ongoing concern over Russian gas supply – EU driving for an energy union to address ◆ Britain exit of EU which could impact energy and waste management supply and prices ◆ Government targets for environmental and energy improvements – 30% CO_2 reduction by 2020 ◆ China market for plastic waste closed to EU	◆ Continue to reduce energy demand and use on site ◆ Monitor energy market changes and opportunities ◆ Reduce/eliminate hazardous waste ◆ Reduce packaging waste
Economic	
◆ Indigenous economic growth forecasts strong but impact of Brexit and type of Brexit not known ◆ Continued low oil and gas prices ◆ FX fluctuations ◆ Increase in interest rates	◆ Impact on Asset Management- Workplan, risk management and strategies, contingencies ◆ Cost of assets

Internal issues and circumstances affecting Grange's environmental performance

These have been analysed using PESTLE criteria, with consideration of both risks and opportunities, the most important are as follows:

PESTLE	
Issue	**Impact/Action/Opportunity**
Social / Culture	
◆ Transport needs of employees ◆ Good relationships with neighbours – e.g. Teagasc, GAA club	◆ Existing and future Corporate Social Responsibility programmes ◆ Possible heating supply from Teagasc bio-gas project

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, which supplies water to the site; Irish Water, which removes waste water 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 contractor has 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, other 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.

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

In addition to periodic formal and informal communications with stakeholders the Commission arranges specific events and meetings, including the following conducted in 2018:

1. Teagasc: periodic discussions on the potential supply of heating water to the site from a bio-gas facility installed on the Teagasc site.
2. OPW: a number of meetings to request OPW's assistance in putting in place a multi-annual plan that will help us to improve and minimise our impact on our biodiversity on site

Figures 1 & 2: Stakeholder Analysis

Stakeholder analysis

Importance to External Stakeholders	Very Important	• Comission 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	
		Important	Very Important
		Importance to the European Commission	

	Sustainable develop.	Business Continuity	Reputation & Brand	CSR	Infra-structure	Staff competence & engagement staff	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

Colour	Meaning
(red)	Legal requirement
(orange)	Very important
(green)	Important
(white)	Not important

Figure H2: Aerial view of SANTE Grange

As shown in Figure H2, 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 being used more and more frequently.

Notable features in the vicinity include a surface watercourse along the Teagasc boundary and which discharges into the River Boyne.

The Commission site also includes an old wastewater treatment plant, disused since October 2010, that still awaits decommissioning by the site owner - the Office of Public Works (OPW). 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.

H3 Environmental impact of Grange activities

A local procedure for the identification, 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 H3, which also shows the related indicators and actions identified in the Commission's 2018 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 below.

Table H3 – Summary of significant environmental aspects for the Grange site

Environmental aspect	Environmental impact	Activity, product or services	Indicator/Action plan	Significance Rating
Hazardous Materials	Potential impacts include contamination of air, water and land.	Operation of equipment, cleaning, maintenance and catering	Potential impacts include contamination of air, water and land. Safety Data Sheets are available for all chemicals in use. Secondary containment is in place for bulk chemicals and smaller containers. This is designed to prevent release of chemicals to groundwater, or drainage. The main fuel tank has been integrity tested and repairs implemented as applicable. An incident occurred in 2017 when the 1000 litre day tank for the generator was overfilled from the main tank and oil flowed onto the floor of the generator room. This has been assessed and corrective actions identified, but not yet fully implemented. The risk has been increased in this evaluation until the new measures are fully evaluated and proven.	54
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	Energy usage is monitored, however this is not related to specific significant energy users in order to identify energy reduction opportunities. Projects have been implemented to reduce energy use (e.g. energy saving from changing out sodium for led fittings for external lighting) or energy equivalent use (e.g. by saving water). An energy audit has been conducted by a specialist energy auditor and additional opportunities identified and plans are in place to implement improvements this year.	54

Environmental aspect	Environmental impact	Activity, product or services	Indicator/Action plan	Significance Rating
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..	Commission has installed gas oil burners which generates GHG.The burners are well maintained and serviced as required. Gas oil use for 2018 was 19.87% below 2017. This continues the improvement from 2017 and indicates the success of the insulation project completed in 2017. Gas oil use for 2017 was 11.87% below the useage for 2016, which in turn was 4.3% below the useage for 2015. The overall pattern of use was similar with the expected dip in the summer months. Lifecycle considerations for fuels include sourcing of oil and impacts on environment, depletion of resources, transport of fuel. Burning of fossil fuels creating CO_2 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.	54
Resource consumption (Energy – Bio – LPG)	Energy production and usage has impacts on air as well as depletion of natural resources.	Bio- LPG is used for cooking purposes and also for heating water during the period May - Sept when boilers are not working.	Commission has installed a LPG fired boiler which generates GHG.The LPG boiler is well maintained and serviced as required. Bio-LPG use for 2018 was 5,727lts well above the 2017 235.97lts (2018 is the year when Bio-LPG was also used to help to heat water. Previous years it was only used for cooking). Lifecycle considerations for Bio-LPG include sourcing and impacts on environment, depletion of resources and its transport. Creating CO_2 emissions and other pollutants. Storage of fuel doesn't present a risk of 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.	54
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. It has diverted 94% of non-hazardous waste from landfill (down slightly from 95% the previous year). Total non-hazardous waste levels for 2017 were 23% down on 2016. 2016 figures were 20% higher than for 2015. This was explained by a major re-organisation during the year involving employees moving office and removing a significant amount of waste during the process. This occurred in February when there was nearly 8 tonnes of non-haz waste generated, in comparison wth a monthly average of about 3 tonnes. If this additional 5 tonnes is not included, the overall figures are virtually identical (40.19 vs 40.30 tonnes). This tends to suggest that non-hazardous waste has been reduced by approximately 3% in 2017, based on a «normal» year, without the office moves experienced in 2016.	48

