



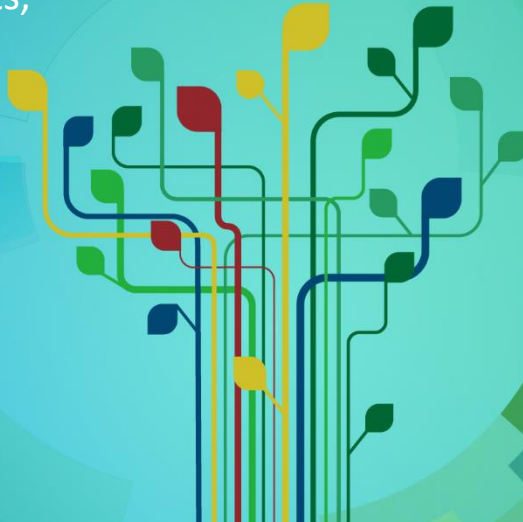
HSE  
Occupational Health & Safety  
and Environmental Protection unit

# CERN & the environment

Anna Cook for the Environment group

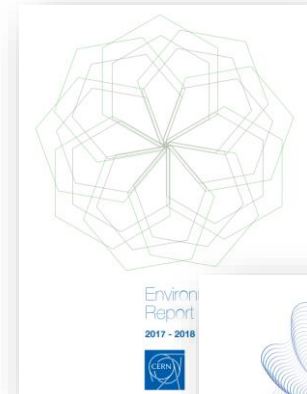
A presentation for the Beamline for Schools participants,

23 September 2022



# CERN & the environment

- Vision: CERN as a role model for environmentally-responsible research.
- Protection of the environment is embedded in the Safety Policy of the Organization.
- Reporting on a range of indicators in an open and transparent way with ambitious and realistic goals.
- Close collaboration with Host State authorities and internationally with the EIROForum organisations.



# Strategy



Minimise the impact of the laboratory's activities on the environment with defined priority actions



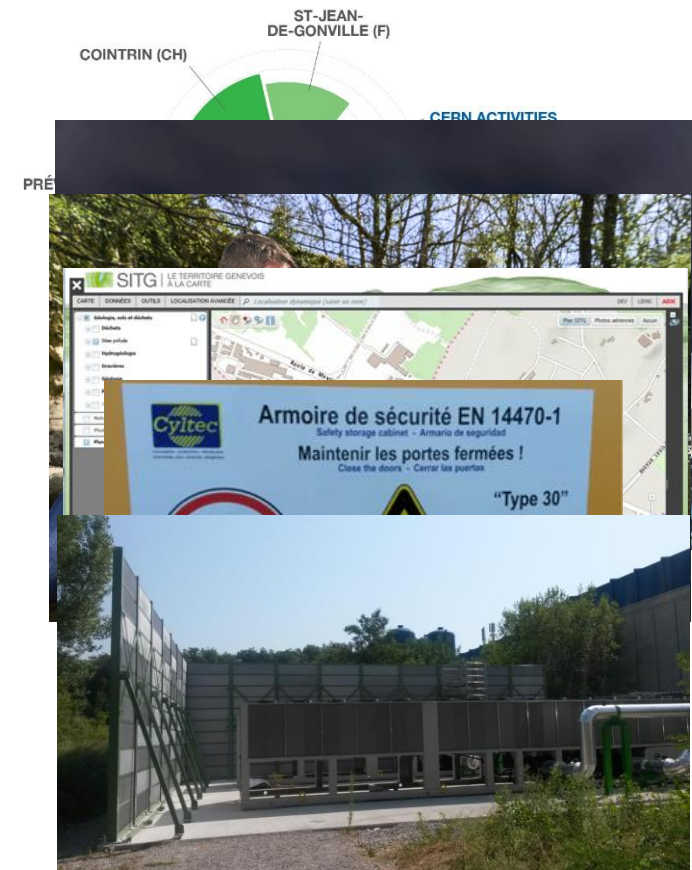
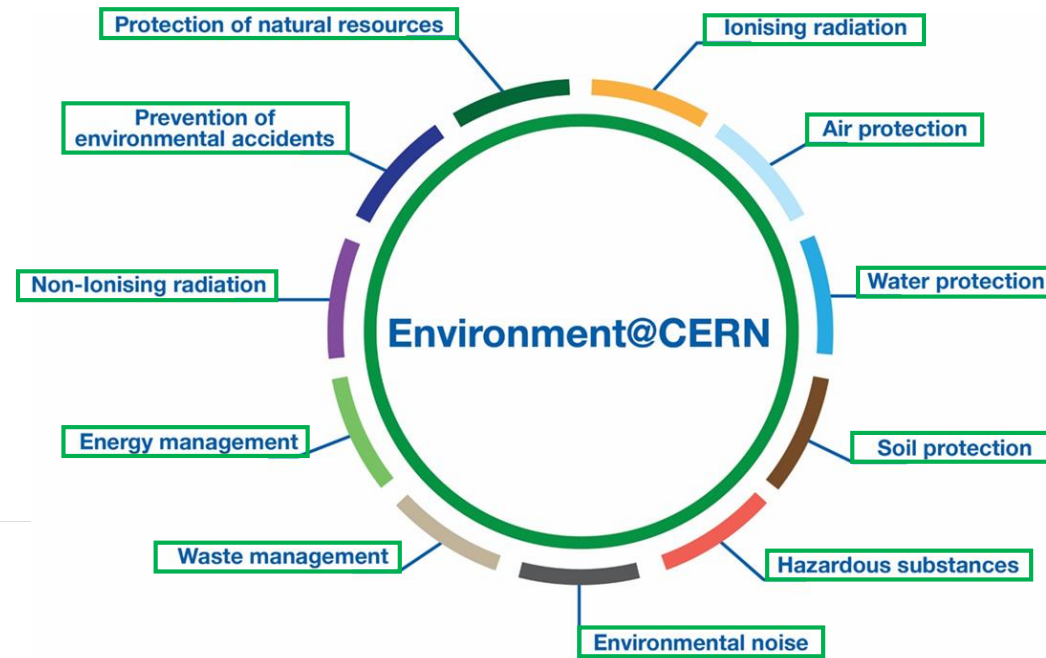
Focus on energy:  
consume less,  
improve efficiency,  
and recover more



