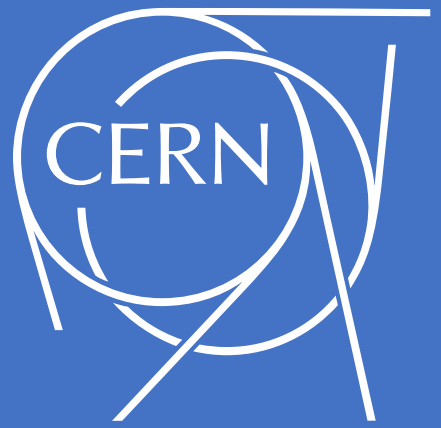
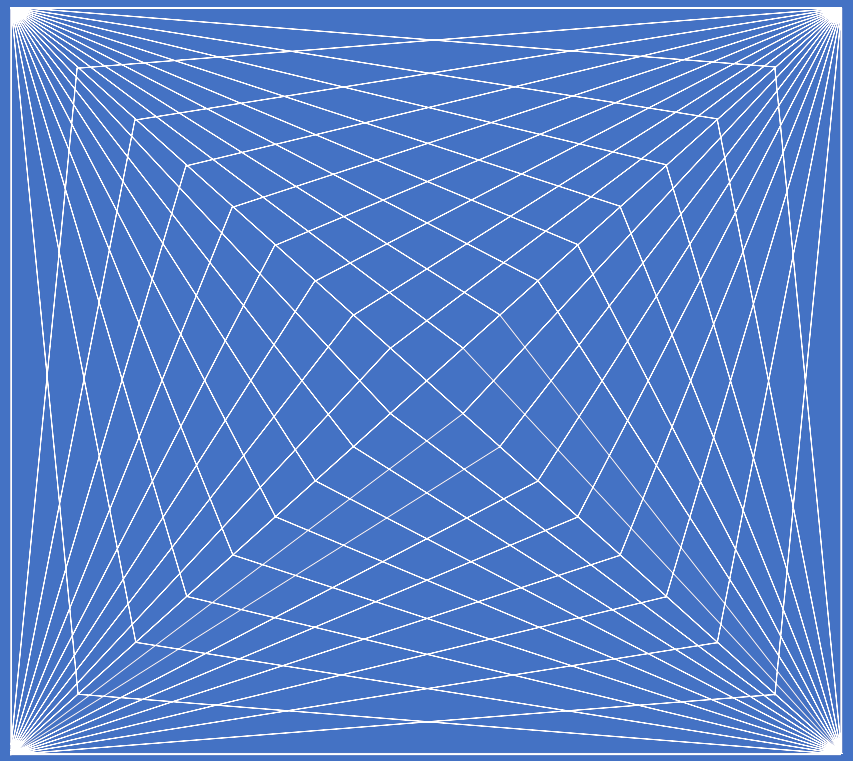


CERN Masterplan 2040
Town Hall meeting

Raphaël BELLO, Director for Finance and Human Resources

Mar CAPEANS, Head of Site and Civil Engineering Department

CERN, June 9th 2022



Masterplan 2040

Raphaël BELLO, Director for Finance and Human Resources

Masterplan translated into the reality of the CERN site 2021-2025

Mar CAPEANS, Head of Site and Civil Engineering department

Q&A accompanied by

Pippa Wells, Deputy Director for Research and Computing (RSC)

Benoît Delille, Head of the HSE unit

Michael Poehler, Leader of the Technical Office and Geomatics Section (SCE)

CERN Masterplan 2040, a strategic document

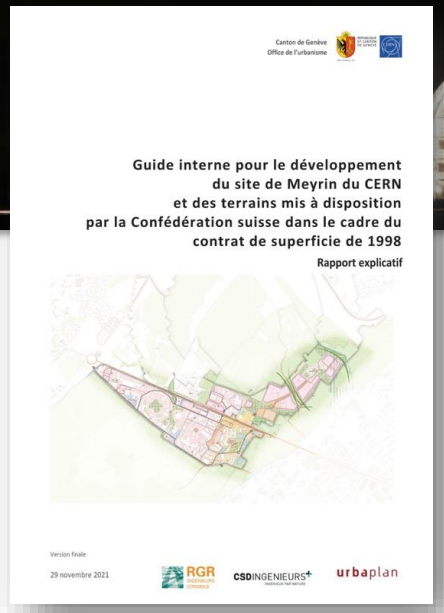
European Strategy for Particle Physics

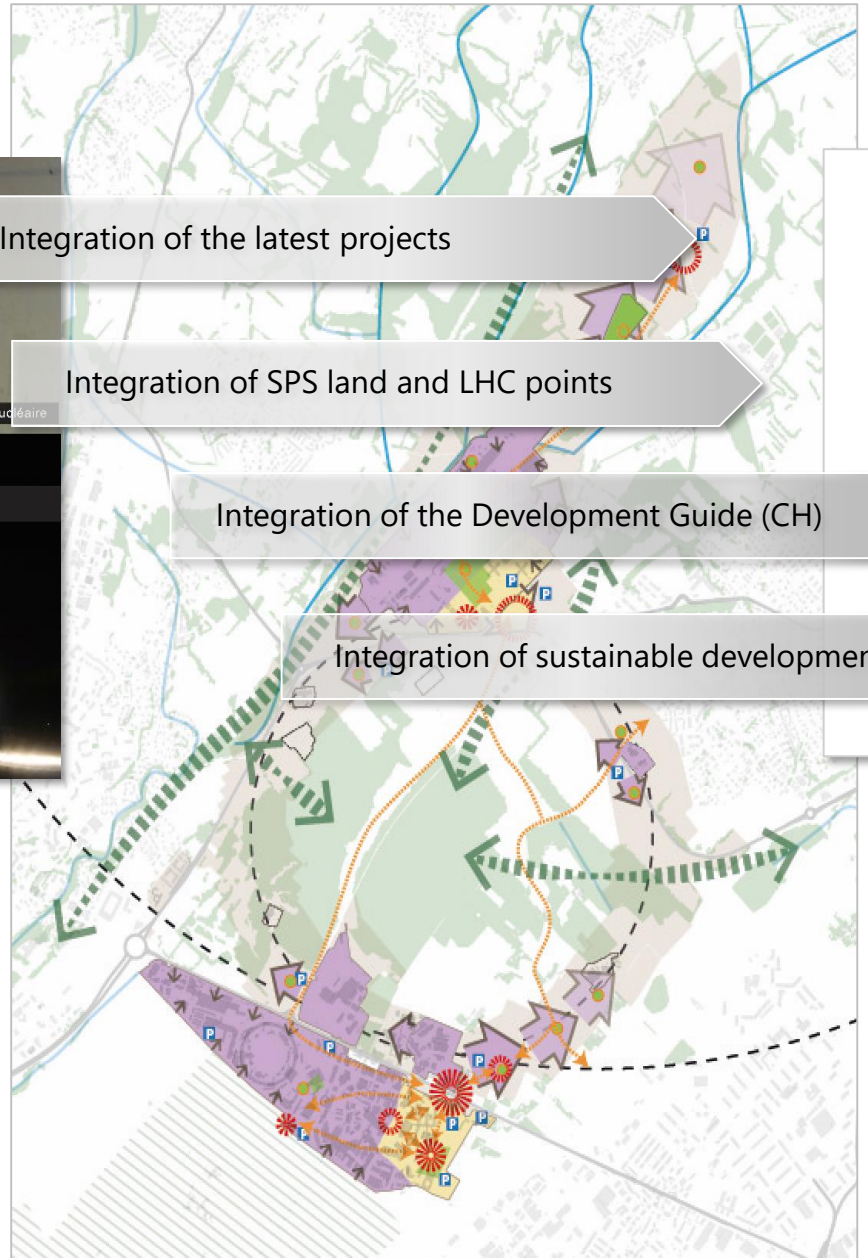
2030 Agenda for Sustainable Development
17 Sustainable Development Goals (SDGs)