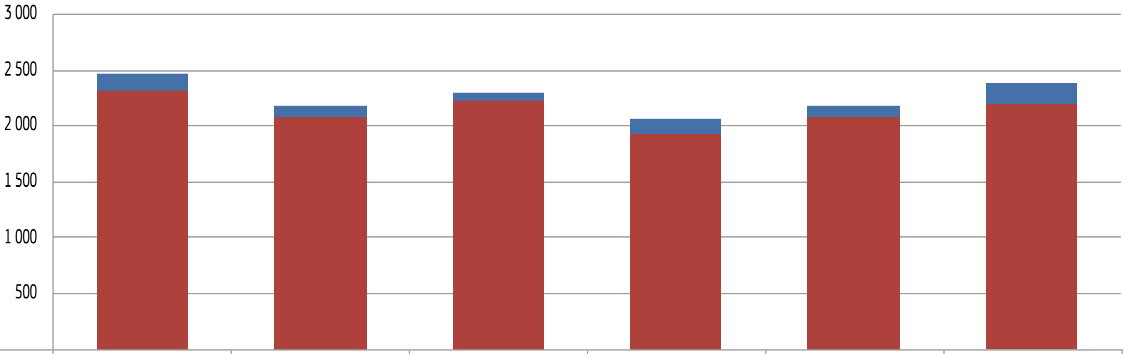
Environmental aspect	Environmental impact	Activity, product or services	Indicator/Action plan	Significance Rating
Water use	Upstream impact on treatment and delivery to site, including energy, land use, materials and chemicals. Downstream impacts include requirements related to water treatment and potential 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. The impact of water use during 2017 has been significantly reduced from 2016 based on the monitoring data from the site. 2017 use was 14.25% lower than 2016, which was 31% lower than the previous year.	36
Storm water and surface water	A spillage of hazardous material is a possible source of release to surface water. Containment and spill control are in place where necessary, i.e. gas oil tank bund, cleaners store spill kits and containment. Oil or fuel leaks from vehicles in parking areas could cause a release to surface water. A leak from the septic tank (no longer used) could cause a surface water emission but would be more likely to effect ground water. An incident occurred in the generator room when the day tank overflowed into the room and had the potential to cause significant pollution of surface water.	Rain water run off from roofs, hard standing areas, car parks etc. Fire water run off.	It is possible that contaminated water would reach the surface water system if there was a leak from a vehicle or a storage vessel. Chemicals stored within the buildings are in secondary containment, as are fuels and water treatment chemicals. An overflow of the day tank for the diesel generator occurred as outlined above. A detailed root cause analysis and action plan has been implemented to address the issue. Additional controls were required for the generator day tank to prevent overflow (high level detection and switch and closure of the link to the main tank). This was in response to an overflow at the generator tank.	36

H4 More efficient use of natural resources

H4.1 Energy consumption

Buildings energy consumption data should be considered in the context of climatic conditions. Analysis of degree data suggests that climatic conditions were harsher in 2018 than in 2017, and consequently that more heating was necessary.

Figure H3: Indicative climate conditions [2]

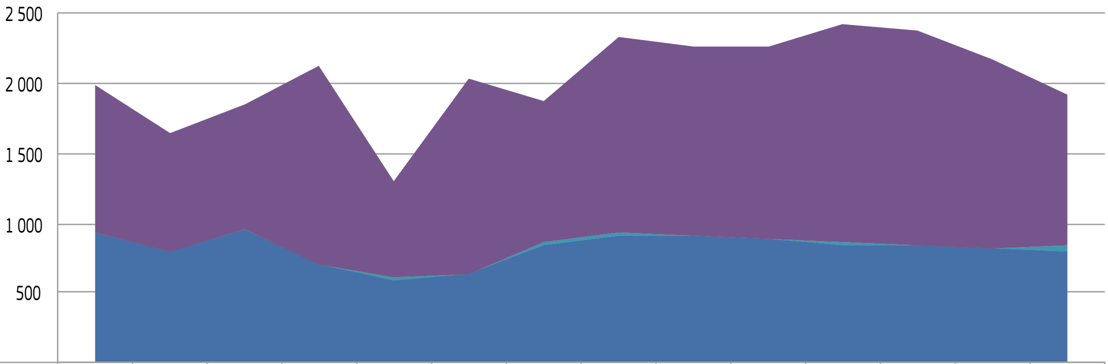


	2013	2014	2015	2016	2017	2018
Total degree days	2 458	2 179	2 297	2 056	2 173	2 376
Cold degree days (CDD), cooling required	147	110	63	128	105	185
Hot degree days (HDD), heating required	2 311	2 069	2 234	1 928	2 068	2 191
kWh/person/degree day	5.05	5.82	5.86	6.09	5.33	4.53

a) 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 litre bunded storage tank. There is no mains connection for gas on site because there is no such facility in the area. Gas 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 H4 Annual buildings energy consumption (MWh) in the EMAS perimeter[3] (indicator 1a)