Identifying and developing CERN technologies that would help mitigate society's impact on the environment



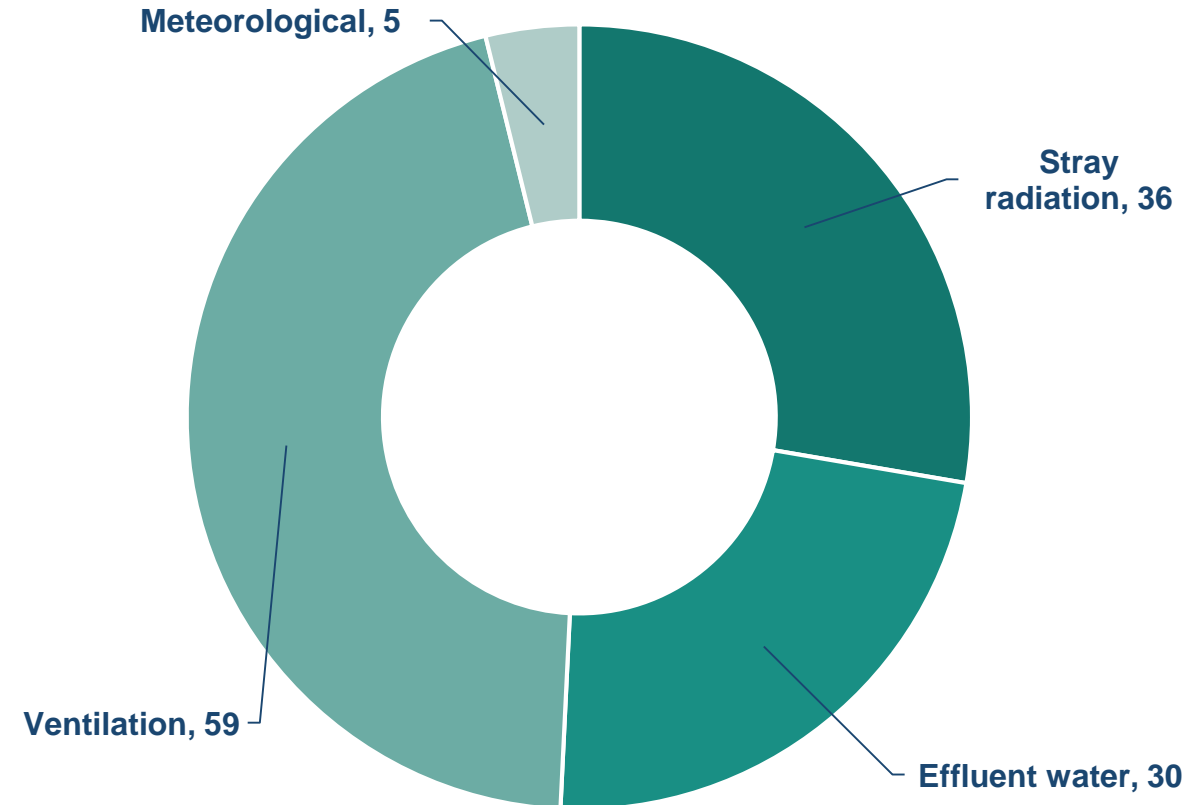
# Environmental protection at CERN



# Environmental online monitoring

130 monitoring stations for environmental parameters

- **Stray radiation** (gamma and neutron)
- **Effluent water** (temperature, pH, conductivity, turbidity, hydrocarbon, foam, flow rate and gamma emitters)
- **Ventilation** and ambient air (alpha/beta)
- **Meteorological data** (precipitation, wind speed, azimuth)