CERN Strategic Objectives 2021-2025

Attractiveness of the site and personnel wellness

CERN Masterplan 2030 → 2040

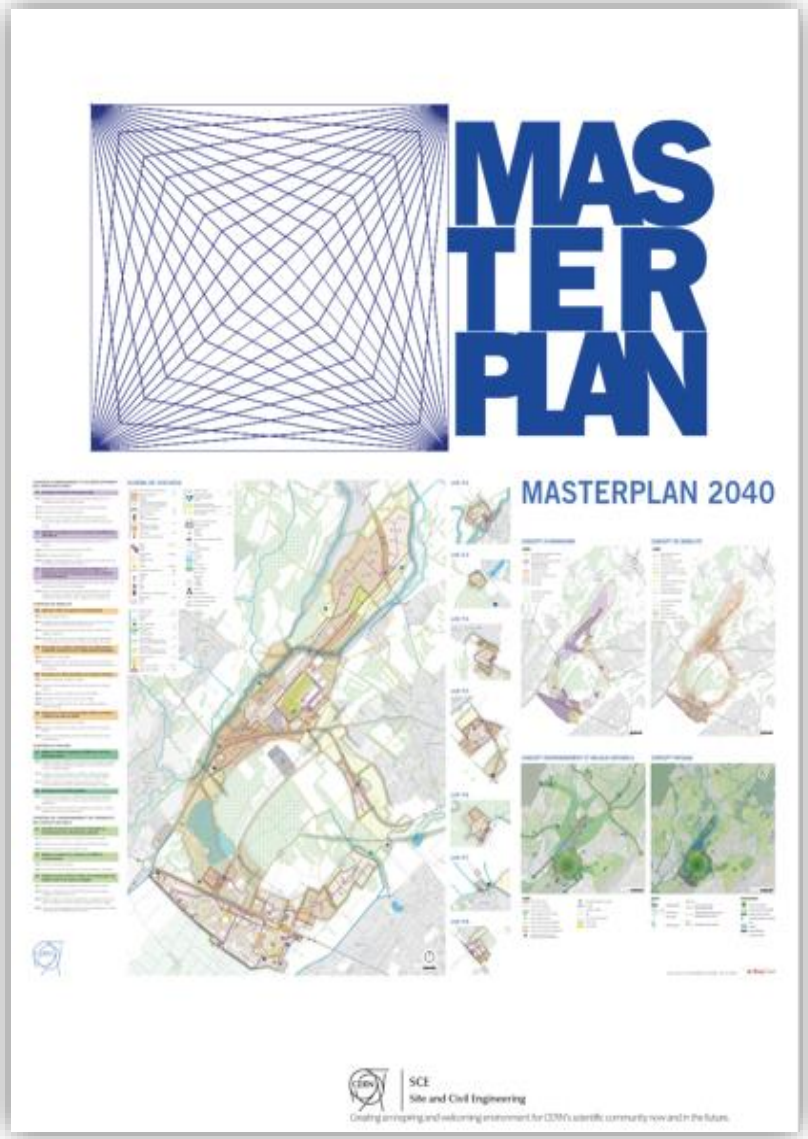




- Integration of the latest projects
- Integration of SPS land and LHC points
- Integration of the Development Guide (CH)
- Integration of sustainable development

CERN MASTERPLAN 2040
Stratégie générale

CERN Masterplan 2040 Use

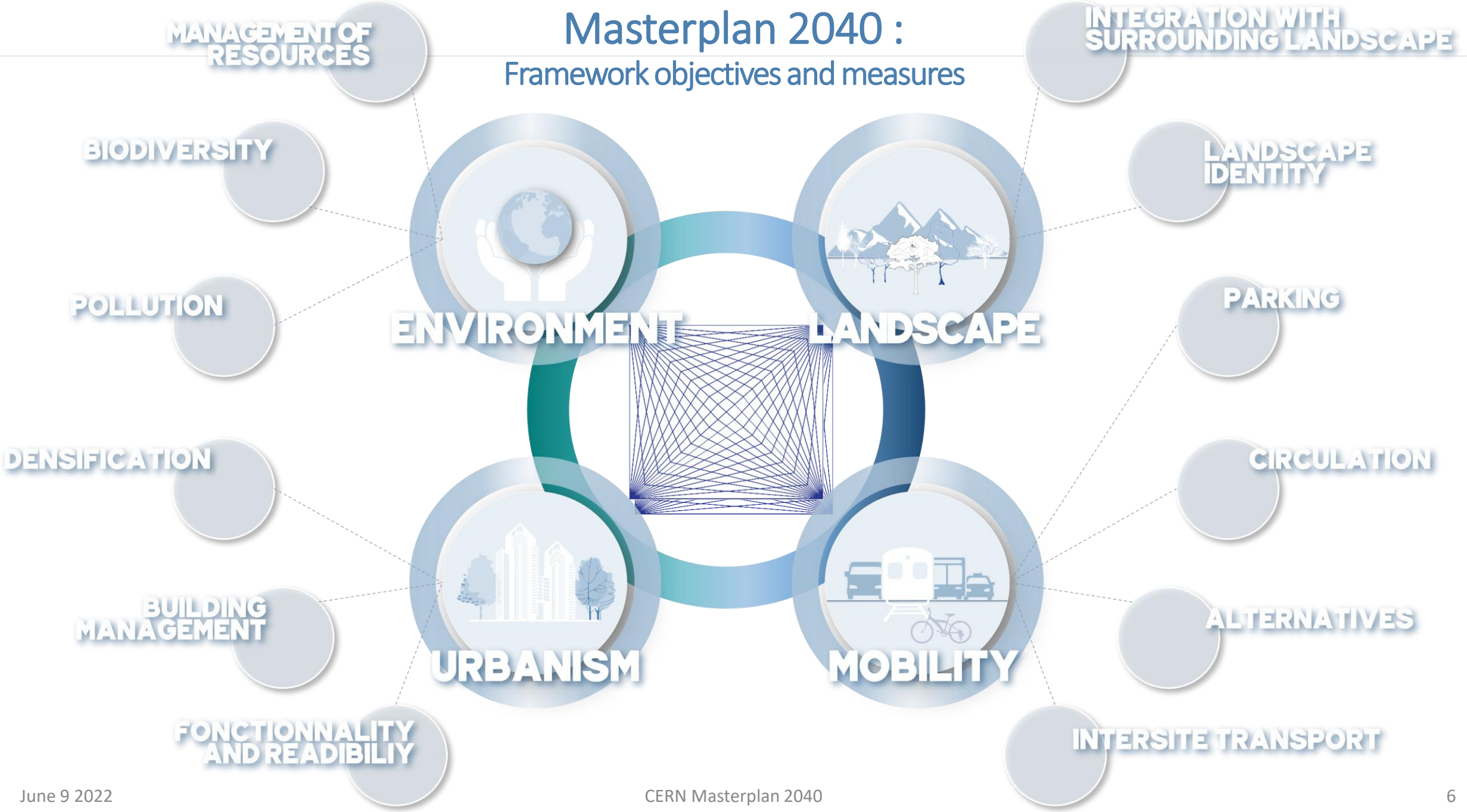


It is a document to inform and inspire a reasoned and meaningful dialogue about the management and update of CERN's site. It is therefore a key document to guide and improve the management and use of land and space at CERN.

The **Masterplan** will be used in a variety of practical ways such as:

- To deliver better on CERN's environmental objectives;
- To support decisions in the approval process of infrastructure projects;
- To reveal trends and analyse effectiveness of land planning and management;
- To connect spatial and infrastructure planning with budgeting and investment decisions;
- To ensure that "privileges over" and "ownership of" space do not hamper the optimization of the existing space and potential savings;
- To favour Project Proposals initiated by a high-level objective;
- To plan better services for the Organization and its scientific community.

Masterplan 2040 :
Framework objectives and measures



Masterplan 2040

MANAGEMENT OF RESSOURCES

Control the resource requirements for the operation of tertiary infrastructures:

- Improve energy consumption and reduce greenhouse gas emissions
- Promote new energy-generation technologies
- Limit the increase in water consumption.

BIODIVERSITY

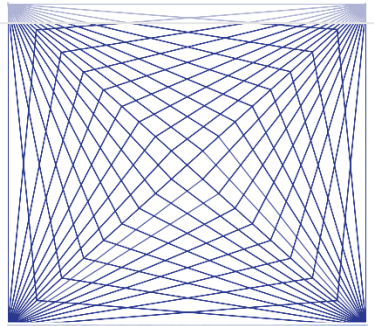
Initiate an action plan in favour of biodiversity, green spaces and protected species:

- Continue to implement the rainwater management strategy
- Draw up an inventory of the existing biodiversity, protected species and green spaces
- Continue the development of the ecological continuity of environments and wildlife corridors.

