CERN and the Environment Town Hall meeting Introduction

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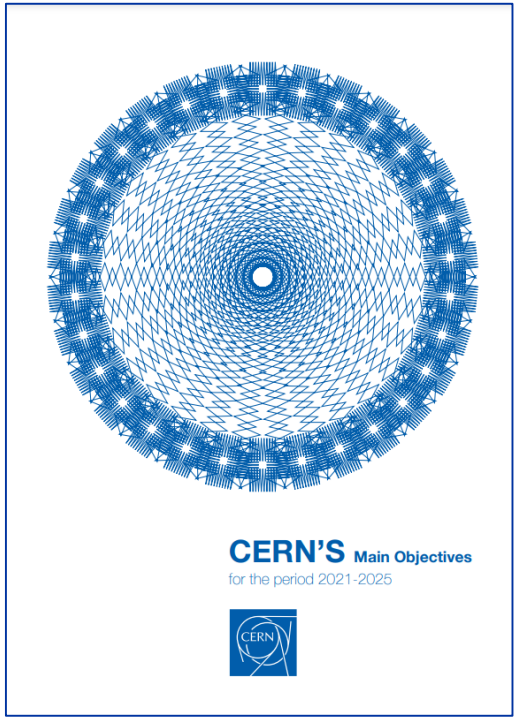
CEPS
CERN Environmental Protection Steering Board

The CERN Environmental Protection Steering Board – CEPS

- Established in 2017, CEPS's **mandate** is to
  - identify and prioritise environmental areas to be addressed
  - propose programmes of action across the relevant environmental domains at CERN – focussing on the current activities of the Organization
  - feed CERN's current strategy for environment and sustainability
- Committee **chaired by the HSE Unit with membership of:**
  - CERN ATS Sector, EP, SCE, IPT, FAP Departments and IR/ECO
  - CERN Energy Management Panel/Enlarged Energy Management Panel and the Sustainable Accelerators Panel
- **External stakeholders: Host States Authorities, linked in particular to:**
  - The Tripartite Agreement in matters of radiation protection and radiation safety at CERN
  - The Comité Tripartite Environnement (CTE) dedicated to non-radiological issues

Current strategy for environment and sustainability



Three main lines of actions (2021-2025):

- ❑ **Minimise** the Laboratory's impact on the environment
- ❑ Pursue actions and technologies aiming at **energy savings and reuse**
- ❑ Identify and develop CERN's **technologies** that may contribute to mitigating the impact of society on the environment

Environment and **sustainability** are crucial aspects of projects and activities in the High Energy Physics field.
Any future project should have minimal environmental footprint.

ENERGY
1215 GWh

The Laboratory is committed to limiting rises in electricity consumption to 5% up to the end of Run 3 compared to the 2018 baseline year, which corresponds to a maximum target of 1314 GWh, while delivering significantly increased performance of its facilities. It is also committed to increasing energy reuse.

In 2021 and 2022, CERN consumed 991 GWh and 1215 GWh of electricity respectively.

In addition, the Organization consumed 67 GWh (240 TJ) and 51 GWh (184 TJ) of energy generated from fossil fuels in the two years respectively.

EMISSIONS
184 173 tCO_2e

CERN's objective is to reduce direct emissions by 28% by the end of Run 3 compared to the 2018 baseline year, which corresponds to a maximum target of 138 300 tCO_2e.

The scope 1 emissions in 2021 and 2022 were 123 174 and 184 173 tonnes of CO_2 equivalent (tCO_2e) respectively.

The total amount of scope 2 greenhouse gas emissions due to CERN's electricity consumption was 56 382 and 63 161 tCO_2e in 2021 and 2022 respectively.

Total scope 3 emissions arising from business travel, personnel commuting, catering, waste treatment and water purification amounted to 7813 and 8956 tCO_2e in 2021 and 2022 respectively.

Scope 3 emissions arising from procurement, which are reported for the first time, amounted to 98 030 tCO_2e and 104 974 tCO_2e in 2021 and 2022 respectively.

WATER AND EFFLUENTS
3234 ML

The Laboratory is committed to keeping the increase in its water consumption below 5% up to the end of Run 3 compared to the 2018 baseline year, which corresponds to a maximum target of 3651 ML, despite a growing demand for water cooling at the upgraded facilities.

In 2021 and 2022, CERN used 2661 and 3234 megalitres of water respectively.