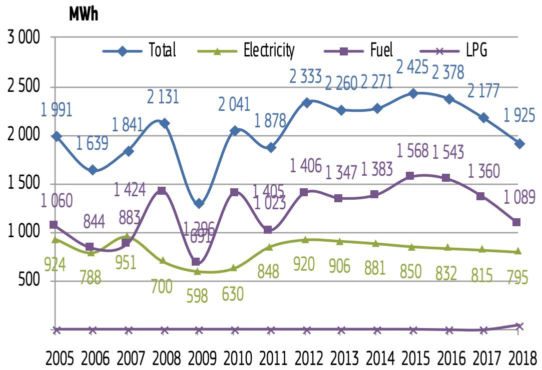
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	1 991	1 639	1 841	2 131	1 296	2 041	1 878	2 333	2 260	2 271	2 425	2 378	2 177	1 925
diesel	1 060	844	883	1 424	691	1 405	1 023	1 406	1 347	1 383	1 568	1 543	1 360	1 089
mains supplied gas														
tank supplied gas (LPG)	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
electricity	924	788	951	700	598	630	848	920	906	881	850	832	815	795

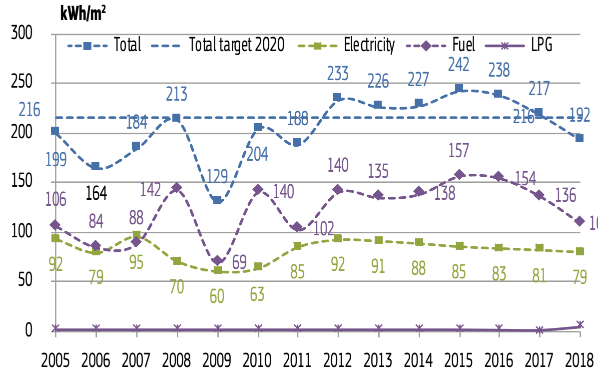
Per capita and consumption per square metre are presented in figures H5 and H6.

2 www.degreedays.net; monthly data for EBBR station (15.5 C reference temperature).

3 Which has expanded steadily since first registration in 2005.

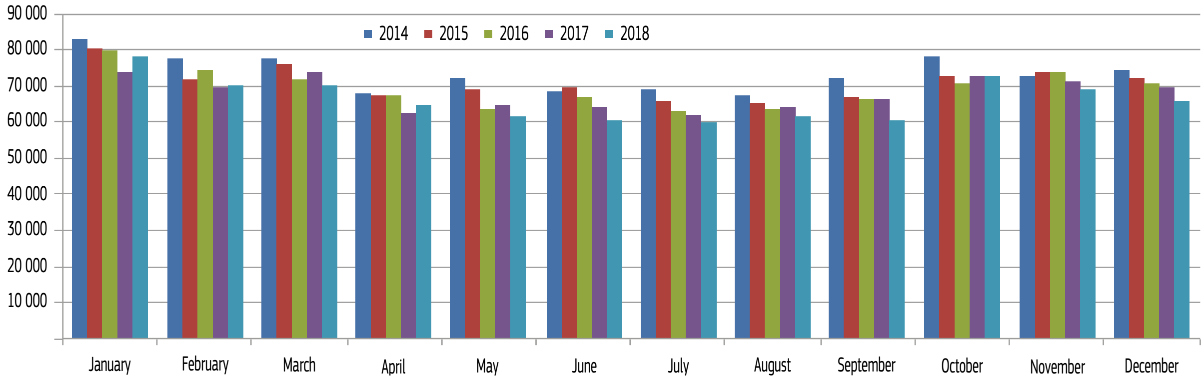
Figures H5 and H6: Evolution of total annual energy consumption for Grange EMAS buildings





In 2018 the main electrical project that took place, and contributed to reducing our energy consumption, was the disconnection of one out of the six lights in each of the ± 48 offices located in the area of the building known as block 2, since we assessed that there was enough light in each office (mostly occupied by only one person in average). Each light has a capacity of 55Wh and block 2 has ± 48 offices, therefore 55wh x 48 = 2,640Wh or 2.6 KWh.

A breakdown of electrical consumption (an environmental aspect with significant environmental impact) by month in 2018 is provided in **Figure H7** here below.



The trends in electricity consumption are largely related to external causes such as climate, seasons (natural light levels) and to office occupancy rates.

Indeed, in 2018 staff conducted 220 audit missions amounting to a total of 3673 person-days of staff absence. That combined with other factors such as holidays, missions to Brussels and other absences has an impact on electricity consumption.