POLLUTION

Control and mitigate CERN's environmental pollution:

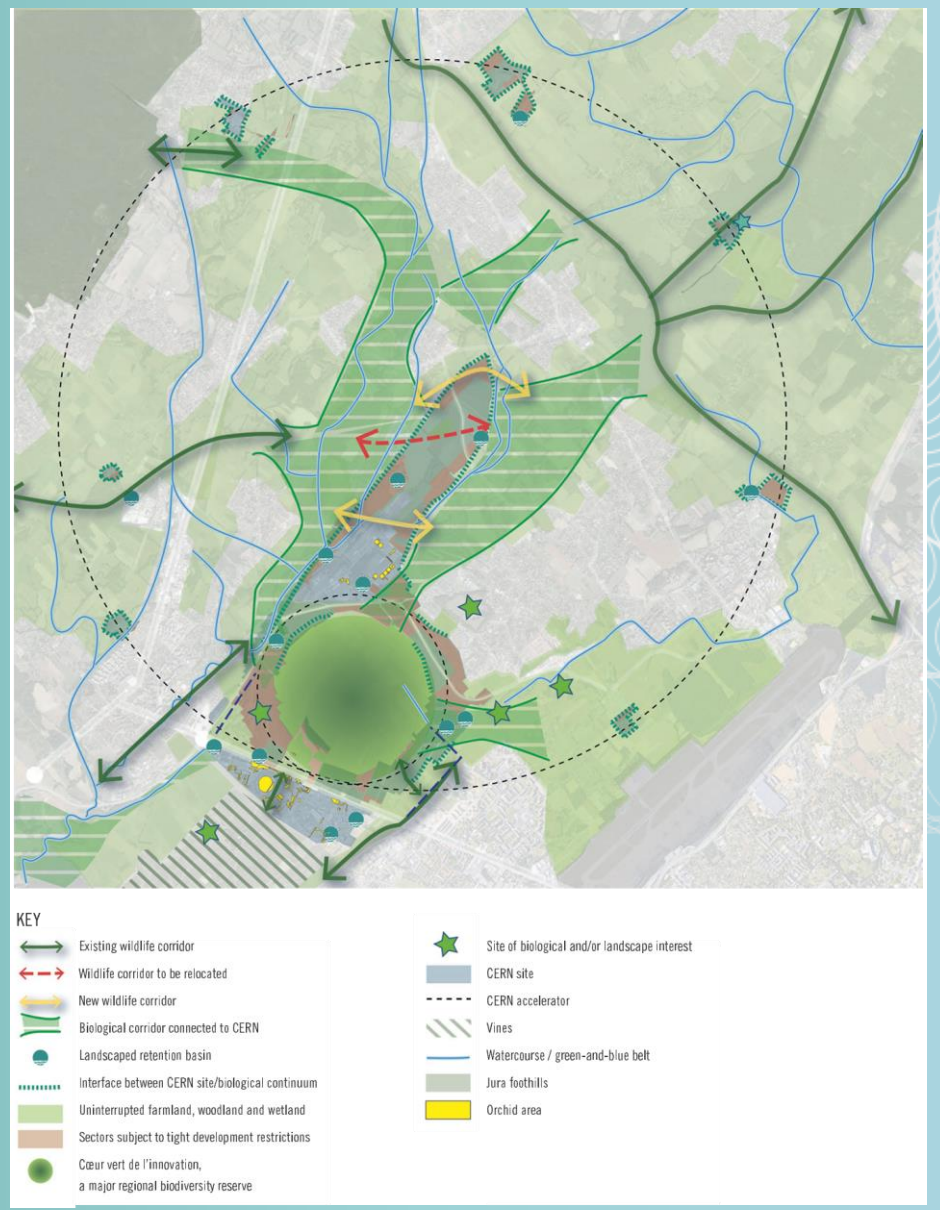
- Limit noise pollution
- Increase the recycling rate and reduce waste production.



Installations and facilities that preserve a “Green Heart” in the region

Integration of sustainable development

ENVIRONMENT AND NATURE CONCEPT



LANDSCAPE
BIODIVERSITY
ENERGY
DENSIFICATION
EMISSIONS
IONIZING RADIATION
NOISE
LIGHT POLLUTION
WASTE
WATER AND EFFLUENTS
ENVIRONMENTAL COMPLIANCE
SUSTAINABILITY
NORMS

Masterplan 2040

DENSIFICATION

Densify land occupation by ensuring flexibility of use

- Identify the areas set aside for development and define priorities
- Continue to monitor CERN's development
- Draw up a land improvement plan
- Favour taller buildings where site conditions and building use so permit

BUILDING MANAGEMENT

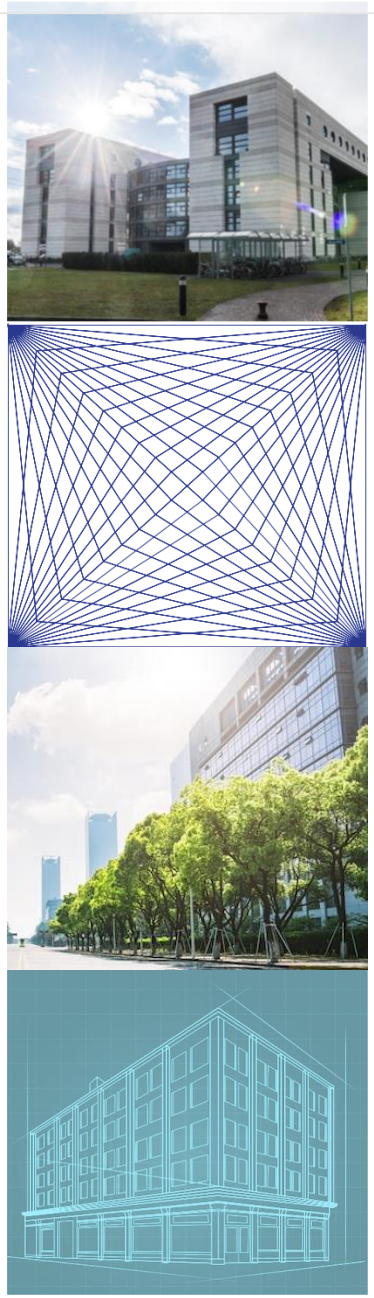
Standardise the use of built-up areas:

- Develop a policy for the management of built-up areas with a specific strategy for each purpose
- Continue monitoring existing buildings
- Continue the renovation programme

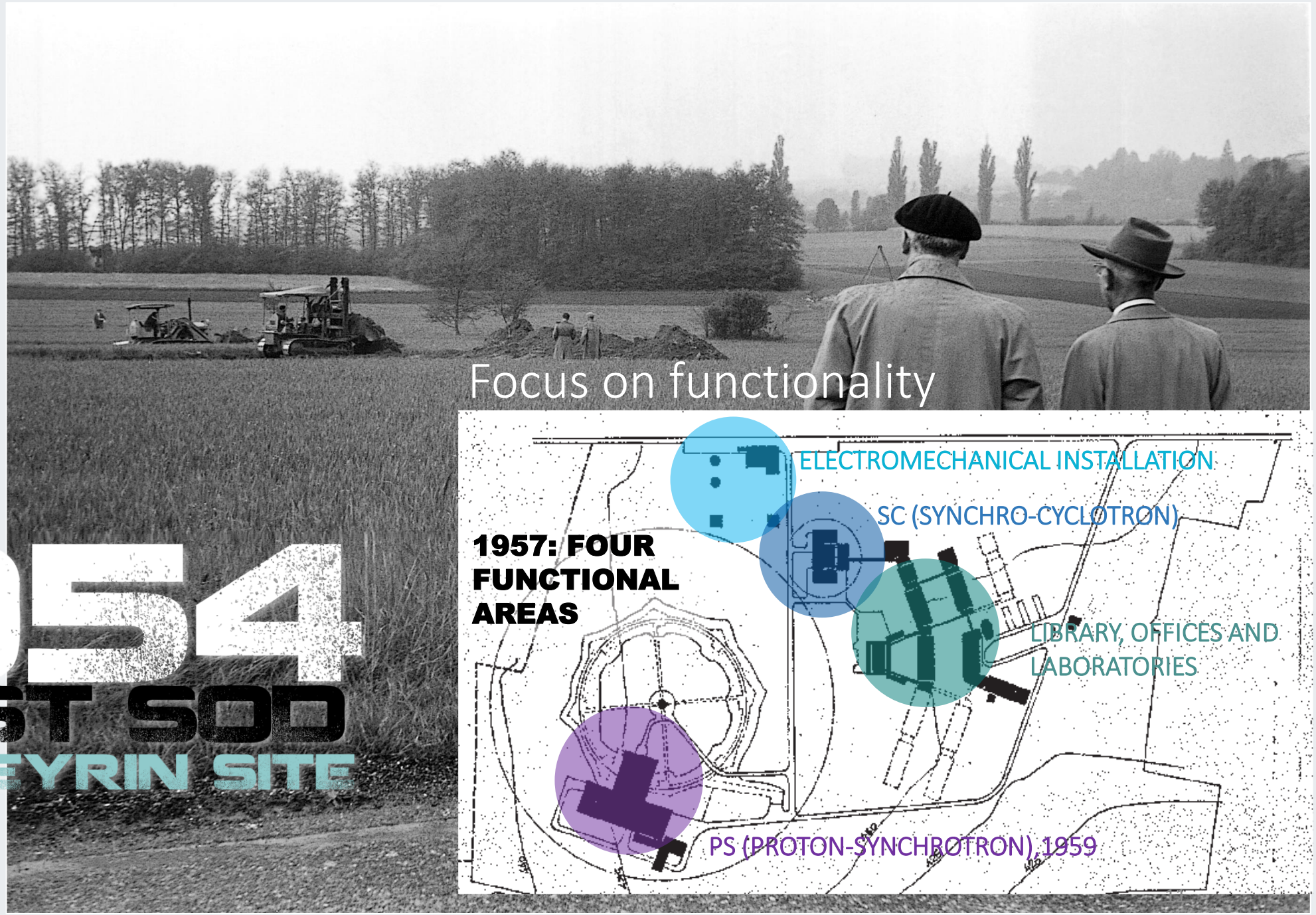
FUNCTIONALITY & READABILTY

Consolidate the functionality of the Meyrin and Prévessin sites and the experiment sites, and make the Prévessin site autonomous :