IONISING RADIATION
< 0.01 mSv

The European annual dose limit for public exposure to artificial sources is 1 mSv. CERN is committed to keeping its contribution to no more than 0.3 mSv per year.

The actual dose received by any member of the public living near the Laboratory was less than 0.01 mSv in the reporting period, which is more than 100 times lower than the average annual dose received from medical exposure per person in Switzerland.

IN BRIEF 2021–2022

This reporting period saw the completion of the second long shutdown and the restart of the accelerator complex (Run 3) with a view to reaching the new collision energy of 13.6 TeV at the Large Hadron Collider (LHC). In some domains environmental indicators may be very different during shutdown years compared to operation years, so they are shown for both years to highlight this, where relevant. 2022 indicators are prominently shown for those domains where priority objectives have been defined, namely Energy, Emissions and Water and Effluents.

WASTE
69% recycled

CERN's aim has been to increase its recycling rate for non-hazardous waste. The recycling rate rose from 56% in 2018 to 69% in 2022.

In 2021 and 2022 respectively, CERN disposed of 5111 tonnes and 8812 tonnes of non-hazardous waste, and of 1544 tonnes and 1295 tonnes of hazardous waste, including 307 and 519 tonnes of radioactive waste.

NOISE
45 dBA at night

CERN is committed to restricting noise at its site perimeters to 70 dBA during the day and 60 dBA at night.

Over this reporting period, CERN implemented measures to improve its noise management, including the installation of an online real-time monitoring system at Point 2 of the LHC and Point 4 of the SPS. Average noise levels measured on the boundaries of CERN's sites are typically around 50 dBA during the day and 45 dBA at night.

BIODIVERSITY
18 species of orchids

Inventories of flora and fauna were conducted in 2022. A further two species of orchid were identified, bringing the total on the CERN sites to 18, as well as 62 species of Lepidoptera and 32 species of Orthoptera.

KNOWLEDGE TRANSFER
8 environmental projects

In 2022, CERN launched the Innovation Programme on Environmental Applications (CIPEA), which spans four focus areas where CERN's know-how can be of use, namely renewable and low-carbon energy; clean transportation and future mobility; climate change and pollution control; and sustainability and green science.

Eight projects were selected for implementation with the financial support of external partners or the CERN Knowledge Transfer fund.

[CERN Environment reports]

CERN High priority environmental objectives – Horizon 2025

ENERGY

The laboratory is committed to limiting rises in electricity consumption to 5% up to the end of Run 3 (baseline 2018) – Target max 1314 GWh/y

EMISSIONS

CERN's objective is to reduce direct CO_2e emissions by 28% by the end of Run 3 (baseline 2018) – Target max 138 300 tCO_2e

WATER AND EFFLUENTS

The laboratory is committed to keeping the increase in its water consumption to 5% up to the end of Run 3 (baseline 2018) – Target max 3651 ML

No showstopper to achieving these objectives by the first year of the next long shutdown (LS3)

High priority – Horizon 2030

ENERGY

While the number of collisions will be multiplied by a factor of 5 to 7.5 during RUN4 (2030-2033) with respect to the nominal LHC design, CERN commits to limiting its electricity consumption to 1.5 TWh/y – This equates to an increase of 14%, compared to 2025 objective

EMISSIONS

Direct CO_2e emissions are linked to CERN's core operations. CERN's objective is to reduce them by 50% vs baseline 2018

WATER AND EFFLUENTS

Despite a growing demand for cooling water, CERN will strive to keep the water consumption below 3600 ML

