

HSE Occupational Health & Safety and Environmental Protection unit

Environmentally Responsible Research at CERN

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Content

Brief historical background on environment@cern

Current organization of environmental protection and overview of recent projects with environmental concerns

Focus on: Energy – Emission of Greenhouse Gases – Water and Effluents – Biodiversity – Waste

Conclusions & Perspectives



About CERN





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About CERN

23 Member States

~ 3600 employees



~ 12'500 scientists using the Laboratory's facilities

18 fenced sites

- **Globe of Science and Innovation**
- 3 Hotels, 3 Canteens, Kindergarten
- ~ 653 Buildings (421'811 m²)



In 2018, more than 40% of the CERN budget was returned to industry through the procurement of supplies and services. CERN strives to ensure a balanced industrial return for its Member States (see p. 33).



Brief historical background on environment@cern (1/7)

Environmental concerns prior to 2000:

Late 50s – PS – Radiological Environmental Monitoring

Mid 70s – SPS – Extended radiological environmental monitoring







Brief historical background on environment@cern (2/7)

Environmental concerns prior to 2000:

Early 80s – LEP – Environmental Impact Study

Common environmental domains linked to civil engineering – specific to LEP – special care to: landscaping – environmental radiological impact – noxious gases (linked to synchrotron radiation) and impact on water resources





Brief historical background on environment@cern (3/7)

Environmental concerns prior to 2000:

Late 90s - LHC - Environmental Impact Study

Similar than for LEP, with more emphasis on certain domains – such as water protection issues & noise

New transfer tunnels, access pits and experimental caverns



fonquille shufe sur l'environnement





Brief historical background on environment@cern (4/7)

- Transition period between stop of LEP and start of LHC (2000-2010):
- **Phasing out CFCs** (refrigerants within air conditioning systems)
- Phasing out PCBs (used as transformer oil)
- **First accountings on F-gas emissions** (forecast for SF_6 and HFCs used in LHC experiments for detector cooling and particle detection)
- Water protection reduction of water consumption – increasing concerns linked to prevention of Legionella in cooling tower circuits – increased chemical treatments









Brief historical background on environment@cern (5/7)

Over the last decay (2010-2020):

Energy – Workshops held between research infrastructures since 2011

Accounting of F-gas emissions from CERN LHC experiments since $2011 - CO_2$ cooling for detectors decided

Water protection – significant impact on receiving watercourses for various reasons – cooling water recycling plant integrated in 2018 and retention basin built in 2020 Workshop 2011: Energy for Sustainable Science





Brief historical background on environment@cern (7/8)

Over the last decay (2010-2020):

Noise – Establishment of an environmental noise policy (2019) – mapping of the CERN environmental noise footprint, communicated to local municipalities

Waste – Follow-up of indicators since 2011 – good recycling rate (above 50 %) – areas of improvements identified

Biodiversity – Label for management of green areas – preservation of species of orchids







Brief historical background on environment@cern (8/8)

Publication of the first public CERN Environment Report 2017-2018

(September 2020)

Thanks to the vision of our CERN Director-General Fabiola Gianotti CERN Bulletin News Articles Officia

Official News Learning

Announcements

Staff Association



Events

A new type of coating to chase the clouds away

Safety first!

Latest news from the YETS: all restarting except the LHC

LIGO: The strong belief

ICTR-PHE 2016: Strength in numbers

Of data and dust.

Organising a conference? Think about what you can do for start-ups!

The next generation of experts in trigger and data acquisition gather at. ISOTDAQ2016

Three new students selected for the ATLAS PhD Grant Scheme

From the CERN web: The Art of Science, Theory corridor, DAMPE and more

Computer Security: one click and BOOM...

Alice-Anne Martin (1926 - 2016)

Subscribe by RSS

SAFETY FIRST!

Among the many duties I assumed at the beginning of the year was the ultimate responsibility for Safety at CERN: the responsibility for the physical safety of the personnel, the responsibility for the safe operation of the facilities, and the responsibility to ensure that CERN acts in accordance with the highest standards of radiation and environmental protection.



The Safety Policy document drawn up in September 2014 is an excellent basis for the implementation of Safety in all areas of CERN's work. I am happy to commit during my mandate to help meet its objectives, not least by ensuring the Organization

makes available the necessary means to achieve its Safety objectives.