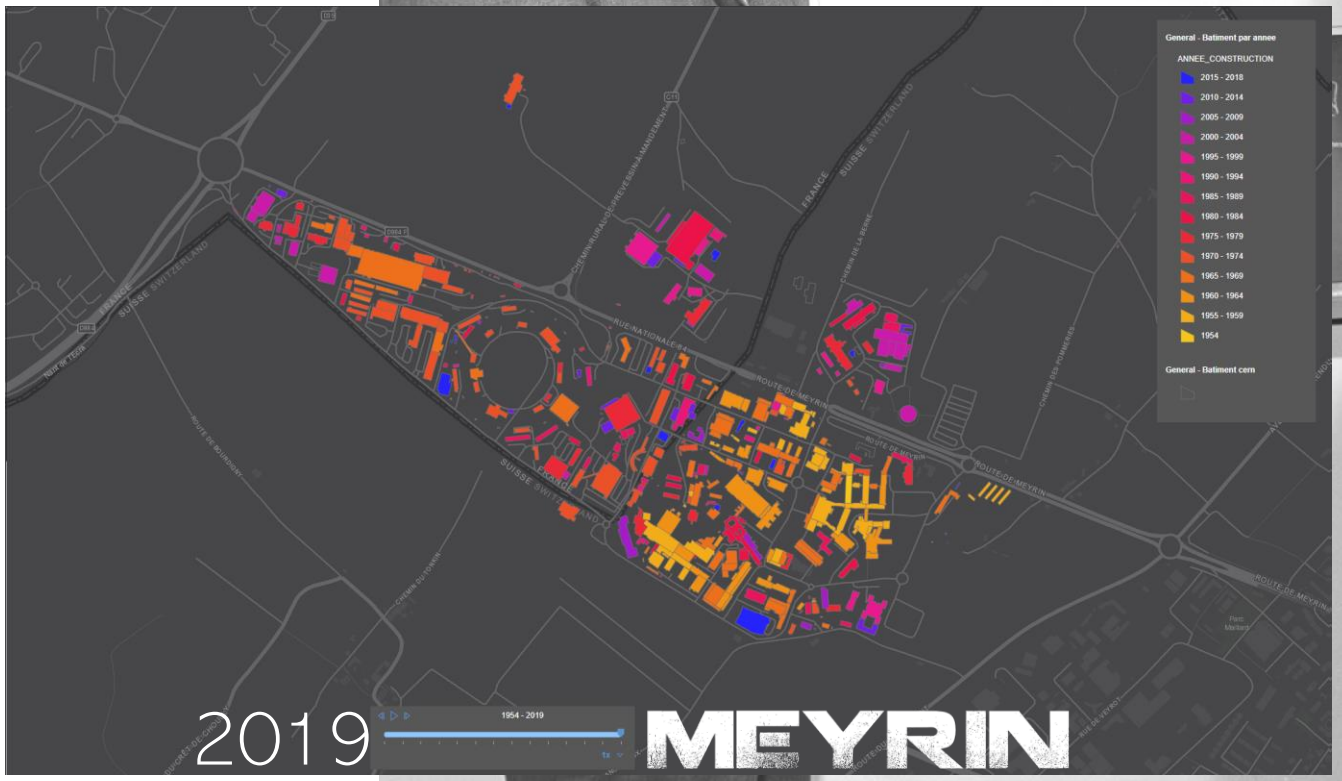
- Enhance the organisation and coherence of the sites by creating specific zones: visitor, academic, scientific–technological .
- Create one or more decentralised service hubs on the existing and future sites, notably bringing together amenities, restaurants, public spaces, lawns, gathering areas, etc

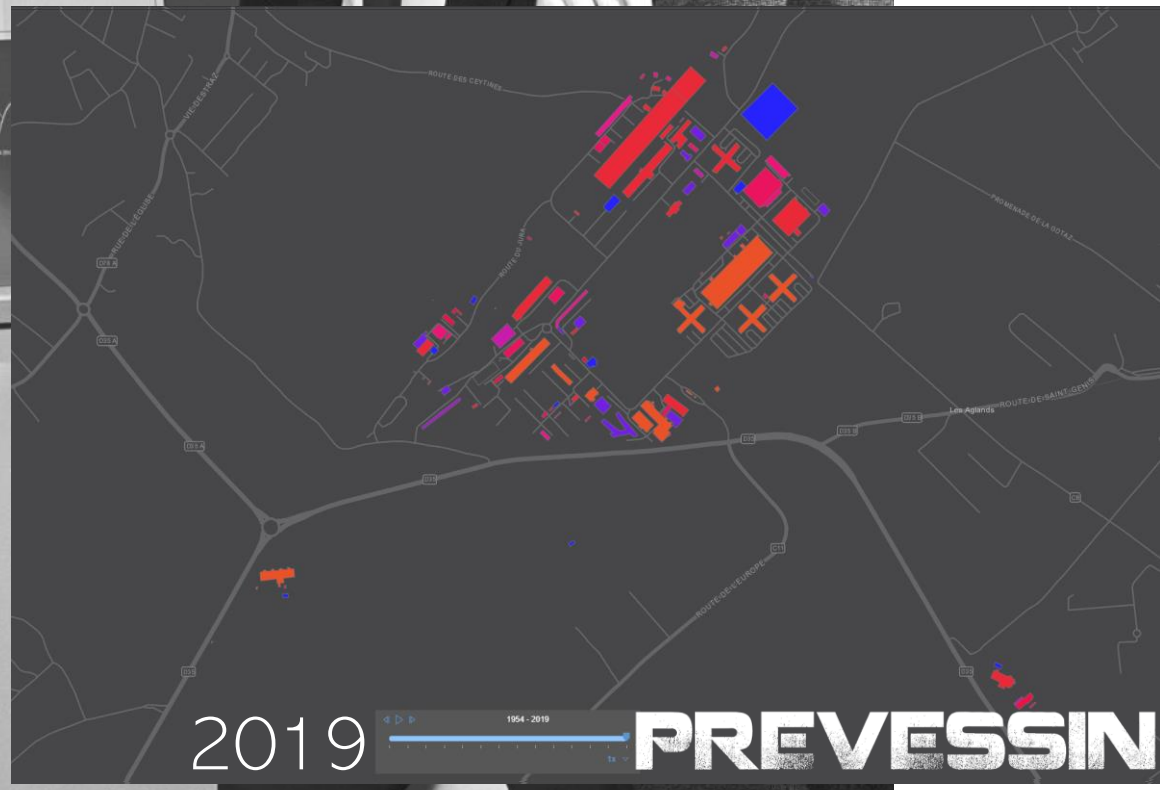


Focus on functionality



Two sites, two stories and parallel developments





C J Zilverschoon (left), K Johnsen and A Schoch discuss the layout of a 300Â GeV proton synchrotron surrounded by a pair of storage rings for colliding-beam experiments.