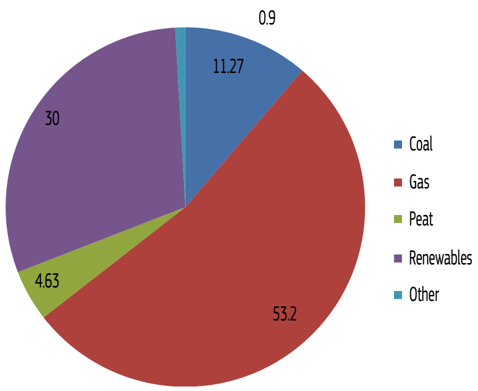
b) Vehicles

The site vehicle which is used for audit missions in either (the Republic of) Ireland or Northern Ireland is a 1999 Seat Alhambra diesel with CO_2 emissions of 174g/km, according to manufacturer's specifications. The distance travelled each year is typically low, and only 729km in 2018.

c) Renewable energy use in buildings and vehicles

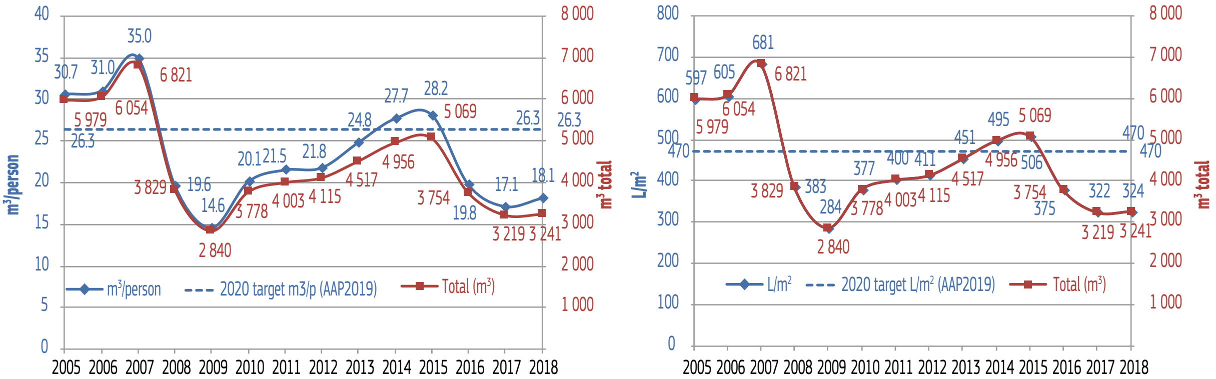
The composition of the grid electricity supply is shown in Table H8. Gas is still the most important component, but renewables account now for 30% compared with the 25.73% of 2017.

Figure H8: Renewable and non-renewable energy use in buildings (MWh and percentage of total)



H4.2 Water consumption

Figures H9 and H9a: Evolution of total annual water consumption for Grange EMAS buildings



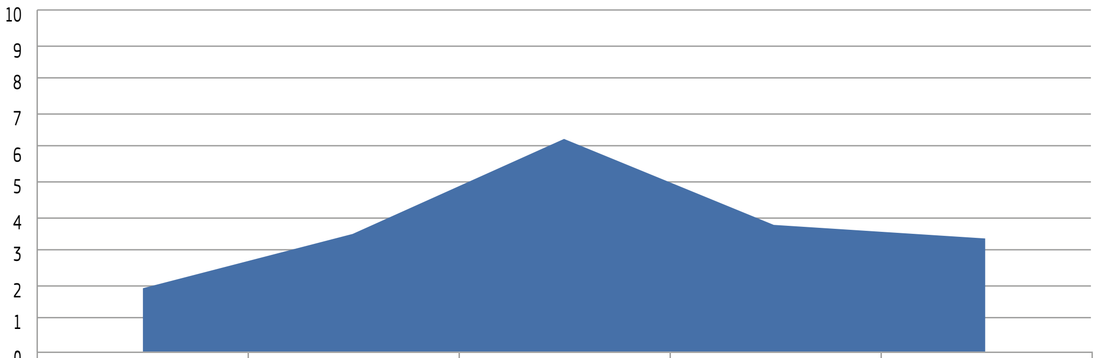
Figures H9 and H9a, show water consumption as a total and per square metre since 2005. 2018 has seen a marginal increase of around 0.68% (mainly due to a major leak as a consequence of a burst pipe in our hydrant tank) when compared with the previous year and this despite a year on year increase in the number of external meetings and workshops on site. In 2018 we had 32 meetings with an average duration of 2 days and 1,189 visitors were registered that year.

H4.3 Office paper consumption

Paper usage in 2018 was 695,000 sheets, an average of 3,882 sheets/person, equivalent to around 17.6 sheets per working day (± 220 working days/year), a major improvement when compared with the 2016 figures – 7,037 sheets/person = 33,3 sheets per working day.

In 2015 all printers and photocopiers had the option to print double sided set as a default. Since 2015, Grange followed other Commission sites in using 75g/m² office paper instead of 80g/m². The difference in the figures can also be explained in the implementation of a better usage control procedure that ensures that the usage data is more accurate.