One of the main objectives of the HSE (Occupational Health and Safety and Environmental Protection) unit in the coming months is to enhance the measures to minimise CERN's impact on the environment. I believe CERN should become a role model for an environmentally-aware scientific research laboratory. Risk assessment and prevention and emergency preparedness are also key targets. An effective approach to handling radioactive waste is also important for CERN where we must work to limit the production of such waste, sort it effectively, store it safely and ensure safe disposal.





CERN organization with respect to environment (1/2)

The protection of the environment is covered by the Safety Policy of the Organization



THE CERN SAFETY POLICY

CERN, an intergovernmental organization for fundamental research in particle physics, defines and implements a Safety Policy. Safety covers occupational health and safety, including radiation protection, the protection of the environment and the safe operation of CERN's Installations, including radiation safety.

CERN strives for excellence in matters of Safety.

INTRODUCTION BY THE DIRECTOR-GENERAL

CERN strives for excellence. We strive for excellence in science, excellence in innovation, and excellence in everything we do. Safety is very much at the heart of that. The objective of CERN's Safety Policy is that the Organization to cellentitio and technical excellence be matched by excellence in matters of Safety. To take that decimate environmentally aware research, best practices in matters of Safety and strives for the optimal procession of the health and cafety of all those involved in its activities.

CERN's performance in matters of Safety is dependent on every one of us. I invite you to familiarize yourself with the CERN Safety Policy and our Safety Rules, and I am confident that you will actively contribute to CERN's experience in matters of Safety through exemptiary conduct and the use of best Safety practices when carrying out your activities at CERN.

Fabiola Glanotti Director-General 8 July 2016

tabiola Gianotti



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CERN organization with respect to environment (2/2)

CEPS Board, incl. CERN Energy Management panel

HSE Unit

- **CERN's Energy Coordinator**
- Executive Officer for Noise Footprint Policy and Implementation Strategy
- Key Services within Departments

Relations with Host States Authorities:

Tripartite Agreement in matters of radiation protection and radiation safety

Tripartite Committee for the Environment

Sectors, Departments and Units

CERN's structure

CERN's governance

Director-General (DG)

- Health, Safety and Environment (HSE)
- Internal Audit (DG-IA)
- Legal Service (DG-LS)
- Translation, Minutes and Council Support (DG-TMC)

Accelerators and Technology (ATS)

- Beams (BE)
- Engineering (EN)
- Systems (SY)
- Technology (TE)

Finance and Human Resources (FHR)

- Finance and Administrative Processes (FAP)
- Human Resources (HR)
- Industry, Procurement and Knowledge Transfer (IPT)
- Site and Civil Engineering (SCE)

International Relations (IR)

- Diplomatic and Stakeholder Relations (IR-DS)
- Education, Communications and Outreach (IR-ECO)



Research and Computing

Experimental Physics (EP)

Information Technology (IT)

Theoretical Physics (TH)

Scientific Information

Service (RCS-SIS)

Projects (RCS-PRJ)

(RCS)

Recent projects with environmental concerns (1/4)

Energy efficient building completed in 2015 (Bldg. 774 – Prévessin site)

Integration of hydrocarbon detection monitors and consolidation of effluent water monitoring stations completed in 2016

New building housing surface treatment and production of printed circuit boards completed in 2017 – Prevention of major accident hazards





Recent projects with environmental concerns (2/4)

2018-2020 East Hall Renovation – insulation of the building & renovation of beam lines (magnets and their power supplies)

New electrical substation completed in 2019

New emergency power generators and fuel tanks completed in 2019

New crèche and nursery school (highly energy efficient) completed in 2020





Recent projects with environmental concerns (3/4)

Specification and <u>start</u> of HL-LHC civil engineering worksites (2018)











Recent projects with environmental concerns (4/4)

And more to come...

FCC Feasibility Study (up to 2025, for the next update of the European Strategy for Particle Physics)

Specific environmental evaluation process to be defined with the Host States Authorities





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Focus on Energy (1/3)

Energy Consumption inside CERN



CERN

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Focus on Energy (2/3)

3 Strategies:

Minimise the increase of energy consumed for new accelerator projects Increase energy efficiency Energy recovery





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EDMS # 2593933

Possible réseau CERN-P1 / Meyrin

Réseau P1-CERN PAC 4MWth

Focus on Energy (3/3)

Future Challenges -

Align to the recommendations of the European Strategy For Particle Physics (updated in June 2020)

Align smoothly to the Energy Plans of the Host States, in particular for the CERN "Campus"





Focus on Emissions of Greenhouse Gases (1/4)



CERN SCOPE 1 AND SCOPE 2 EMISSIONS FOR 2017 AND 2018 BY CATEGORY. Other includes air conditioning, electrical insulation, emergency generators and

CERN vehicle fleet fuel consumption.