3 high priority objectives out of 9

Ionising radiation

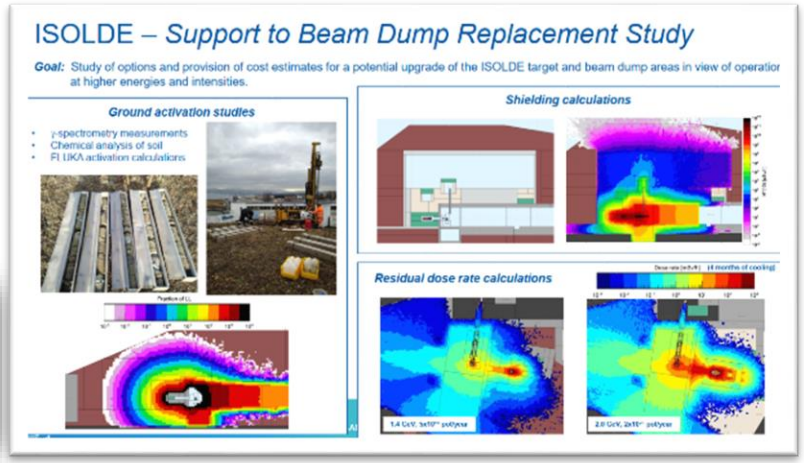
Calculations and Studies

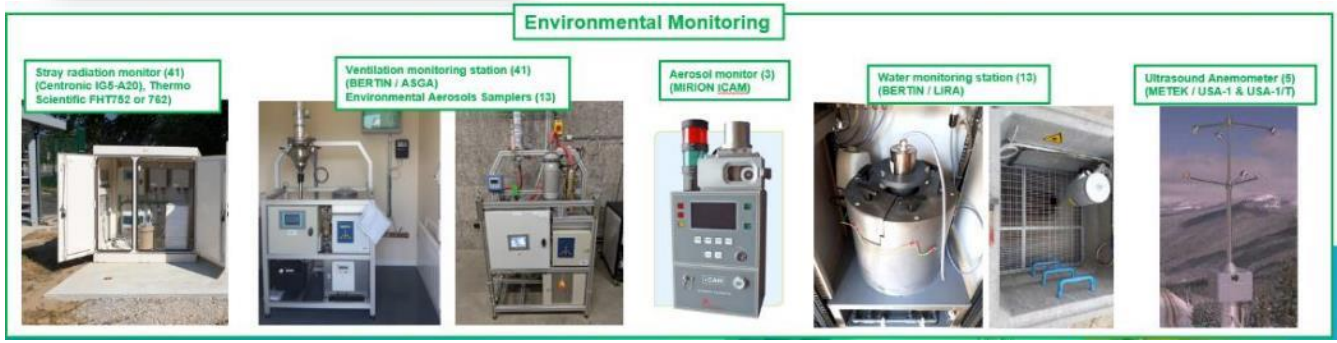
Environmental Monitoring

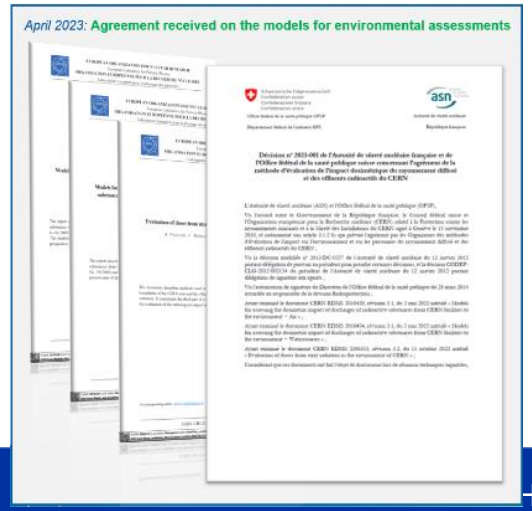
Tripartite Agreement

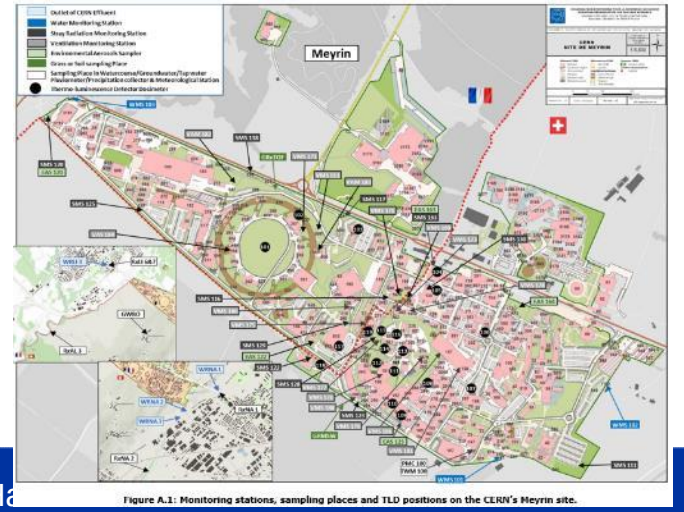
FLUKA

ActiWiz 3







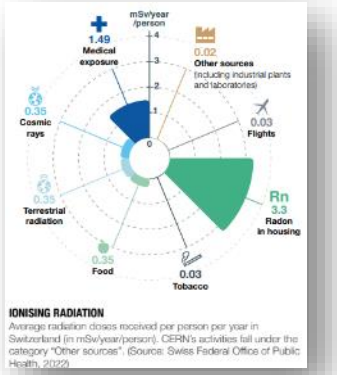


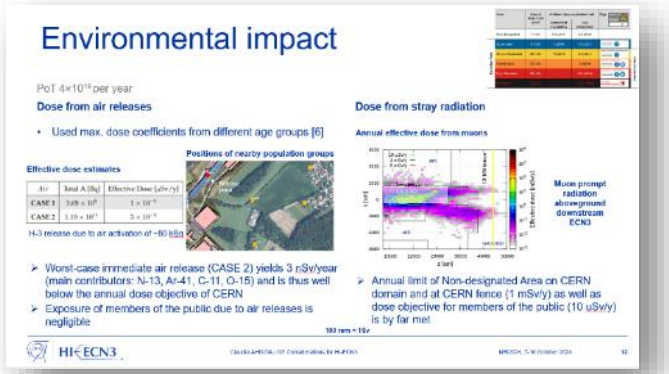
Ionising radiation – Horizon 2030

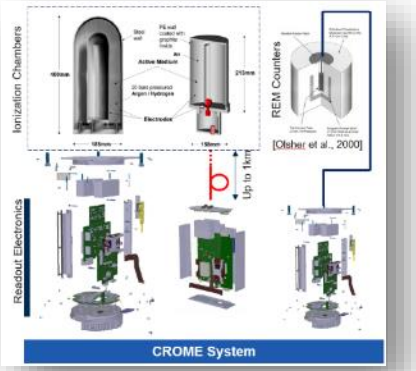
IONISING RADIATION

Optimise the radiological environmental impact resulting from the Organization's activities
- Keep the radiological environmental impact due to ionising radiation on the reference population groups below 20 μSv/year

How ?	Minimisation of environmental impact through optimization of new facilities
	R&D for radiological environmental monitoring







Radioactive waste

Radioactive Waste Programme

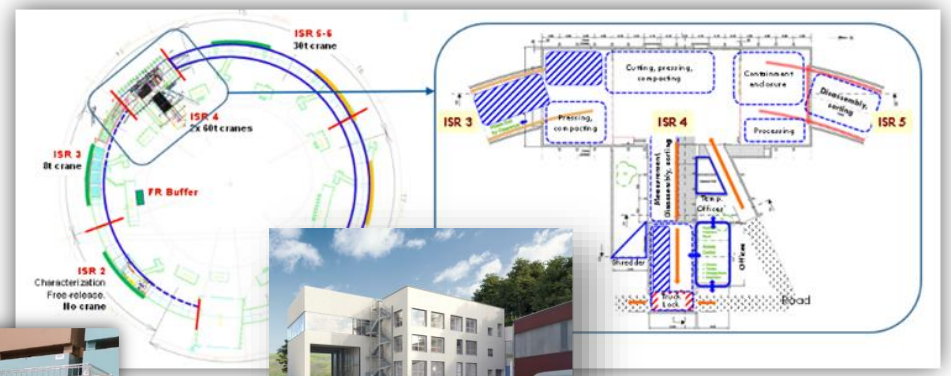
Minimisation of handled volumes

Extension of the Treatment Centre

Clearance for elimination in CH

Formalized by decision of host state authorities ASN (France) and OFSP (Switzerland)

Classification CERNs Radioactive Waste	
Negligible activation *(Candidats à la Liberation inconditionnelle – CL)*	Clearance from radiological control and elimination as conventional waste towards ***Switzerland***
Very low activation *(Très Faibles Activités – TFA)*	Elimination towards ***France*** according to acceptance criteria of the National Agency for radioactive waste management (ANDRA)
Low and medium activation with short half-life (< 30 years) *(Faibles et Moyennes Activités à Vies Courtes - FMA-VC)*	Elimination towards ***France*** according to acceptance criteria of the National Agency for radioactive waste management (ANDRA)
Low and medium activation *(Faibles Activités et Moyennes Activités – FA-MA)*	Elimination towards ***Switzerland*** of waste that does not satisfy the conditions of the FMA-VC category (half-life, activity level)