Figure H10: Evolution of total paper consumption at Grange



	2014	2015	2016	2017	2018
Office (A4 sheet equivalent)x1 000 000	0.38	0.76	1.34	0.80	0.71
Total paper consumption (tonnes)	1.839	3.54	6.254	3.74	3.3
Offset paper (tonnes)	0	0	0	0	0
Office paper (tonnes)	1.839	3.54	6.254	3.74	3.3

H5 Reducing carbon footprint and air emissions

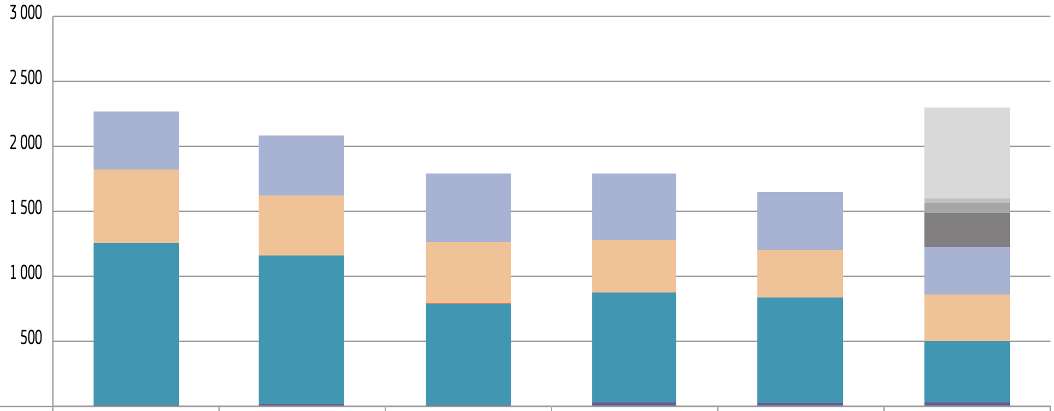
H5.1 Carbon footprint

Emissions associated with energy supply for the buildings still account for virtually 75% of all the CO_2 emissions evaluated for the site. Business air travel emissions have substantially decreased when compared with previous year 2017.

Table H4: Per capita CO_2 or equivalent (CO_2e) emissions 2013 to 2018 by scope (tonnes)

	2013	2014	2015	2016	2017	2018
Scope 1 - Own direct fuel consumption and direct losses	**2.01**	**2.09**	**2.38**	**2.20**	**1.96**	**1.73**
Buildings fuel consumption	2.01	2.09	2.36	2.20	1.96	1.69
Coolant losses (CO_2e)	0.00	0.00	0.03	0.00	0.00	0.04
Scope 2 - Purchased energy	**2.66**	**2.17**	**2.25**	**1.78**	**1.56**	**1.60**
Electricity	2.66	2.17	2.25	1.78	1.56	1.60
Scope 3 - Other "indirect" sources	**7.78**	**7.37**	**5.30**	**5.47**	**5.27**	**9.53**
Upstream losses (buildings fuel consumption)	0.44	0.46	0.52	0.49	0.43	0.37
Upstream losses (electricity)	0.42	0.42	0.40	0.37	0.37	0.38
Upstream losses (district heating)	0.00	0.00	0.00	0.00	0.00	0.00
Missions (air, RFI=2)	6.86	6.38	4.31	4.47	4.32	2.64
Business (non air travel)	0.06	0.11	0.07	0.06	0.07	0.08
Commuting	0.00	0.00	0.00	0.07	0.08	0.08
Fixed assets - buildings						1.44
Fixed assets - IT						0.47
Goods and service contracts						0.13
Own waste						3.94
Total	**12.45**	**11.63**	**9.94**	**9.45**	**8.79**	**12.86**

Figure H11: CO_2 or equivalent emissions generated by Grange, 2013 to 2018 (tonnes)