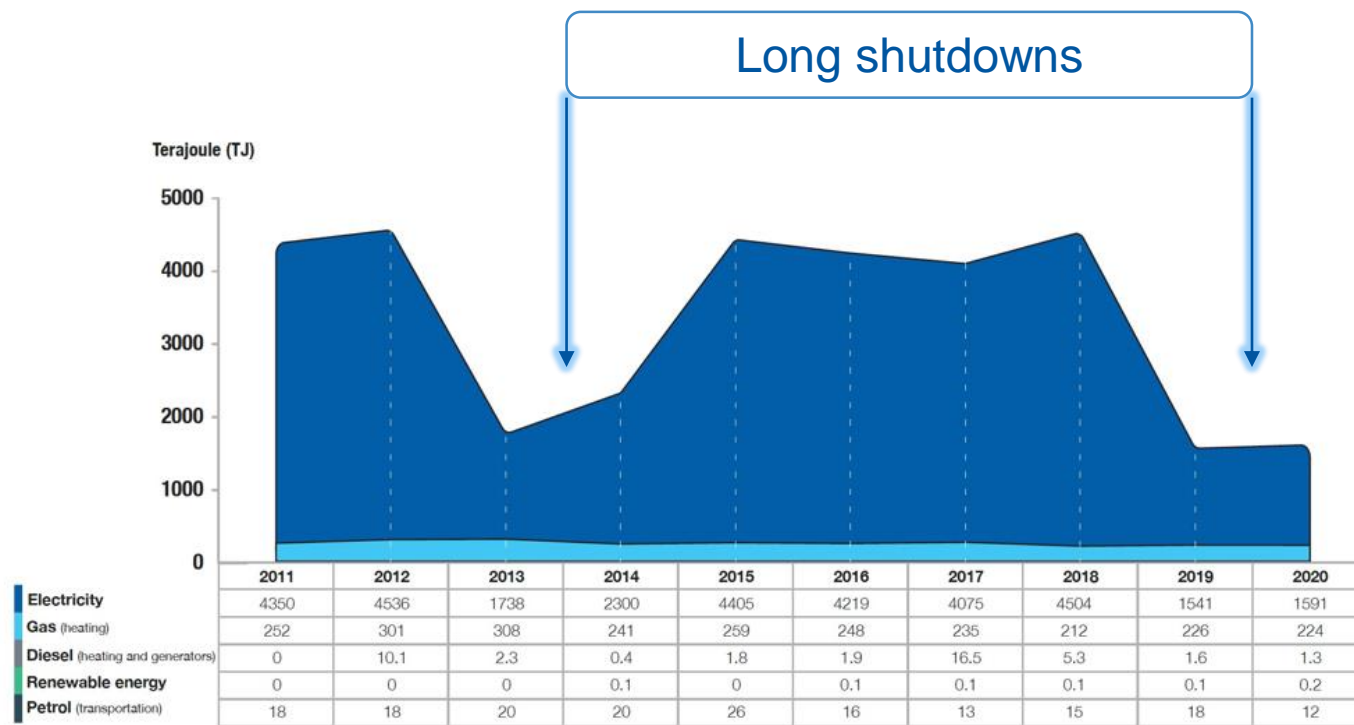


# Environmental sampling and analysis

In addition to online monitoring, some 400 samples are taken annually in and around CERN sites to monitor the Organization's impact on the local environment.

The samples are taken for both **radiological analysis** and **physicochemical analysis** of effluents discharged into the neighbouring watercourses.

# Energy



CERN'S ENERGY CONSUMPTION 2011-2020. This does not include the energy consumed at the Wigner Data centre in Hungary (2011-2019).

- Mostly electricity
- The accelerators are the biggest consumers
- Consumption during RUN years ~ 1.2 TWh/year
- Main goal: **limit the increase in energy consumption to 5% up to the end of run 3** (baseline year: 2018)
- **Increase efficiency, use less, recover more**