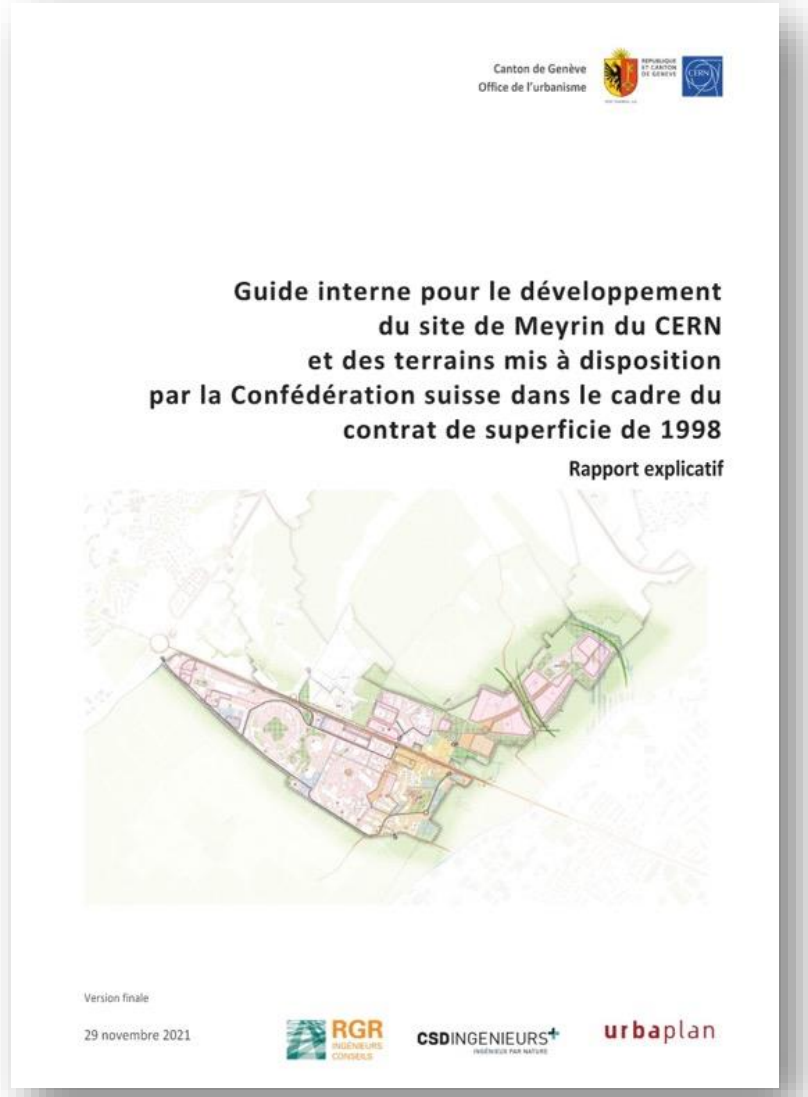
Internal Guide for the Development of the Meyrin site

2018 - 2021

The Internal Guide for the Development of the Meyrin site was launched in the framework of the Structure de Concertation Permanent (SCP) at the end of 2018.

Collaboration between CERN and Canton de Genève, Office de l'Urbanisme.

Its objective is to allow the development of CERN and to guarantee the functionality of the site while preserving the surrounding rural and forest space.



Internal Guide for the Development of the Meyrin site

Inventories

Green Spaces

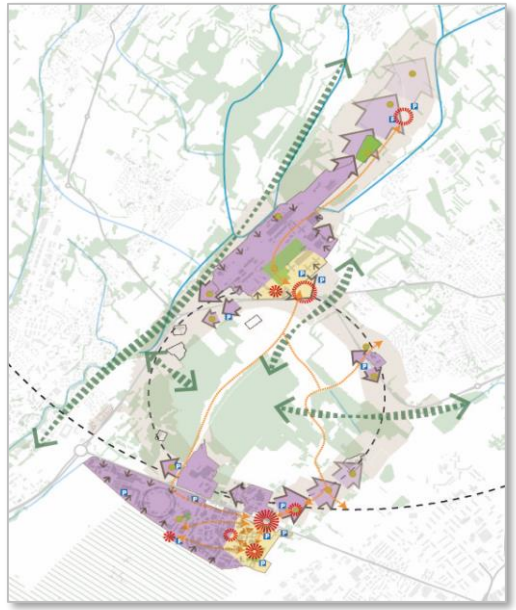
Buildings Functionality

Capacity to transform

1. Heritage and historical qualities of buildings as a constraining factor;
2. Period of construction, considering that the older a building is, the more its depreciation justifies an intervention;
3. Function of the buildings, considering that offices, office-laboratories or storage are more conducive to relocation than spaces devoted to experiments, technical or production buildings;
4. Functional links with underground infrastructures a constraining factor.

Guiding Principles

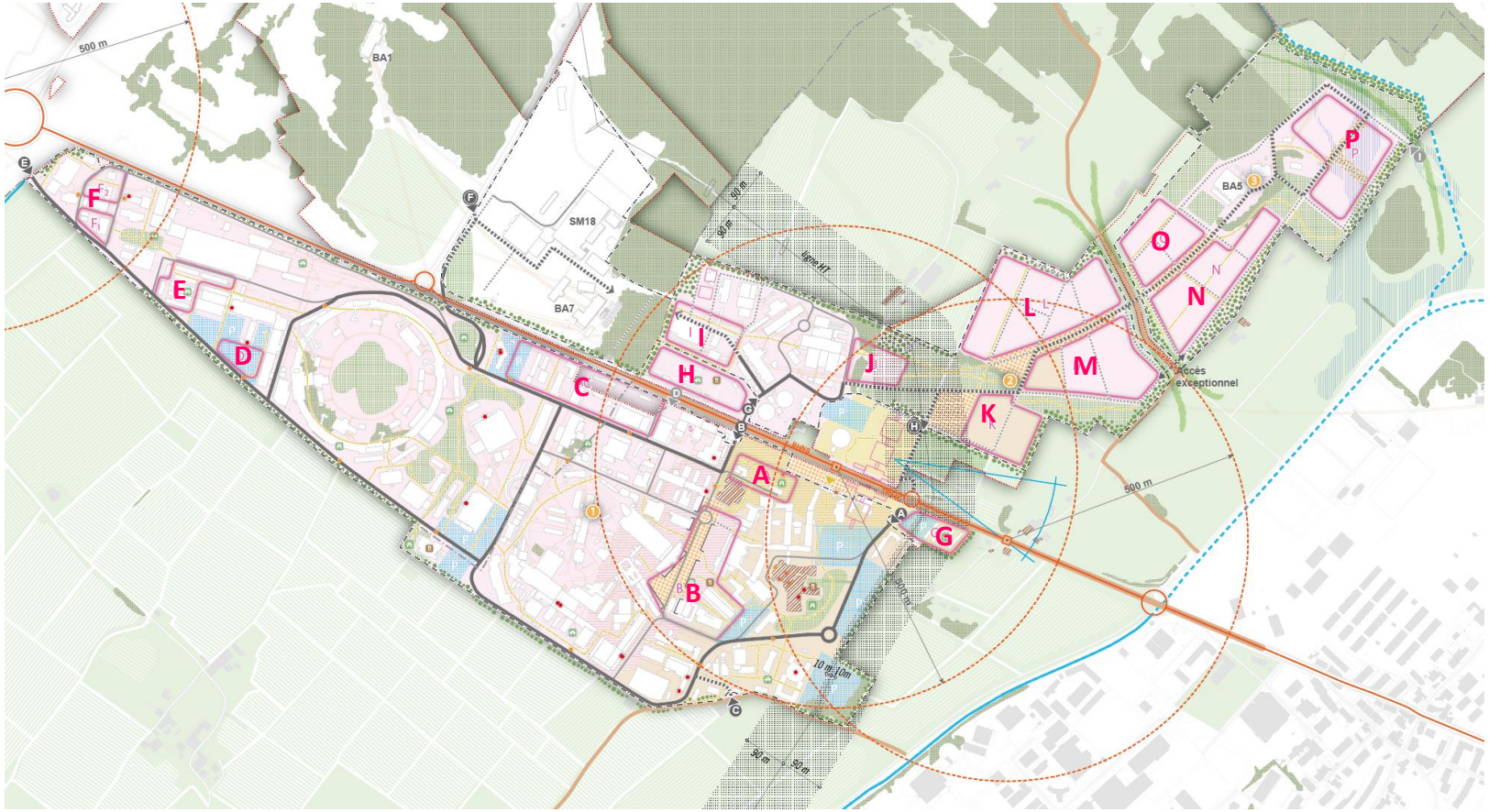
1. Prioritize potential sectors identified as “intra-muros”;
2. Give priority to developments in the continuity of the existing site;
3. When particular conditions require it, extensions of the site extra-muros.