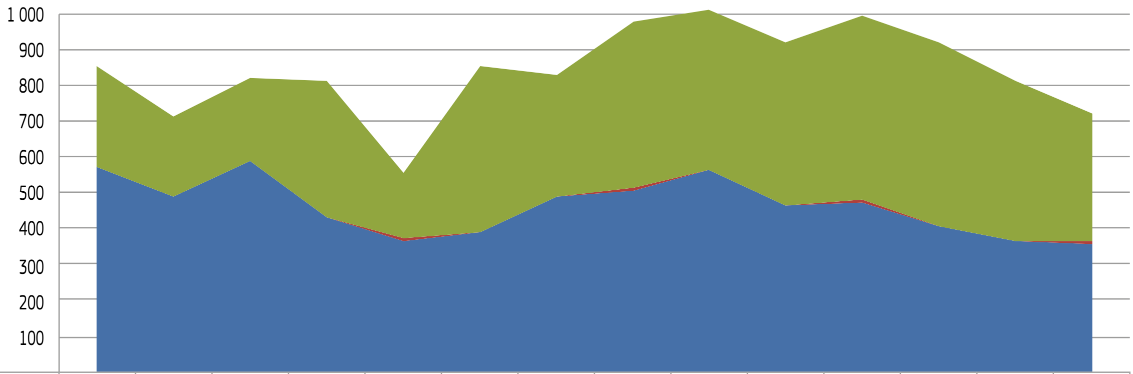


	2013	2014	2015	2016	2017	2018
Sum	2 266	2 082	1 789	1 795	1 652	2 303
Own waste						706
Goods and service contracts						24
Fixed assets - IT						83
Fixed assets - buildings						258
Buildings - fuels for heating	446	458	519	510	449	368
Buildings - electricity	562	463	477	409	363	355
Buildings - district heating/cooling	0	0	0	0	0	0
Buildings - coolant losses			5			7
Vehicle fleet - fuel consumption						
Missions (air, RFI 2)	1 248	1 142	776	850	811	473
Missions (excluding air)	10	19	12	11	14	14
Staff commuting				14	14	14

H5.2 CO_2 emissions from buildings

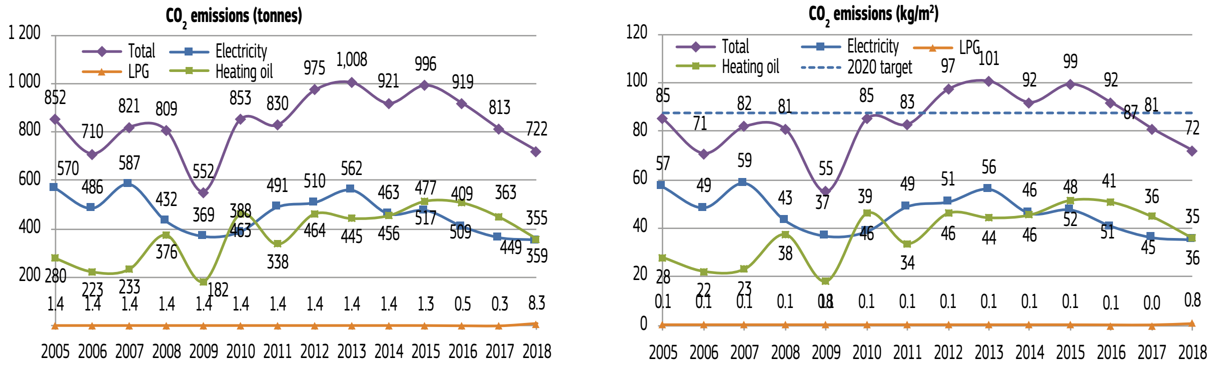
a) Buildings (energy consumption)

Figure H13: CO_2 emissions from buildings energy consumption at Grange, (tonnes)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	852	710	821	809	552	853	830	975	1 008	921	996	919	813	722
diesel	280	223	233	376	182	463	338	464	445	456	517	509	449	359
tanked gas	1	1	1	1	1	1	1	1	1	1	1	1	0.3	8.3
electricity	570	486	587	432	369	388	491	510	562	463	477	409	363	355

Figure H14 and H15: CO_2 emissions from buildings energy consumption



Less heating oil was used in 2018 compared to 2017 (-19.87%). CO_2 emissions due to electricity consumption fell by 9 tonnes. Per capita CO_2 emissions in 2018 were 3.99 tonnes of which 1,98 from electricity generation and 2.01 from diesel.

b) Buildings other greenhouse gases (cooling gases)

A loss of 7.10 tonnes of Co_2 from leaking R407C refrigerants was recorded in 2018 from one of the two main Hitachi chillers for the air-conditioning system in the main conference rooms, following the maintenance schedule below:

i) air conditioning units (quarterly/six-monthly and annually depending on capacity);

ii) main kitchen freezers and fridges (six-monthly and annually); and

iii) 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.

H5.3 CO_2 emissions from vehicles

a) Commission vehicle

The car is well maintained and serviced according to the manufacturer's service schedule. Since annual CO_2 emissions are quite low, it was decided that no further action was required.

b) Missions (excluding Commission vehicle)

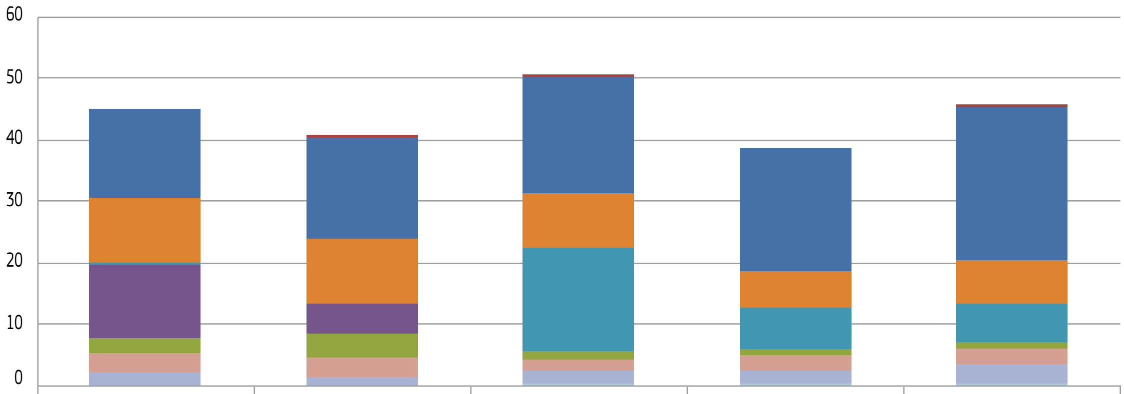
Missions within the EU and to third countries are part of SANTE Grange's core business. All missions carried out are part of an approved work programme of official controls and, in setting priorities, every effort is made to ensure that the missions carried out are essential. At the same time SANTE has invested in improvements to its video conference facilities to allow meeting take place without the need to travel, particularly between colleagues in SANTE's three locations (Brussels, Luxembourg and Grange).