# QUIZ BREAK

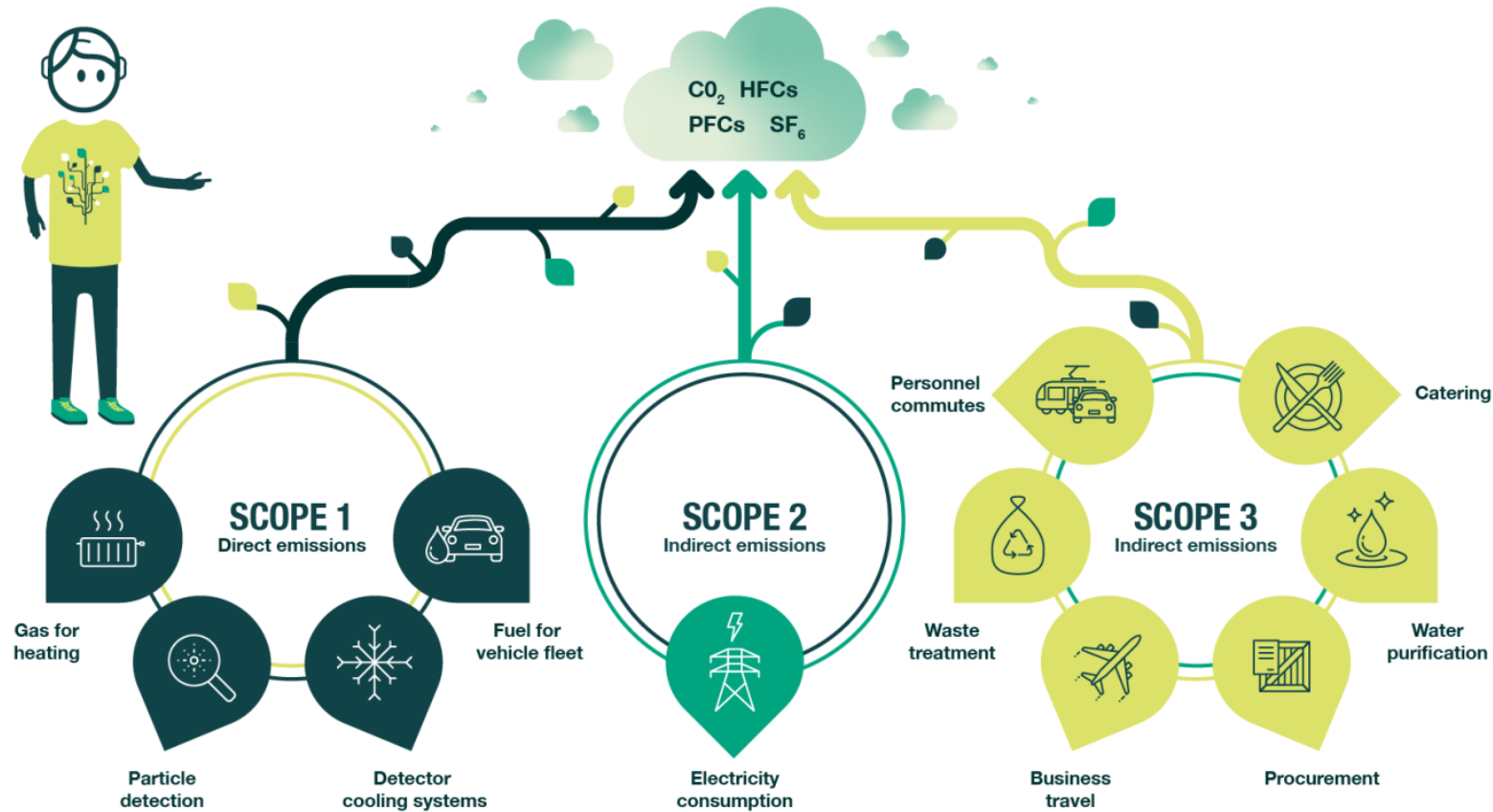


**The production of 1 kWh of CERN's average electricity mix emits a certain amount of CO<sub>2</sub> in grams. To what weight could that amount be compared?**

- A. The weight of a Swiss “5 CHF” coin (about 13 g)
- B. The weight of 10 Covid masks (85 g)
- C. The weight of an “AA” size battery (about 25 g)
- D. 50 g of radioactive waste



# Greenhouse Gas Emissions



Main goal: **reduce**  
scope 1 emissions  
by **28%** by the end  
of 2024  
(baseline year: 2018)

# QUIZ BREAK



**What was the main source of direct CO<sub>2</sub>eq emissions in 2018?**

- A. Fuel combustion from CERN fleet of vehicles
- B. CO<sub>2</sub> emissions from the CO<sub>2</sub> cooling system
- C. F-gas leaks from the detectors
- D. Gases for heating