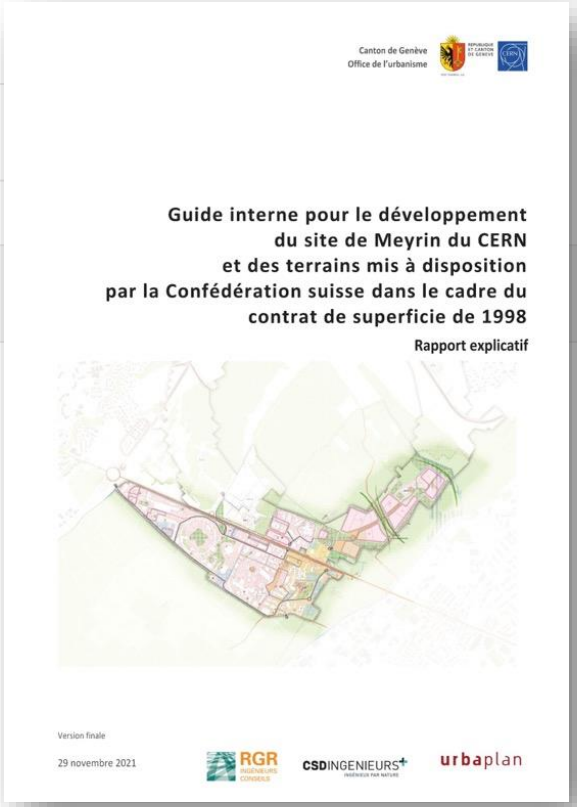


Internal Guide for the Development of the Meyrin site

Potential

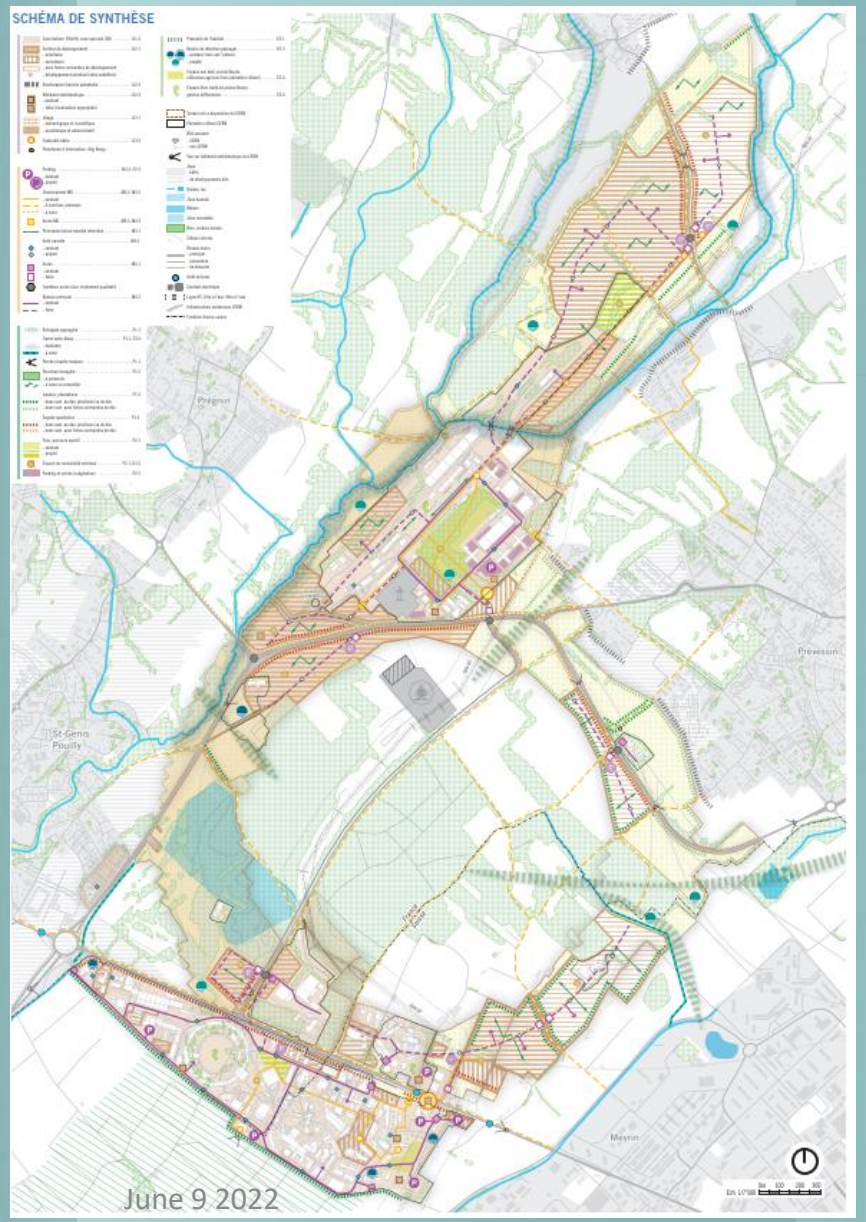
Plan with the 16 development sectors – one sheet per development sector