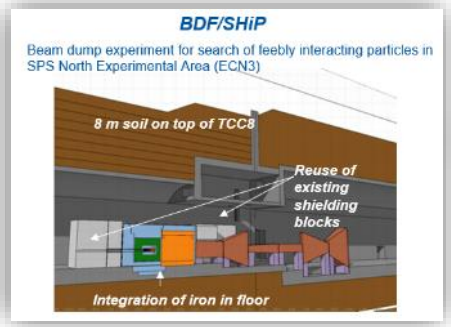


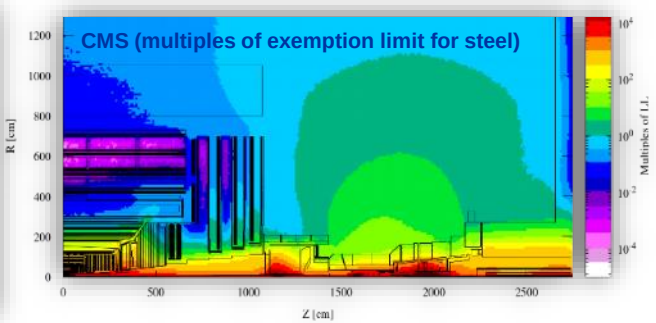
Radioactive waste – Horizon 2030

RADIOACTIVE WASTE

Limit the production of radioactive waste resulting from the Organization's activities
- Keep the recycled waste from clearance of former radioactive waste above 110 m^3 /year

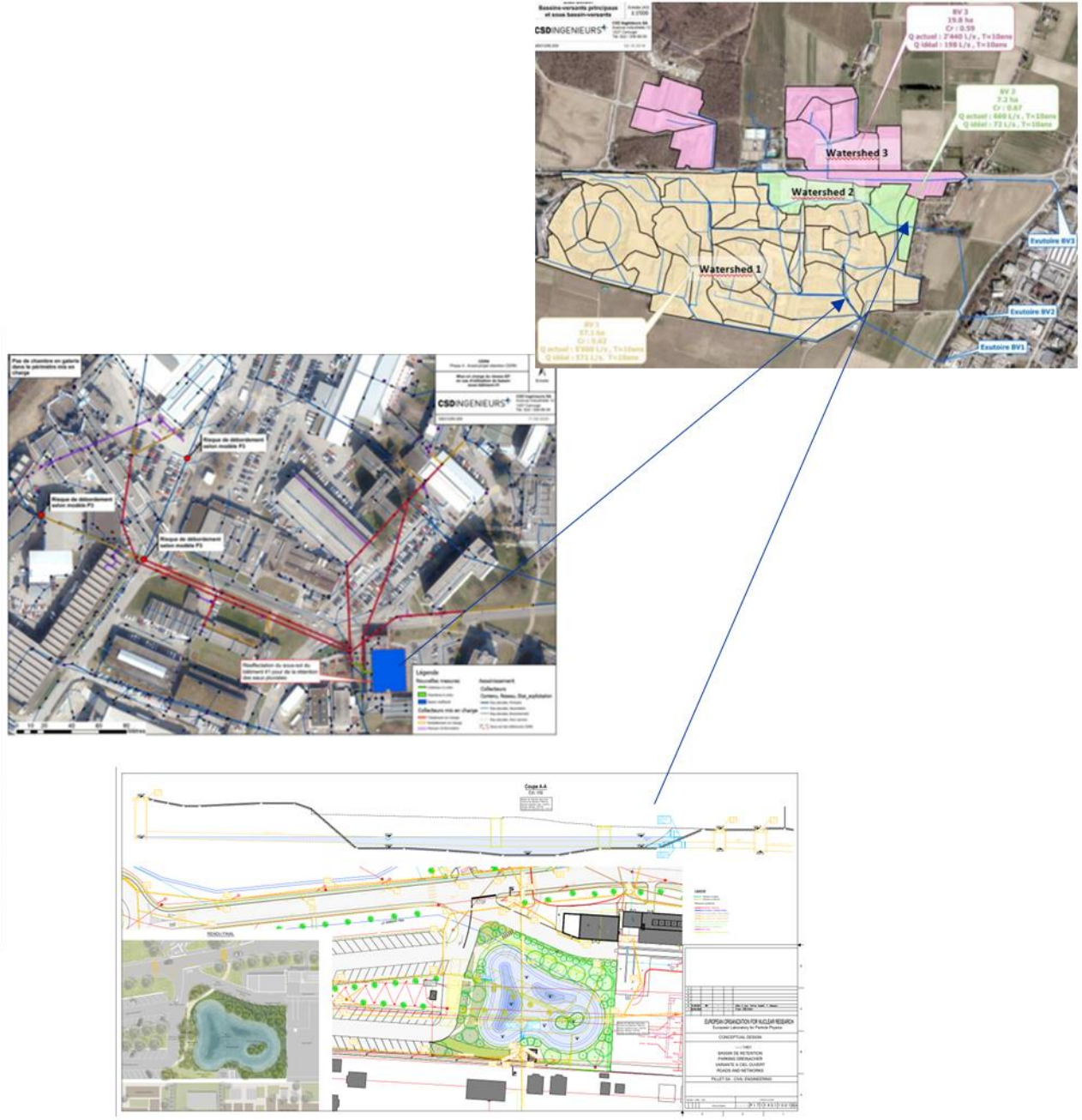
How ?	Follow-up of the Radioactive Waste Programme
	Reduction of radioactive waste volumes through treatment
	Prospective waste zoning studies