H6 Improving waste management and sorting

H6.1 Non hazardous waste

Waste generation is an environmental aspect with significant impact, and the evolution of waste generation since 2014 is shown below.

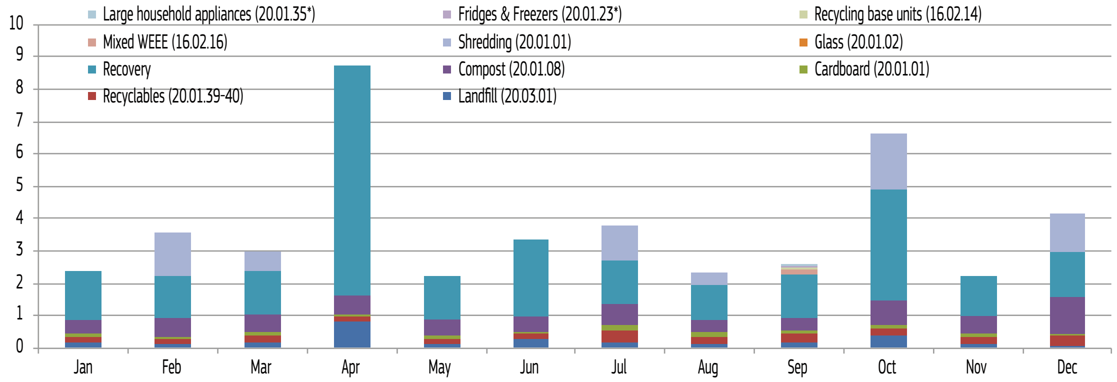
Figure H16: Evolution of total non-hazardous waste in Grange (tonnes)



	2014	2015	2016	2017	2018
Total	45.0	40.5	50.2	38.7	45.2
Total (tonnes/person)	0.25	0.23	0.26	0.21	0.25
Glass (20.01.02)	0.0	0.1	0.130	0.000	0.070
Recovery*	14.6	16.6	18.790	20.080	24.660
Compost (20.01.08)	10.3	10.3	8.960	5.960	7.080
Shredding (20.01.01)	0.3	0.0	16.660	6.470	6.370
Paper (20.01.01)	11.9	5.1	0.000	0.000	0.000
Cardboard (20.01.01)	2.4	3.8	1.290	1.360	1.030
Recyclables (20.01.39-40)	3.1	3.2	1.950	2.320	2.610
Household waste, landfill (20.03.01)	2.3	1.5	2.009	2.246	2.839
Mixed WEEE (16.02.16)			0.428	0.188	0.520
Recycling base units (16.02.14)			0.000	0.042	0.042

2018 saw an increase of non-hazardous waste generation (± 15% compared to 2017). In 2018, figures increased mainly due to: the disposal of a large number of old office chairs (and other furniture) following an upgrade to new ergonomic ones decided on H&S grounds; and, a major clean-up of our compound.

Figure H17: Monthly breakdown of waste in 2018 (tonnes)



Recovery is still the largest single component, compost (food waste from the kitchens) has overtaken shredding and the three of them account for ± 85% of the total waste.

H6.2 Hazardous waste

In 2018 8.975 tonnes of hazardous waste were collected. There was 8.94 tonnes of oily water from oil/water separators and 35 kg of fluorescent tubes and other mercury-containing waste.

H7 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 447 m² of the site or 52,7m² of the built up area.

The main actions regarding the protection and enhancement of our bio-diversity, was i) the planting of 25 apple trees from heritage varieties and two fig trees. This was an action presented by the Grange Staff Social Club and once again Dir. F Management was 100% behind the project and gave its authorisation to go ahead, ii) the replacement of 3 dead English oaks with new ones.

H8 Green Public Procurement

Separate tenders for Facilities management, Childcare, Electricity services were launched in 2018 and each contained reference in the technical specifications to EMAS. SANTE envisage to use 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. For instance, the tender regarding the electricity supply would fall under the "green by nature" classification since one of the criteria is that the electricity supplied must be 100% renewable.

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.

H9 Demonstrating legal compliance and emergency preparedness

H9.1 Management of 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[4]. 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:

a. Full title of legislation;

b. Reference number;

c. Purpose of the Act/Regulation/Directive; and

d. Summary of the Act/Regulation/Directive.

[4] www.pegasuslegalregister.com.