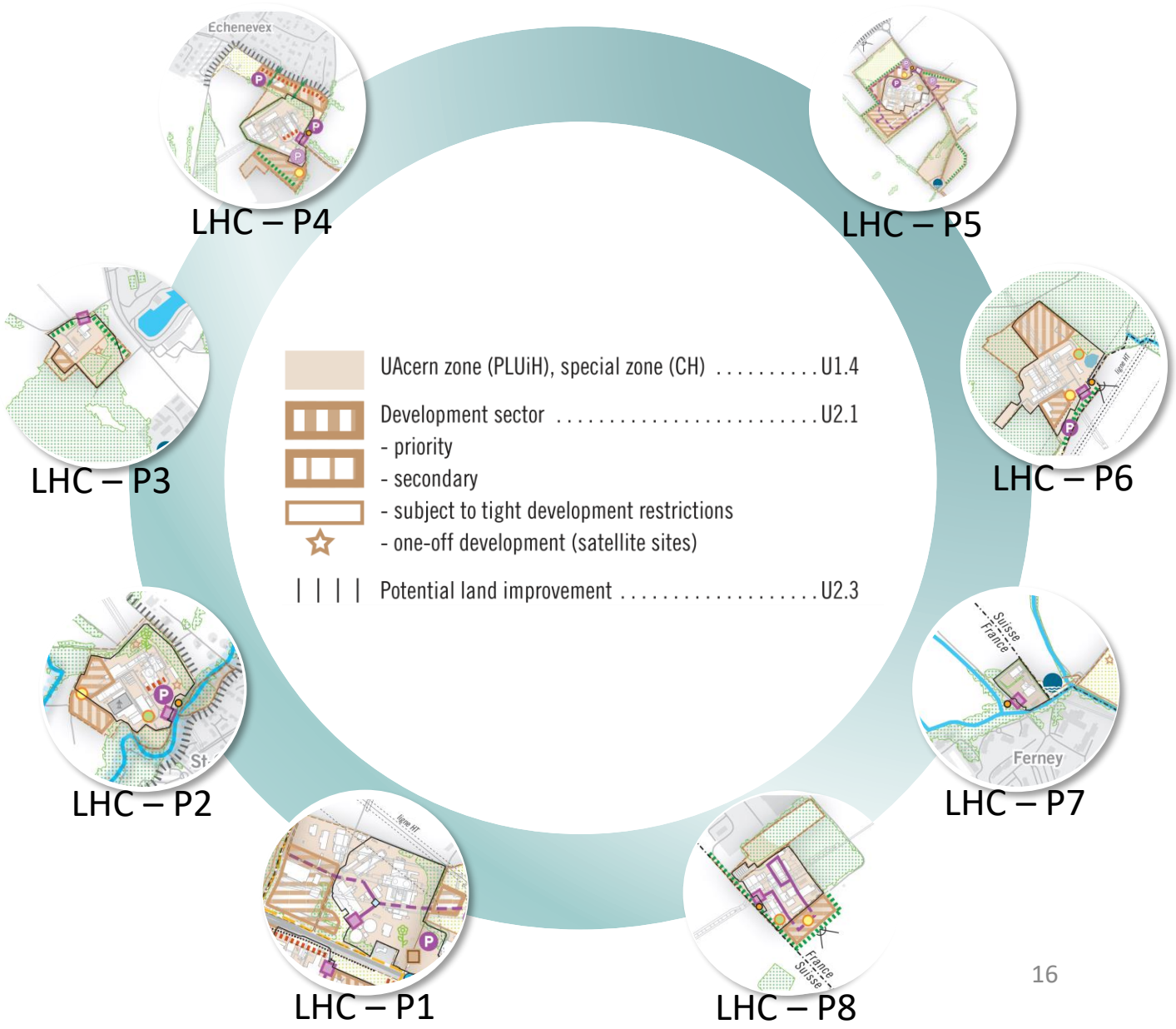




Sheet – Development sector C

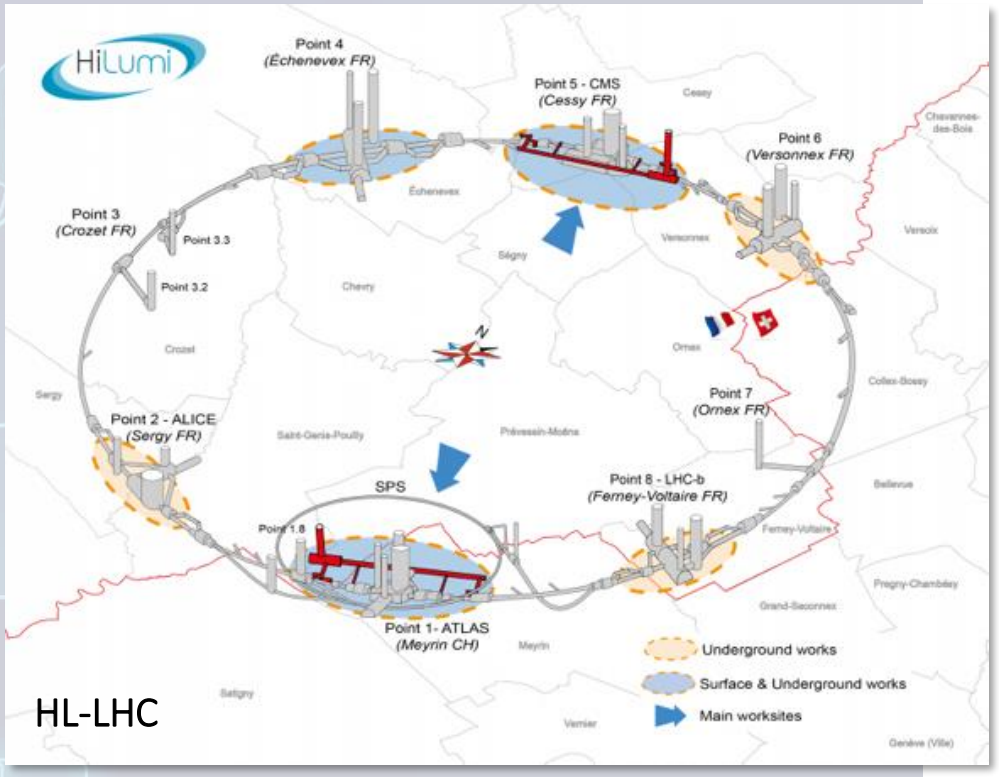
Development plan for Meyrin and Prévessin





Future projects

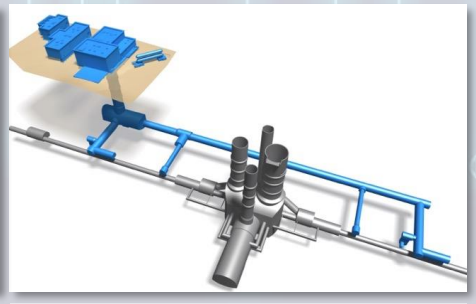
HL-LHC (P1&P5): civil engineering works delivered end 2022



HL-LHC

Tunneling works

Tunnel finalised



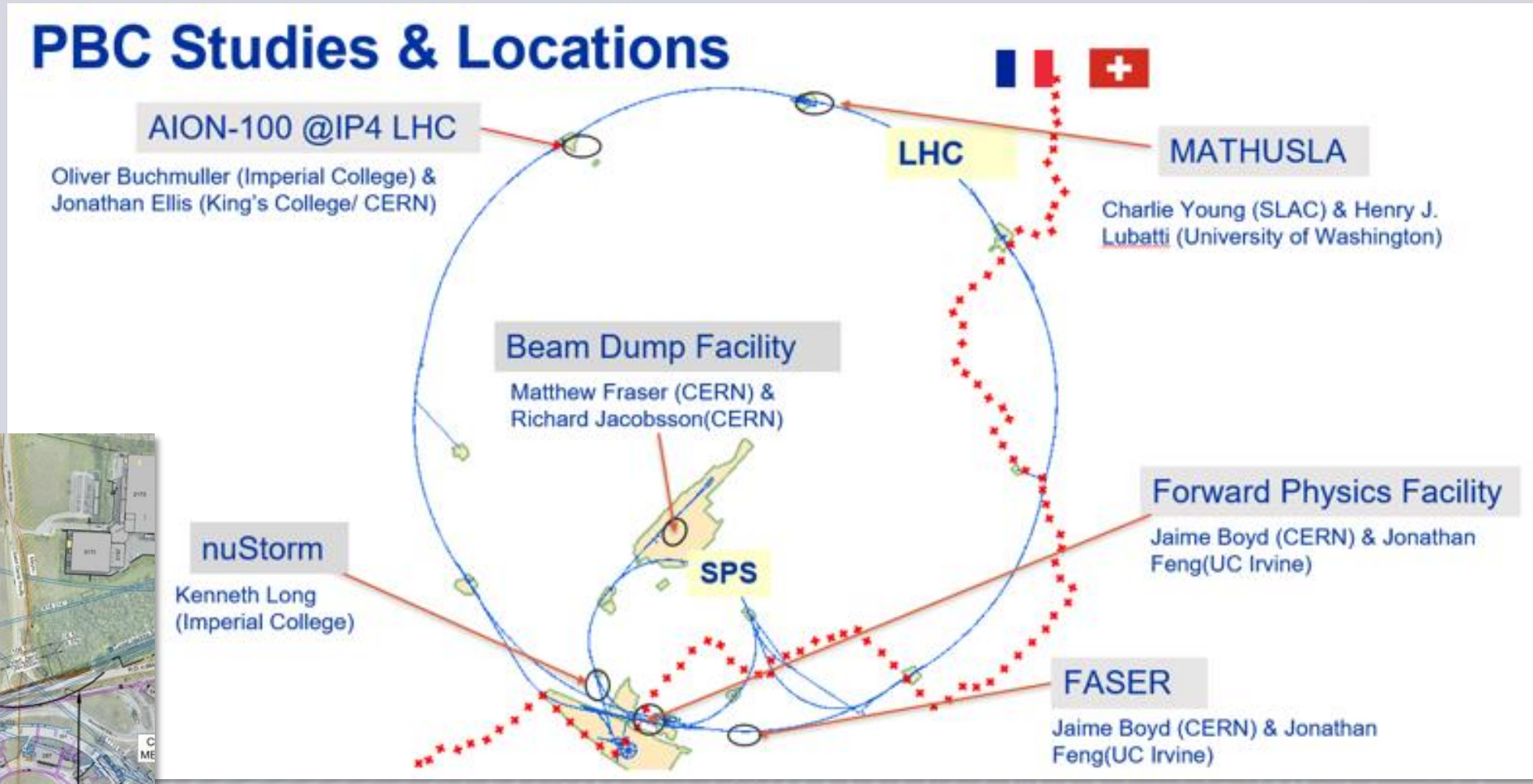
Works in Point 1 - Meyrin

Above-ground buildings

P1 - 60% of excavated material treated on site – topsoil reclaimed

Studies

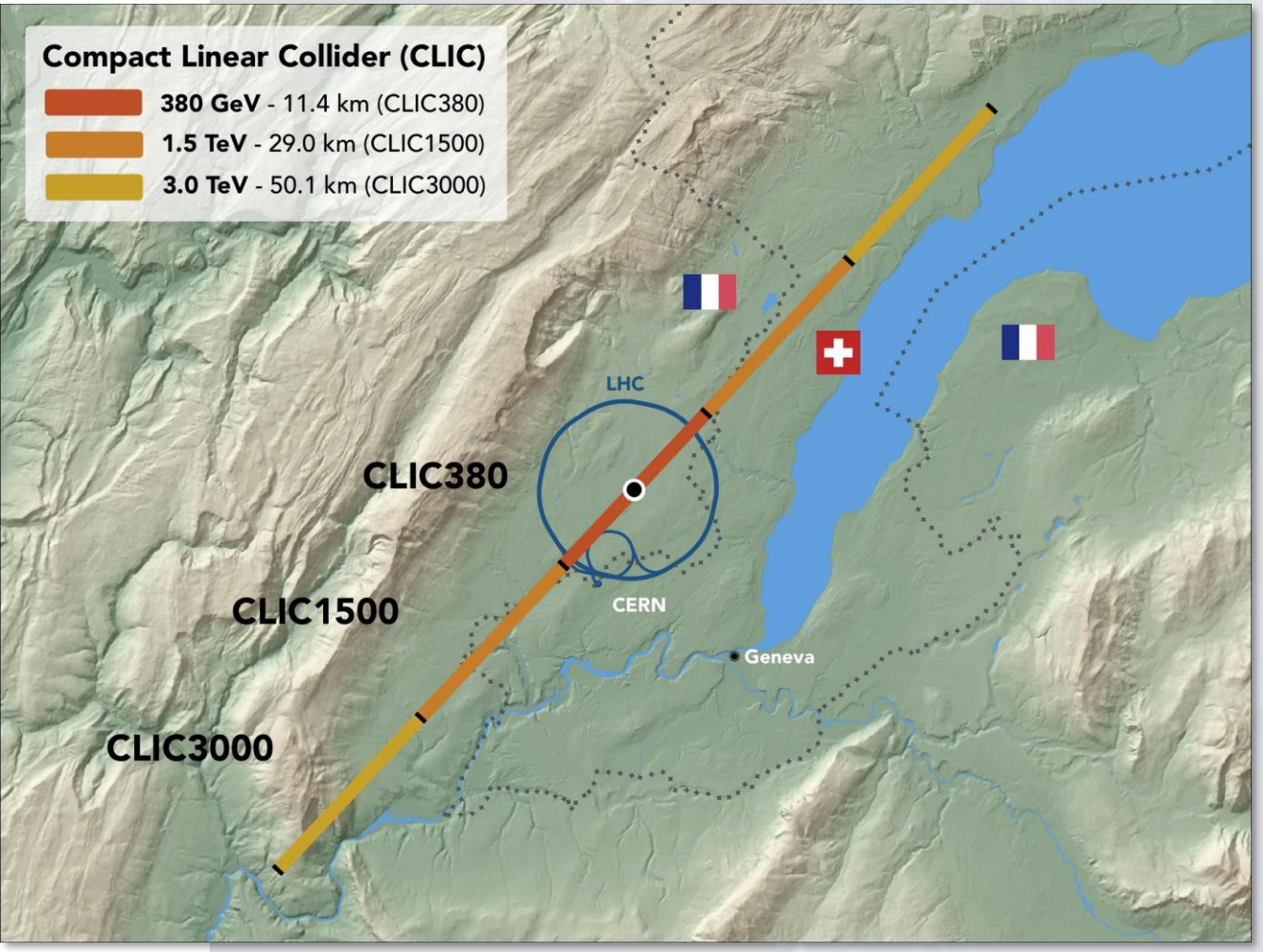
Physics Beyond Colliders (PBC)