Hazardous substances

- A focus on liquid chemical agents
- Major consolidations achieved
- Inventories in CERES
- Future projects



Hazardous substances – Horizon 2030

HAZARDOUS SUBSTANCES

Reduce the potential environmental impact of hazardous substances used for the Organization's activities

- Reduce by 120 m^3 the quantity of transformer oil present on CERN sites (2023 baseline)

How ? Prioritized replacement programme to change oil-filled transformers with cast resin transformers (EN-EL and SY-EPC)

Non-hazardous waste

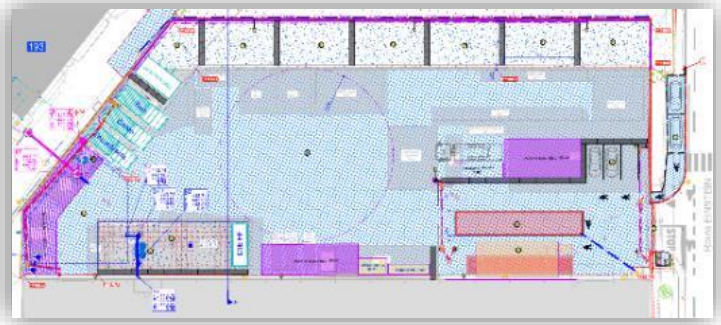
- Tidy-up Week
- SCE Waste Roadmap
- Actions in the field
- 5’R’s: Refuse, Reduce, Reuse, Recycle, Repeat

Non-hazardous waste – Horizon 2030

Non-hazardous WASTE

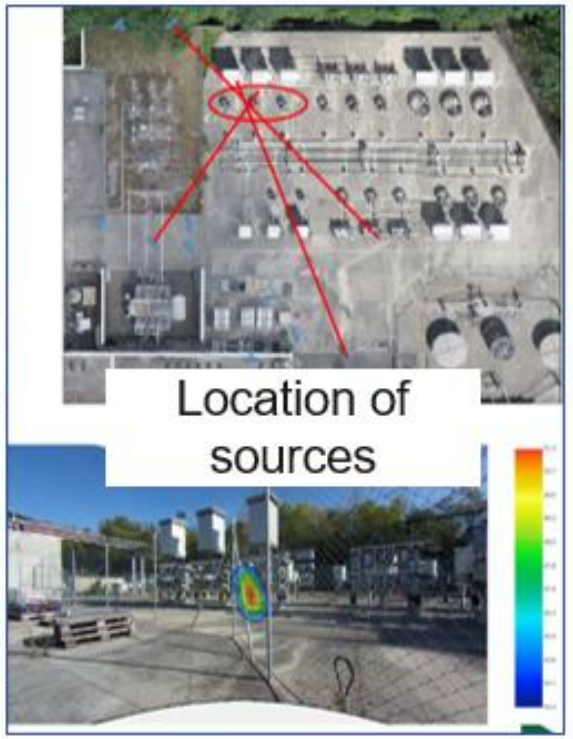
Increase the non-hazardous waste recovery rate resulting from the Organization's activities
- Maintain the recovery rate above 70%
- Increase by 10% in weight the total reuse vs 2022
- Reduce by 5% in weight the campus household waste per person on site vs 2022

