A SUSTAINABLE RESEARCH ENVIRONMENT

CERN is fully committed to ensuring the health and safety of everyone participating in its activities, present on the site or living in the vicinity of its installations. CERN works to limit the impact of its activities on the environment, and to guarantee best practice in matters of safety.

Members of CERN's environmental protection team collect samples from a watercourse that receives effluents from several of the Laboratory's sites. Each year, some 3000 samples are taken in and around the CERN sites to monitor CERN's impact on the local environment. (CERN-PHOTO-201804-100-5)

PROTECTING HEALTH, SAFETY AND THE ENVIRONMENT

In 2017, the newly established CERN Environmental Protection Steering board (CEPS) got to work, making a series of recommendations to minimise CERN's environmental impact. In parallel, CERN's Energy Management Panel (EMP) continued to ensure that the Laboratory's energy was put to the most efficient use possible. A recently formed working group on mobility also made its first recommendations to keep things moving smoothly at the Laboratory.

Other highlights from the year included a drive to increase the percentage of conventional waste that is recycled, and the elimination of a substantial volume of low-level radioactive waste.

ENVIRONMENTALLY RESPONSIBLE RESEARCH

CERN's Environmental Protection Steering board (CEPS) was established to examine the Laboratory's environmental impact across eleven domains, identify priorities and propose actions. In 2017, CERN's water usage and its waste water system, along with the handling and storage of hazardous substances, were the first subjects to come under scrutiny. A number of actions have been identified and are currently being planned and implemented. In some of CERN's underground installations, for example, naturally occurring hydrocarbons are present in the water that seeps out of the rock. Consolidation of the hydrocarbon capture process will ensure that these are efficiently dealt with before water is released. Furthermore, water retention basins are to be constructed at strategic points to contain any accidental release of pollutants, regulating releases triggered by heavy rain and so protecting local watercourses.

Another potential source of environmental impact is the release of gases from particle detection systems. CERN has committed to reducing such emissions considerably while in parallel launching an R&D project to identify environmentally friendly gas mixtures for future detectors.

Particle accelerators are energy-hungry machines, so CERN strives to maximise the efficiency of its energy use. To this end, it established an Energy Management Panel (EMP) in 2015, and several measures have since been put in place to economise energy wherever possible. In a recent consolidation of the East Area experimental hall, improving energy efficiency was part of the design brief, with the result that the beam line magnets will now be pulsed so that they are on only when needed. This simple expedient reduces energy consumption by 90% in the East Area hall.

Other measures include an energy economy cycle for the SPS accelerator that kicks in when beam is not available from the upstream accelerators. The major LHC experiments are also implementing low-energy modes for periods of operational stops, and preparations are being made to recycle heat generated by CERN's cooling systems to heat local neighbourhoods and CERN's Meyrin site.

A BOOST FOR RECYCLING

All in all, some 50% of the conventional waste produced by CERN is recycled, putting the Laboratory in a leading position in the Geneva region, but more could be done. To this end, a recycling awareness week was held at the Laboratory in November, informing personnel of what is already recycled and encouraging people to recycle more. All the waste from CERN's offices and restaurants is sorted at a dedicated plant, with anything that is not recyclable or compostable being incinerated to generate energy. At the various worksites around the Laboratory, recycling is being proactively implemented. Such actions resulted in CERN recycling 543 tonnes of wood, 294 tonnes of paper and cardboard, and 5.4 tonnes of PET in 2016 (the most recent available data).

A LABORATORY IN MOTION

With increasing numbers of people at CERN, challenging commuting conditions across a busy international border, numerous daily inter-site trips and surging demand for parking, mobility is becoming a pressing issue. To address the challenge, the Organization established a mobility working group in 2017 to make mobility at CERN safer, greener and more enjoyable for all. The group's objectives are to optimise the supply and management of CERN parking spaces, to promote alternative modes of transport, and to optimise traffic safety and fluidity within

Measures have been taken to promote the use of bicycles, involving safety improvements at site entrances and the installation of bicycle repair stations. (CERN-PHOTO-201804-087-4)

and around the CERN sites. In 2017, the group began a fact-finding exercise with a view to presenting a mobility plan to the CERN Management in 2018. This will include an action list aimed at meeting these objectives by 2030. In the meantime, many actions have already been taken, such as the automation of CERN's entrance gates, the establishment of a CERN Mobility Centre, the construction of a cycle path between the Meyrin and Prévessin sites, safety improvements for cyclists and pedestrians at CERN's entrances, and the installation of bicycle repair stations.