# QUIZ BREAK

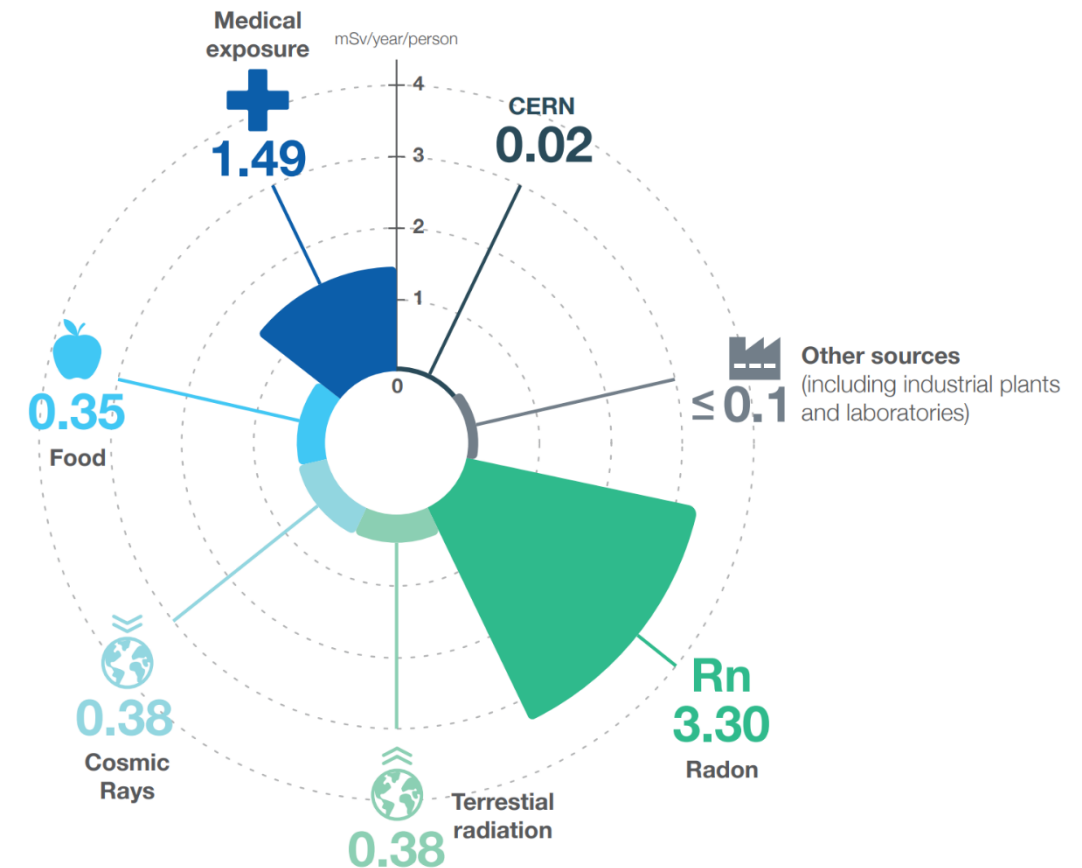


**What was the proportion of CERN personnel walking or cycling to work in 2018?**

- A. Less than 10%
- B. Between 10 and 15%
- C. Between 15 and 20%
- D. Over 20%

# Ionising radiation

- Constantly monitored inside and outside the CERN perimeter.
- Every year, the Organization carries out thousands of analyses of air, ground, vegetal and water samples from the surrounding environment.
- State-of-the-art monitoring stations.
- CERN's methods and the scope of its monitoring program are reviewed by Host State authorities, which also carry out their own monitoring around CERN installations.





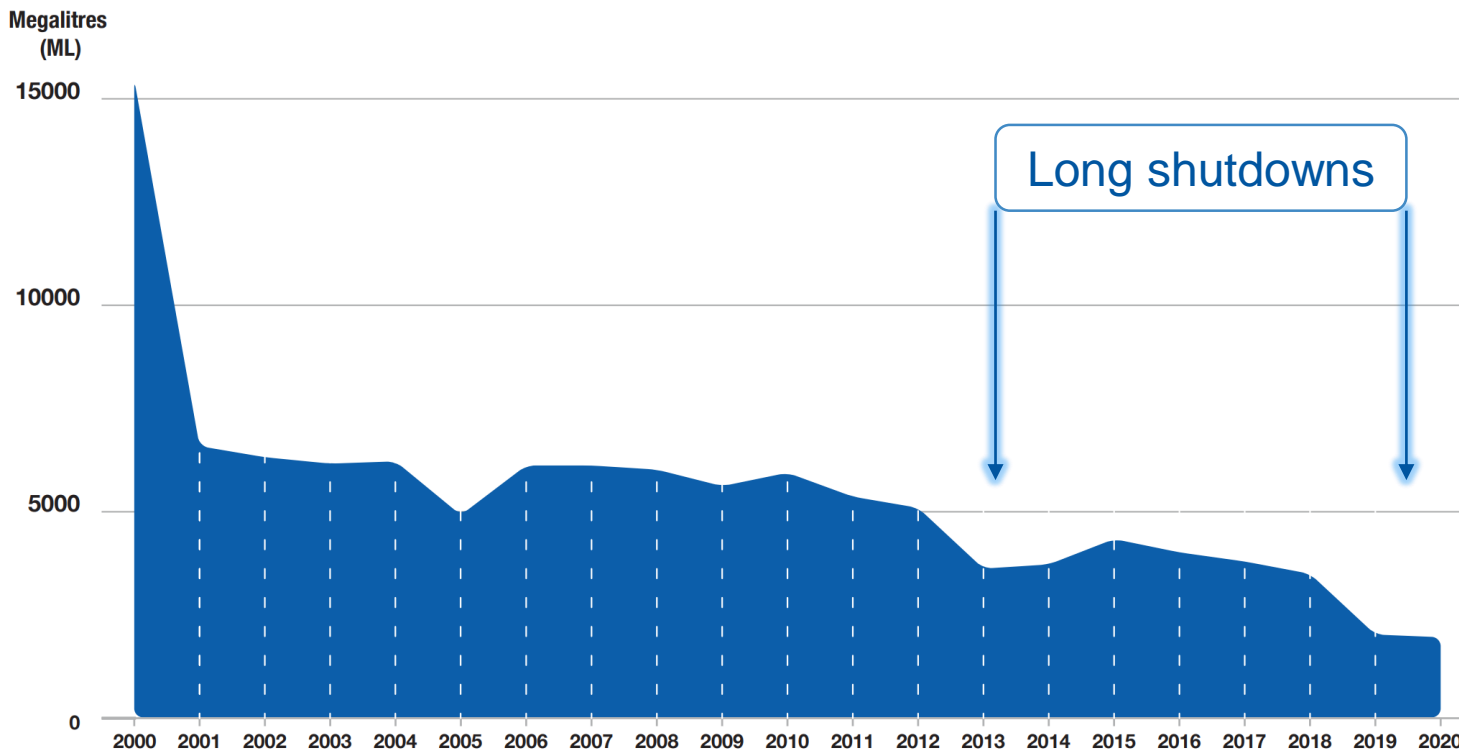
# QUIZ BREAK



**To what can we compare the yearly dose of ionising radiation caused by CERN's activities to any member of the public living in the immediate vicinity of CERN?**