How ?	Consolidation of the CERN recuperation and sales service (Bldg. 133) completed
	Extended roadmap established by SCE at horizon 2025 up to horizon 2030



Noise in the environment

- **Policy published end 2019**
- **Annual measurement campaigns**
- **Noise Model for forecast (NuisoCERN)**
- **Hot spots – Carefully monitored**

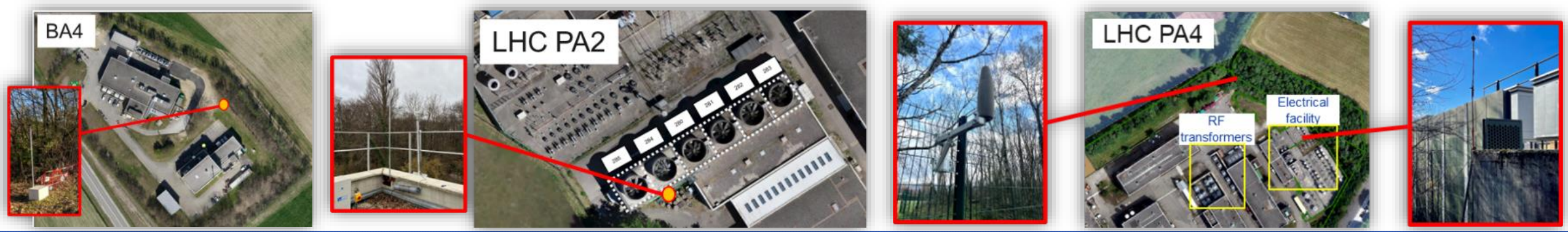


Noise in the environment – Horizon 2030

NOISE

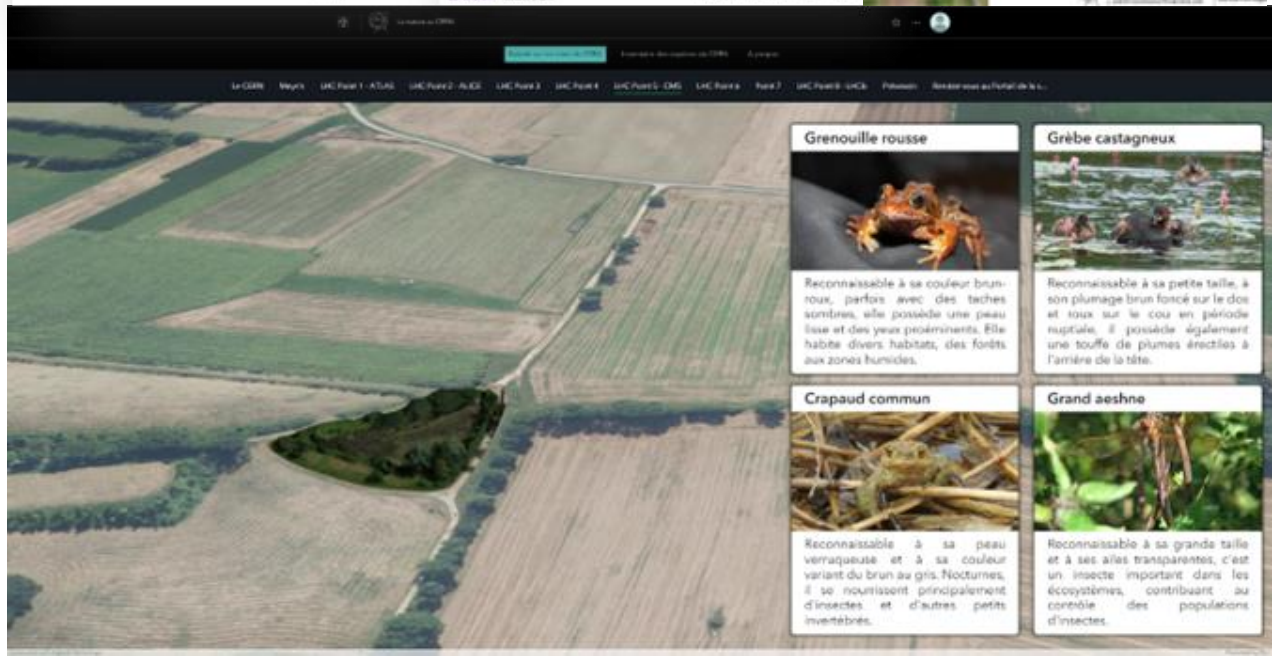
Control and reduce the noise footprint resulting from the Organization's activities
- Reduce noise hotspots (>40 dBA) at residential areas