Source: CERN Environment Report 2017-2018



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Focus on Emissions of Greenhouse Gases (2/4)

Priority on reducing emissions of F-gases – CERN has more than 1100 equipment concerned, containing about 433'000 tCO2eq of F-gases

Priority measures in the LHC Experiments, involving CERN and the collaborations

For particle detection:

Leak repairs, optimization of the experimental gas recirculation systems, R&D on CF_4 and R-134a recuperation plant, R&D on alternative gases







Focus on Emissions of Greenhouse Gases (3/4)

For detector cooling:

Replacement of F-gas cooling systems by CO_2 cooling systems

R&D ongoing for primary and secondary CO₂ cooling systems for ATLAS and CMS Experiments

New associated building infrastructure to integrate

 CO_2 cooling systems shall be operational by 2027 (after Long-Shutdown 3 – 2025 to mid 2027)





Focus on Emissions of Greenhouse Gases (4/4)

More to come...

CERN initiated an evaluation of the scope 3 of the Greenhouse Gas Protocol for the years 2019 & 2020– Includes business travel, employee commuting, food...

CERN joined the 2050Today Initiative brining together the International Geneva Institutions

New CERN Data Centre project in the pipeline, with the aim to contribute to reduce fossil-fuel-related emissions in future







Focus on Water and Effluents (1/4)



EDMS # 2593933

Note: ML = Megalitres

THE DISTRIBUTION OF SUPPLIED WATER DETAILING THE RELEASE

PATHWAYS. Data on evaporation and effluents are measured on-site. Data on sanitary sewage are measured by the Host States. This does not include the release of precipitation runoff or infiltration water.



Source: CERN Environment Report 2017-2018



Focus on Water and Effluents (3/4)

Implementation of a cooling water recycling plant in 2018 on the Prévessin site

Major works on the Meyrin site in 2019-2020 (Long-Shutdown 2) for the PS Complex – Cooling tower circuits will be supplied with demineralised water

Implementation of a cooling water recycling plant foreseen during LS3 for SPS and LHC cooling tower effluents









Focus on Water and Effluents (4/4)

Decision of implementing a retention basin downstream to the Prévessin site to prevent the impact of any water pollution

Studies completed for other basins – decisions on funding in progress

Retention basins also aim to regulate stormwater runoff





Focus on Biodiversity (1/2)



PROTECTED NATURAL AREA OF CERN RÉSERVE FLORALE NATURELLE DU CERN

626 Hectares of land – among 211 Ha fenced

Orchid sanctuaries – 15 species – 10 on the Swiss national conservation list

Since 2009, Swiss label on the Meyrin site "*Nature & Economie*" in recognition of its land management

Agreement with the French Office National des Forêts for sustainable woods and forest management

Challenge – expansion of CERN activities while preserving, developing biodiversity on CERN sites







Focus on Biodiversity (2/2)

Commitments to local programmes

Proposal of actions defined recently by an internal working group – e.g.:

Actions on reducing the impact linked to light sources

Actions on reducing "urban" heat islands

Decisions in progress



Visibilité des sources lumineuses du bassin genevois. (Ranzoni et al., 2019)



Focus on Waste (1/2)





Aluminium, glass and PET



Focus on Waste (2/2)

In 2018 – CERN eliminated 5808 tonnes of non-hazardous waste, of which 56% was recycled

Most of the contractor waste is not included

Objective to increase the recycling rate

Proposal of actions defined recently by an internal working group – decisions in progress



CERN'S WASTE CATEGORISED BY ELIMINATION PATHWAY.

Quantities of waste and information on elimination pathways for radioactive waste are based on CERN data. Data on elimination pathways for all other categories come from the companies engaged by CERN to eliminate the waste.



Source: CERN Environment Report 2017-2018

Conclusions & Perspectives



CERN has a wide range of activities and infrastructures and is hosted by Switzerland and France – it is a real challenge to integrate current environmental requirements and best practices to limit its impact



The Organization will consider lessons learned from the COVID-19 pandemic to limit its impact and will strengthen environmental awareness of its personnel



Follow-up the highlighted topics in the second public CERN Environment Report 2019-2020 that will be published in September



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Thank you for your attention!