- A. It is more than the exposure from eating a banana a day for the whole year
- B. It is more than the exposure from a flight from Geneva to New-York
- C. It is comparable to smoking a pack of cigarette/day for 1 year
- D. It is less than 2% of the annual dose limit for public exposure set by the European Council

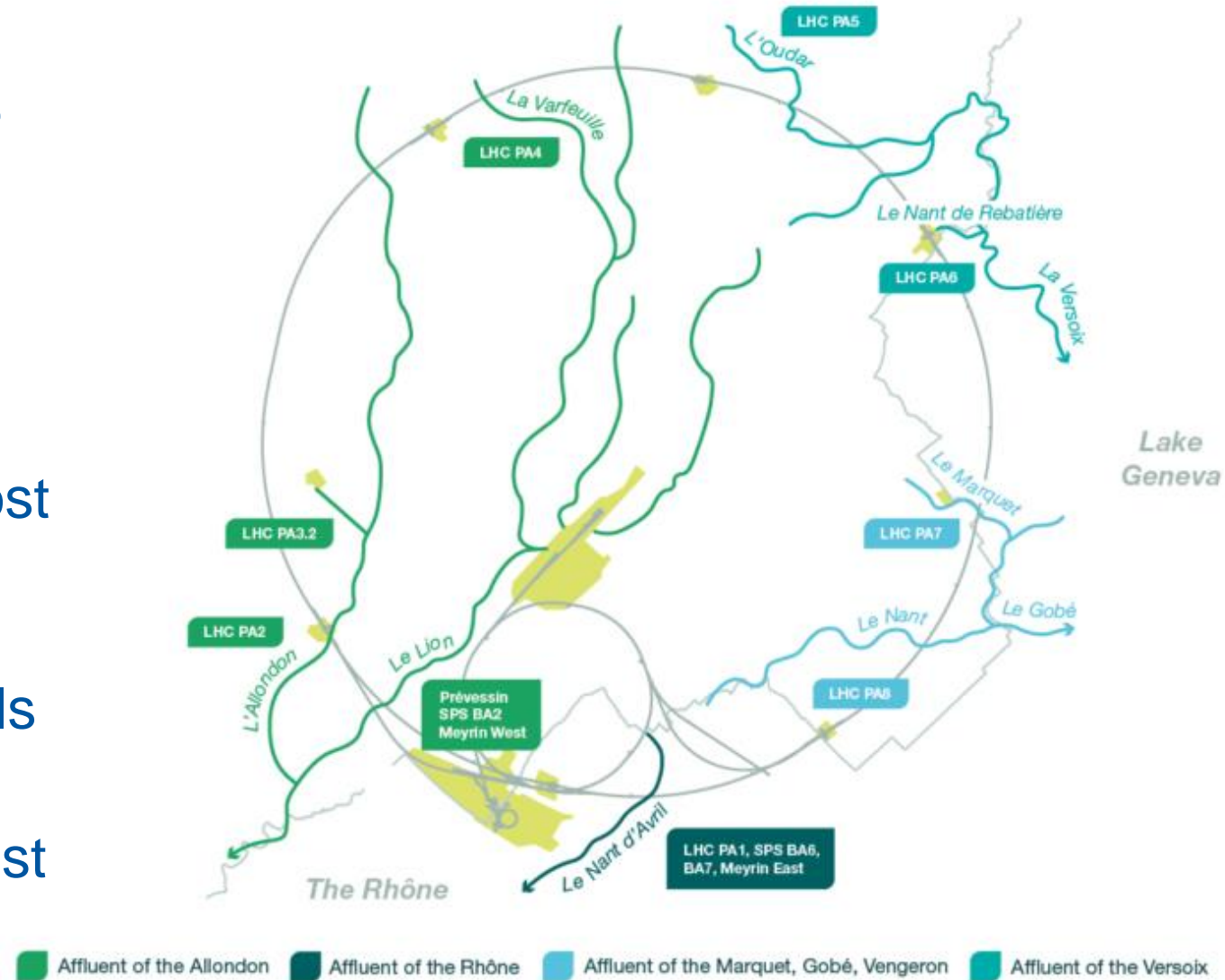
# Water



- 75% of the consumption related to industrial activities
  - Cooling the accelerator complex
- Main goal: **keep the increase** in water consumption to **below 5%** up to the end of run 3 (baseline year: 2018)

# Water – effluents

- CERN releases effluents to neighbouring 9 watercourses
- Compliance with the technical requirements laid down in the Host State regulations
- Long-term programme to further reduce concentration of chemicals in our effluents
- Regular exchanges with local Host State authorities on water protection issues