Among the new ideas being studied are measures to increase traffic flow at the French entrance to the Meyrin site, which is a major rush-hour bottleneck, the introduction of cycle paths and one-way streets on the CERN sites, and the setting-up of a CERN ride-sharing scheme.

MOBILITY INITIATIVES SUCH AS BIKE PATHS AND REPAIR STATIONS ARE MAKING CERN GREENER AND SAFER.

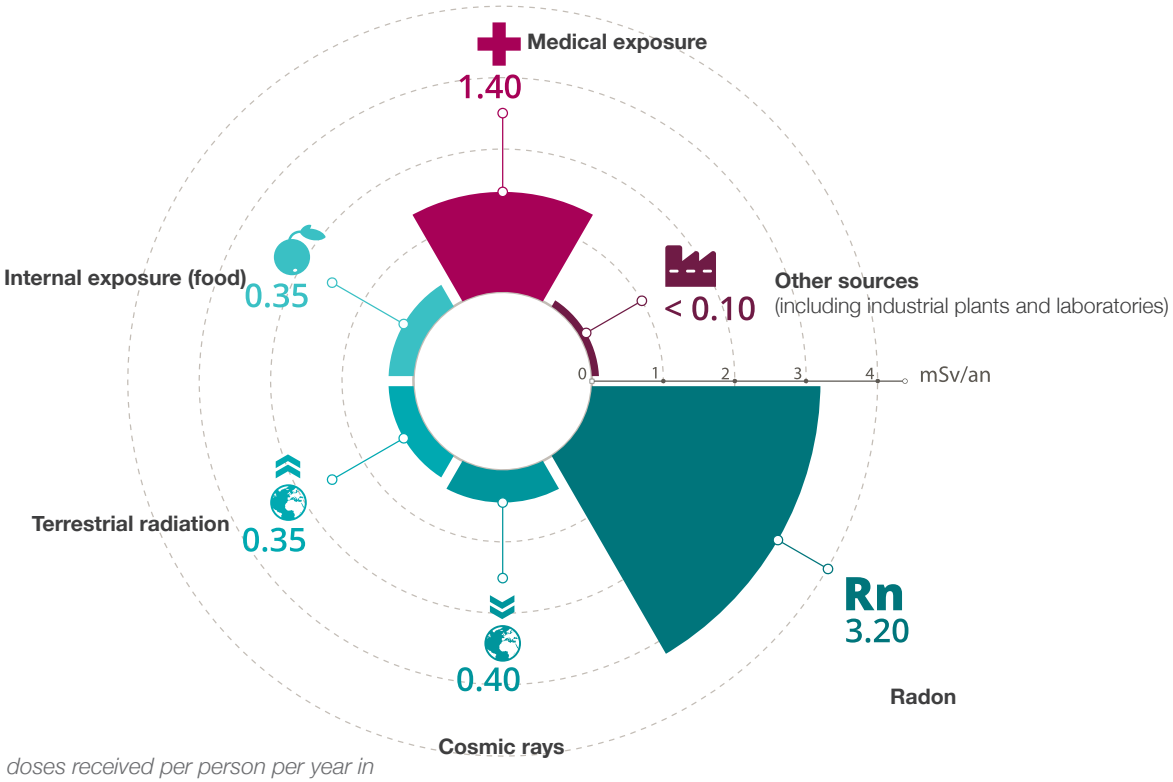
A PARTNERSHIP THAT SAVES LIVES

The partnership established between CERN and the Geneva University Hospitals (HUG) in 2015 was designed to make the most of the synergy between CERN's emergency response teams and the largest hospital in the region. The agreement is built around the stationing of a cardiomobile and paramedical team at CERN.

EXPOSURE TO IONISING RADIATION

People are constantly exposed to radioactivity in their everyday lives. This is known as ionising radiation because it can interact with matter and strip electrons away from atoms. Ionising radiation can come from natural sources, either on Earth or from space (cosmic rays), from our food (internal exposure) or from artificial sources such as medical examinations.The doses received vary greatly from one person to another, depending on lifestyle, and from one region to another.