The Register of Environmental Legislation is divided into the following sections:

1 - General Environmental Legislation	7 - Energy
2 - Water	8 - Dangerous Substances
3 - Waste	9 - Emergency Preparedness
4 - Air Pollution	10 - Habitats and Eco systems
5 - Physical Planning	11 - Existing Licences, Planning Permissions and EMS Policy
6 - Noise	

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.

H9.2 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 (LPG) tank on site is subject to maintenance and periodic testing by the supplier, who also own the tank.
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 FM 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.

H9.3 Emergency Preparedness

The Emergency Plan, last updated in 11/10/2018 contains procedures for minimising the potential for impacts associated with significant environmental aspects, for example contaminants leaking into the surface water drainage system, or directly into the ground.

H10 Communication

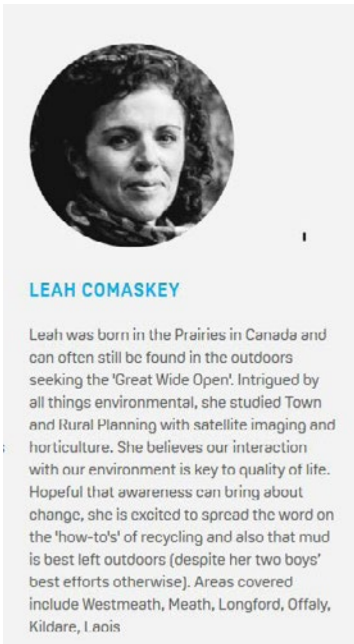
H10.1 Internal communication

Internal communication may involve Commission staff and contractors. A summary of the actions is included here below:

Step	Method	Person responsable	Target Date	Status
1	Communicate key environmental messages through meetings, induction, signs, posters and notice boards	ECOR, Facilities Management Team	All year round	Done (via emails)
2	Periodically circulate environmental information and references by email, including ◆ Commission environmental website ◆ Commission and Office EMAS Policies ◆ EMAS Manual ◆ EMAS Objectives and Programmes ◆ KPIs ◆ EMAS Statement	ECOR	All year round	Done (messages via the weekly FAN email)
3	Use the screens on site to highlight environmental issues: ◆ Environmental aspects ◆ KPIs ◆ Projects ◆ Behaviour ◆ Achievements	ECOR	Every end of the month and when needed	Presentation of monthly utilities KPIs results via TV screen
4	Hold knowledge hours for environmental information	ECOR	Q3 2018	Presentation of an awareness campaign on recycling waste by an Irish ONG (Voice)

Samples of internal communication are shown below:

Presentation to all Directorate F staff on Waste (point 4 of table above)







H11 Training

An introductory EMAS training course was 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.

H12 EMAS Costs and saving

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

Parameter	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Change in last year
Total Direct EMAS Cost (EUR)	0	0	0	0	0	0	0	0	0	47 400	47 900	48 356	49 356	51 856	2500
Total Direct Cost per employee	0	0	0	0	0	0	0	0	0	265	266	255	263	290	27
Total buildings energy cost (Eur)	0	0	0	0	0	0	0	0	0	126 956	124 246	121 390	116 398	113 228	- 3170
Total buildings energy cost (Eur/ person)	0	0	0	0	0	0	0	0	0	709	690	639	619	633	13
Total water costs (Eur)	0	0	0	0	0	0	0	0	0	6 096	6 235	4 617	3 959	3 986	27
Water (Eur/person)	0	0	0	0	0	0	0	0	0	34	35	24	21	22	1

Energy is by far the largest single resource cost. We can see that in 2018 energy costs represented ± 67% of the total amount.

H13 Conversion factors

Table H13: Conversion factors used in producing data for the Grange site

Parameter and units	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
kWh of energy provided by one litre diesel (1)										10.89	10.89	10.89	10.89	10.89
Paper Density (g/m^2)										78.63	75	75	75	75
Kgs CO_2 from 1 kWh of electricity (2)	0.532	0.532	0.532	0.532	0.532	0.532	0.494	0.469	0.535	0.44	0.476	0.407	0.361	0.361
Kgs CO_2 from 1 kWh tanked gas (3)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Kgs CO_2 from 1 kWh diesel (1)	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Kgs CO_2 from one litre of diesel (3)										2.5	2.5	2.5	2.5	2.5
Kgs CO_2 from one litre of petrol (3)										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
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	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

H14 Site breakdown: characteristics of buildings and performance of selected parameters (indicative data)

Table H14: Site breakdown: characteristics of buildings and performance of selected parameters (indicative data)

Building	Address	Occupant	Construction Yr	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	Electricity	Mains gas	Other gas	Diesel	District heating	District cooling	Site renewable solar	Site renewable biomass	Water (m^3)	Non hazardous waste (tonnes)	Hazardous waste (tonnes)	Wastewater discharge (industrial)
1) Building essential details 2017:							**2) Building use 2017**														**3) Energy sources and amount (MWh for 2018)**								**4) Water and waste consumption**			
GRANGE																																
GRAN	Grange, Kiltale, Dunsany, Co Meath, Ireland	DG SANTE/ Dir F	2 002	BXL -000003	10 010	179	X	X	X	X	X			X	X	X	X				795		40.5 5	1 089					3 241	45.22	8.98	

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