# QUIZ BREAK



**The amount of water consumed on site in 2018 corresponds to...**

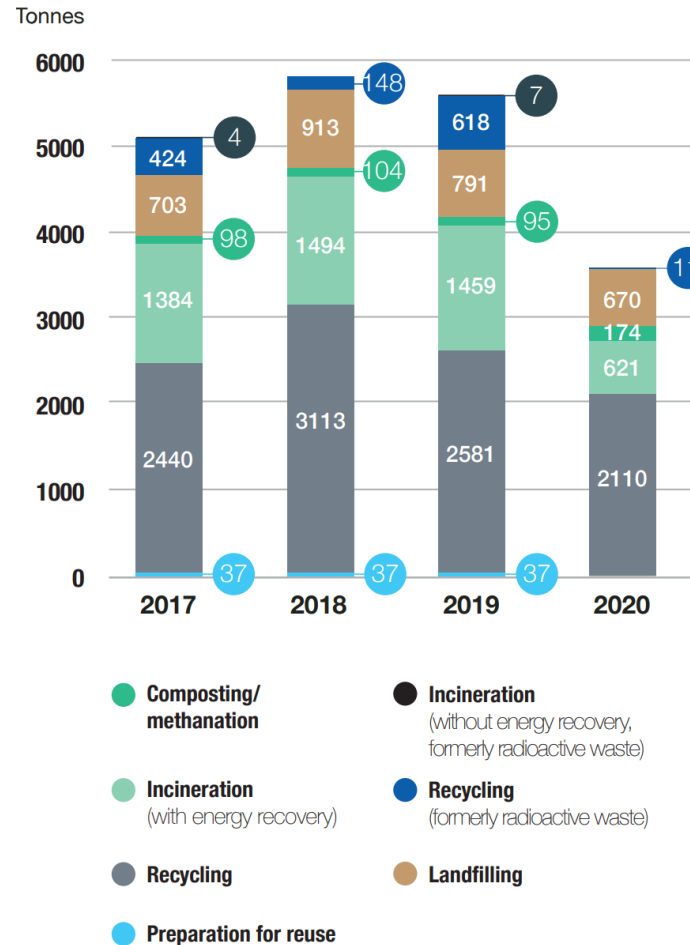
- A. About 1400 Olympic swimming pools
- B. More than 10 times the yearly beer consumption in Switzerland
- C. Less than 4% of the yearly amount of water treated in waste-water treatment plants in Geneva
- D. The yearly average amount of water processed by the “*Jet d’eau*” of Geneva.



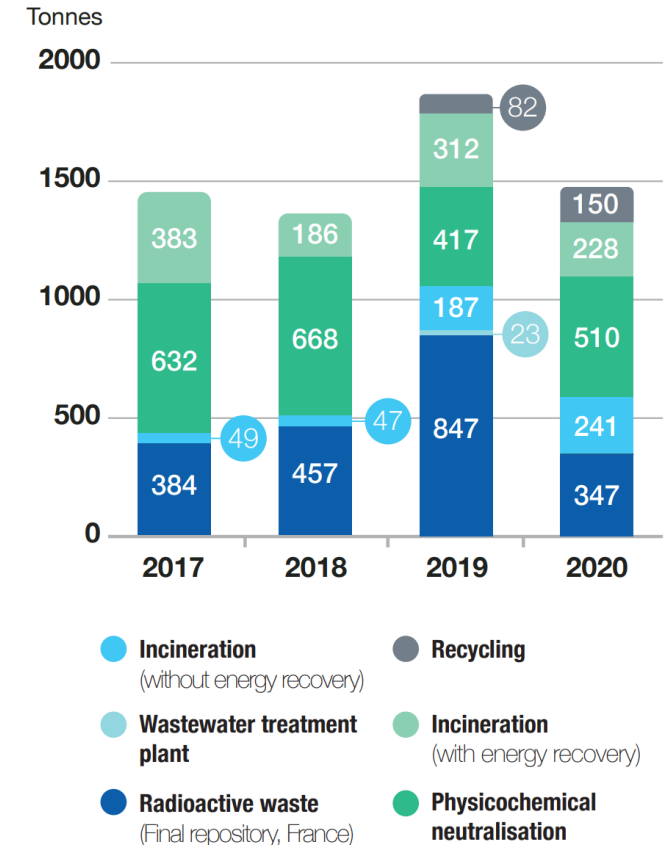


# Waste

- Conventional and radioactive
- Defined elimination pathways
- 56% recycled in 2018, 57% in 2020 (conventional, non-hazardous)
- Main goal: **increase current recycling rate**
- Tripartite agreement on radiation protection and radiation safety guides the radioactive waste (RW) treatment



Non-hazardous waste



Hazardous waste

# QUIZ BREAK



**To what can you compare the weight of non-hazardous waste produced in 2018?**

- A. To about 18 times the weight of radioactive waste produced on site
- B. To about a fourth of the yearly weight of incinerated urban communal waste in Geneva
- C. To more than half the weight of the CMS detector
- D. To more than 5% of the weight of CERN's direct greenhouse gas emissions

# Biodiversity

- CERN's sites spans 625 hectares, 415 which are non-built environments
- To foster preservation CERN
  - Uses low-intensity maintenance
  - Eliminates fertilisers and chemicals wherever possible
  - Set-up a working group in 2020





# QUIZ BREAK



**Which of the following photos depicts recurring activities at CERN?**



A.



B.



C.



D.