The sources of radiation to which people are exposed are mainly radon, a gas that comes from uranium in the Earth and is emitted in our homes, medical treatments and natural radioactivity. Industrial plants and scientific research institutions are much weaker sources of radiation. CERN's contribution is around 0.01 to 0.02 mSv per year at the perimeter of its sites. CERN has 136 monitoring stations and takes numerous samples and analyses every year, which it submits to the competent authorities in its two Host States.



Average radiation doses received per person per year in Switzerland [in mSv/year/person] by origin. (source: Swiss Federal Office of Public Health, 2016).

The CERN-HUG partnership provides coverage not only for CERN, but also for the western side of the canton of Geneva and the surrounding area. It effectively integrates CERN into Geneva's emergency response systems. As a result of the agreement, CERN's emergency control room now has a permanent link and a single point of contact with the ambulance and emergency services control centre in Geneva. CERN's ambulance assists the Geneva fleet on request, improving service both for CERN and for the canton, and making survival much more likely in the event of an emergency.

As well as an immediate improvement in emergency response, the partnership with the HUG brings long-term benefits to CERN. For example, the HUG now provide training in emergency response to CERN personnel in the Medical and Fire and Rescue Services, and the Laboratory's ambulance personnel are now able to take a course leading to the award of a diploma recognised nationally in Switzerland (the *Brevet Fédéral de Technicien Ambulancier)*. The partnership also allows on-the-job training for safety control room personnel.

RECYCLING LOW-LEVEL RADIOACTIVE WASTE

The operation of particle accelerators results in the activation of certain components. Most of the isotopes produced have half-lives of minutes or even seconds, but some can have longer half-lives. Some components therefore remain radioactive for several years and have to be stored at CERN until they are prepared for disposal at CERN's waste treatment centre. In 2017, some 3000 m^3 of waste was safely eliminated in the course of the year. This largely consisted of accelerating modules from the LEP accelerator, recycled in Switzerland as conventional metals after release from regulatory control, and cables, disposed of as very low-level radioactive waste in France. This amount of low-level radioactive waste eliminated in 2017 was considerably higher than the 630 m^3 produced during the year.

SUPPORTING THE UN'S SUSTAINABLE DEVELOPMENT GOALS

In October, the United Nations Office in Geneva held a public Open Day in which CERN was invited to participate. The Organization used the opportunity to show how research at CERN contributes to the UN's Sustainable Development Goals (SDGs). The SDGs are ambitious – the UN's goals always have been – and that ambition has paid off. Over the decades, the UN development goals have kept a range of critical challenges in the spotlight, and they have made a real difference to millions of people's lives.

The link between the SDGs and fundamental physics research might not be immediately obvious, but of the 17 goals, ranging from eliminating poverty and hunger to promoting peace and justice through strong institutions, there are five to which CERN contributes simply by carrying out its core mission.

CERN promotes health and well-being, a domain to which particle acceleration and detection technologies have been contributing for decades, through applications such as medical scanners and accelerators for hadron therapy. CERN's range of educational programmes, formal and informal, serves students and educators from around the world. The Laboratory promotes innovation through its knowledge transfer activities. The promotion of peaceful and inclusive societies is an integral part of CERN's governing convention. The final SDG goal aims to strengthen the means of implementation of the preceding 16 by revitalising the global partnership for sustainable development. CERN is a model for global cooperation in science and continues to inspire and provide practical guidance in different areas of science and in other areas of human endeavour.

A safe space for chemicals

A brand new building housing laboratories for the surface treatment of vacuum equipment, and workshops for the manufacturing and treatment of printed circuit boards, was completed in 2017. An extensive risk assessment was carried out to ensure safe handling of chemicals, resulting in the incorporation of state-of-the-art safety systems in the building's design. The tanks in which chemicals are stored, for example, are equipped with a double skin and leak detection sensors, and are installed above high-tech retention basins able to withstand more than 100 different types of chemical. The building is equipped with solar panels and a heat recovery system, saving around half the energy that would otherwise be needed to heat it.