How ?	Mitigation measures implemented at hot spots (e.g BA4, LHC-PA2, LHC-PA4)
	On-line noise monitoring systems implemented on all relevant CERN surface sites



Biodiversity

- Flora and fauna inventories
- Areas of ecological interest on GIS
- Mapping of heat islands on the sites
- Communication



Biodiversity – Horizon 2030

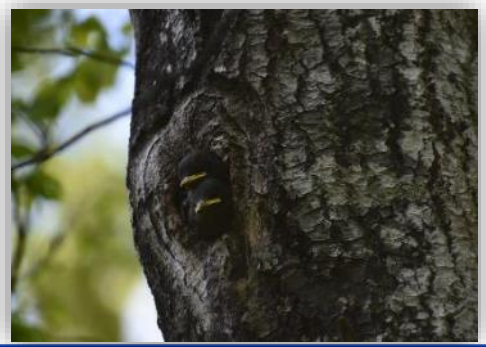
BIODIVERSITY

Conserve and enhance the Organization’s natural, agricultural and forest areas
- Reduce the presence of urban heat islands on CERN sites
- Foster biodiversity in the identified ecosystems (wetlands, grasslands, shrublands and woodlands)

How ?	Numerous trees planted over the period 2025-2030 following an arborisation plan
	Biodiversity development measures implemented in the identified ecosystems







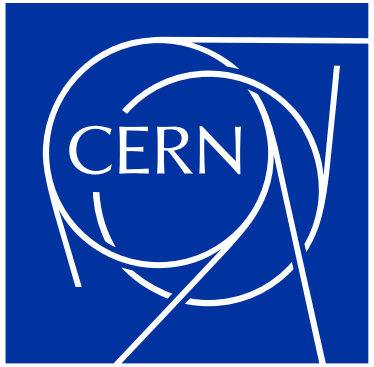
Commitments at the level of the Organization

- Strong commitments are taken at the level of the Organization through various programmes of actions
- **Horizon 2030 objectives** – HL-LHC era:
  - ***Energy: max 14% energy increase (vs 2025 target) with 10% of energy supplied by PV PPA***
  - ***Emissions: Reducing direct CO_2e emissions by 50% (vs 2018)*** *aligned to decisions taken at the COP21 in Paris (2015) –* ***concrete projects to reach international targets***
  - ***Minimising the use of local resources*** *(such as water)* ***and the impact on*** *the local surrounding* ***environment*** *(such as on biodiversity)* ***and the public*** *(such as due to ionising radiation and noise emissions)*

How can we all contribute ?

- Applying the CERN Environmentally Responsible Procurement Policy: **CERP3** started in 2021 - launching pilot projects – online training now available
- Developing ideas for **environmental applications** based on CERN's technologies & know-how (Knowledge Transfer – CIPEA): Fostering CERN's **societal impact**
- **Making conscious choices** : daily **commuting** from home to CERN, **planning of duty travel** and **reflecting on our food habits**
  - **Awareness raised about existence of barriers to change** (*see talk at the CERN & Environment Workshop – October 2022*)

For further information on environment: three CERN public-facing Environment Reports published, following the Global Reporting Initiative (GRI) Standards, available here



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Highlights for Commuting – Duty travel – Catering – Horizon 2030

EMISSIONS

Reduce emissions of greenhouse gases resulting from the Organization's activities
- **Commuting:** reduce the use of individual motorised transport to 50%, versus 62% in 2022
- **Duty travel:** reduce by 30% emissions from duty travel vs 2019
- **Catering:** increase the offer of vegetarian/vegan meals up to 50% of the total offer

How ?	Increased offer for on-site mobility, improved facilities for soft mobility, optimisation of the public transport offer in collaboration with the Host States
	Increased % of ground travel for short-medium distances (700 km), decrease n. of long-haul flights, implementation of guidelines for conferences
	Increased variety and attractivity of the vegetarian/vegan offer