# QUIZ BREAK



**Which of the following technologies has been transferred from the Knowledge transfer group for applications outside of CERN?**

- A. Improving the acceleration in electric vehicles using particle accelerators
- B. Reducing air pollution from maritime traffic using particle accelerators
- C. Particularly accelerating the isolation of cancerous cells using particle accelerators
- D. Developing a new and modern standard for radiation measurements in hospitals, the “P Article”, using particle accelerators

# Contribute while you are at CERN...



Save energy  
Switch off lights  
and electrical  
equipment  
when not in use



Limit water  
consumption!  
Not all taps turn  
off  
automatically...



Choose soft  
mobility  
  
Walk, cycle or  
use public  
transport



Protect  
watercourses  
  
Don't throw  
waste down  
drains or  
manholes, it will  
end up in a  
river...



Protect  
biodiversity  
  
Don't pick  
orchids or other  
flowers and  
don't disturb  
animals



**Thank you for your attention!**

<https://hse.cern/environment-report>

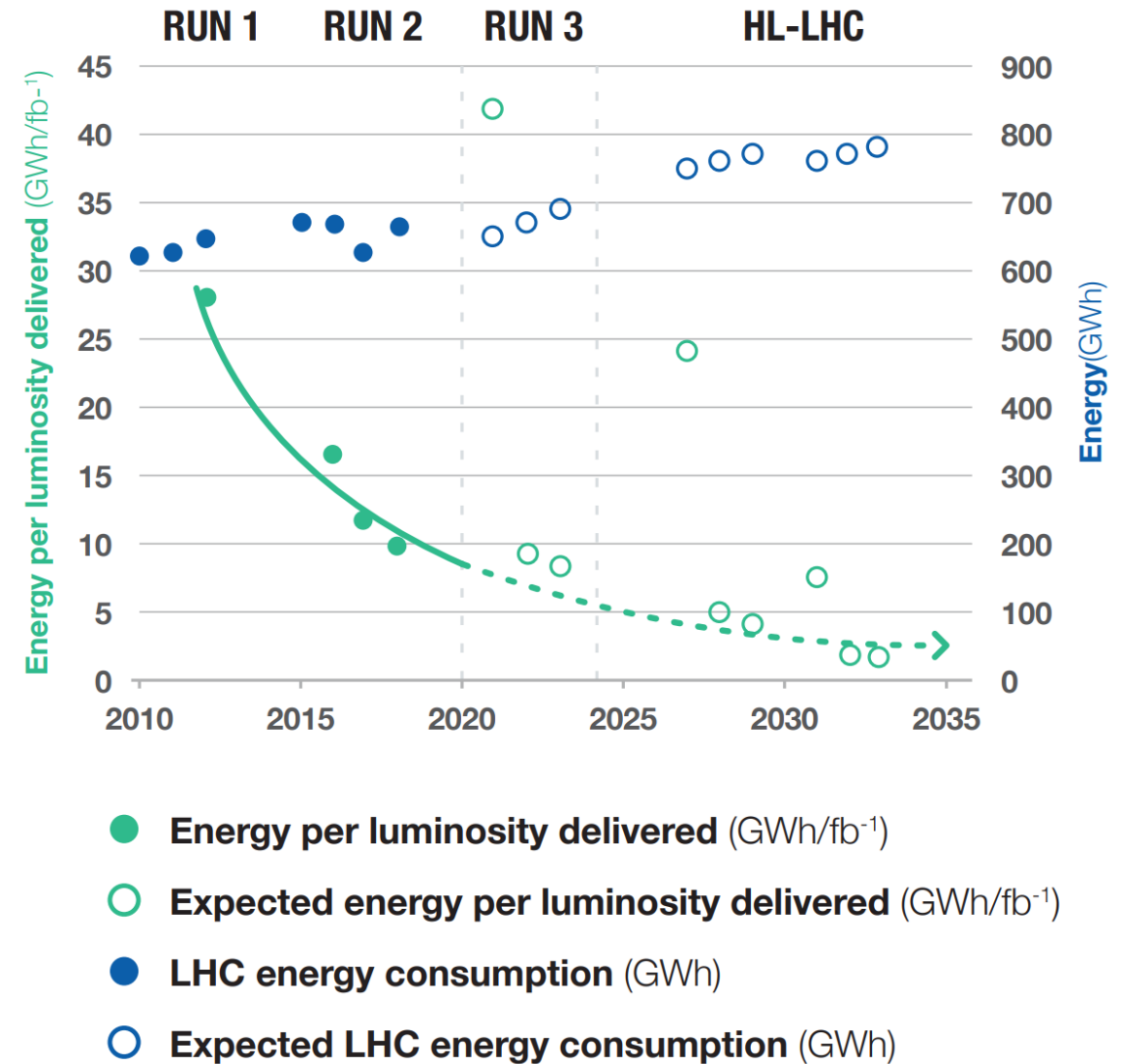


[www.cern.ch](http://www.cern.ch)



# Energy efficiency

- Metric developed by the Energy Management Panel
- Energy per luminosity delivered.
- Efficiency expected to be multiplied by a factor of 10 with the HL-LHC era



*Energy efficiency of the LHC*

# GHG Scopes 1,2,3