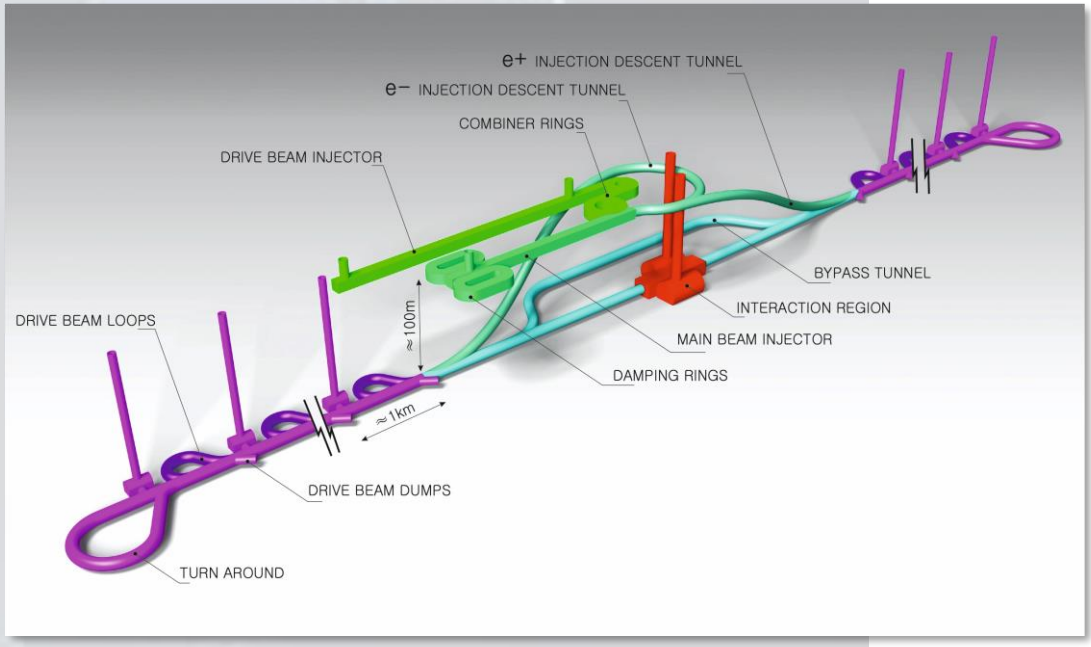
Studies

Linear Colliders : CLIC at CERN (ILC in Japan)

Three stages plan



Electron-positron linear collider at CERN over the HL-LHC



Studies

The Future Circular Collider

Collision energy: 100 TeV
Circumference: 90 km
Feasibility Study: 2021 - 2025

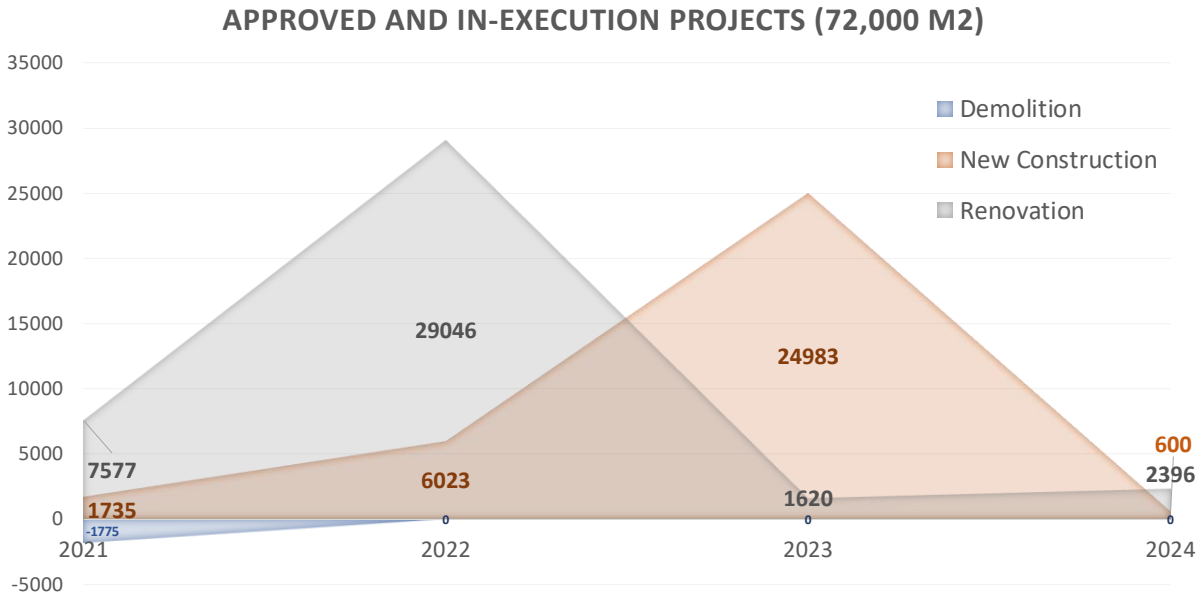
- Artist's impression of LHC (blue) and FCC (red)

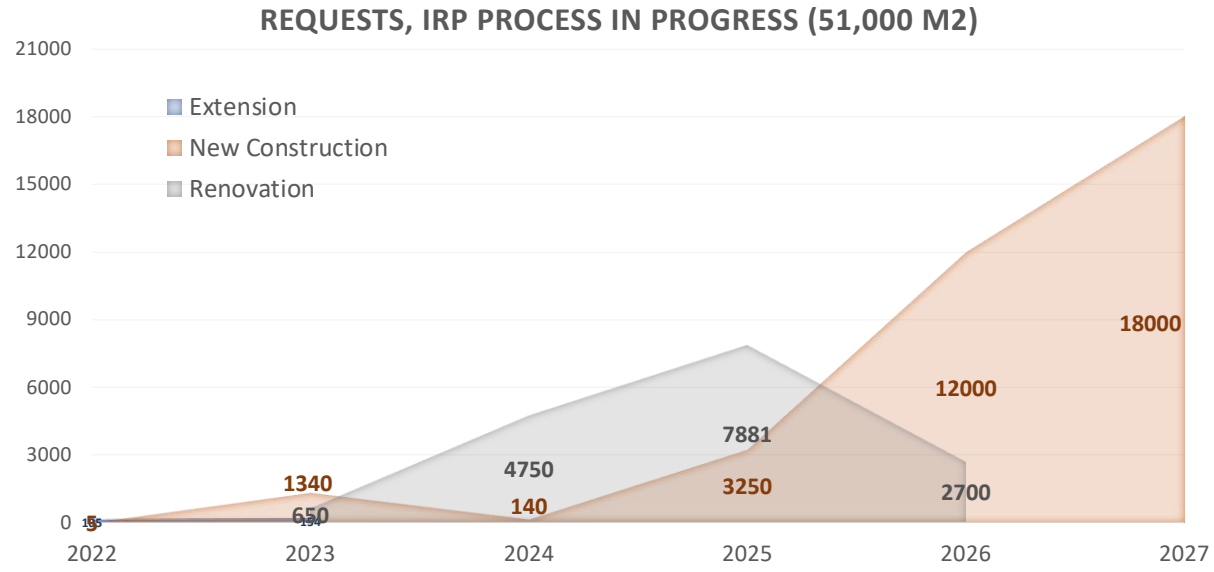
CERN site key figures

- 590 ha (220 fenced)
- 2 main sites and 15 satellite sites
- 670 building from 10 m^2 to 20.000 m^2
- 65% built before the 70s
- 70 km tunnels and 80 caverns
- 30 km roads
- 1000 km technical galleries and trenches

- 9000 persons/daily
- 490 hostel rooms
- 8500 working places
- >5000 parking places
- 25000 daily movements to- and inter-sites
- Public transport links in CH, not in FR

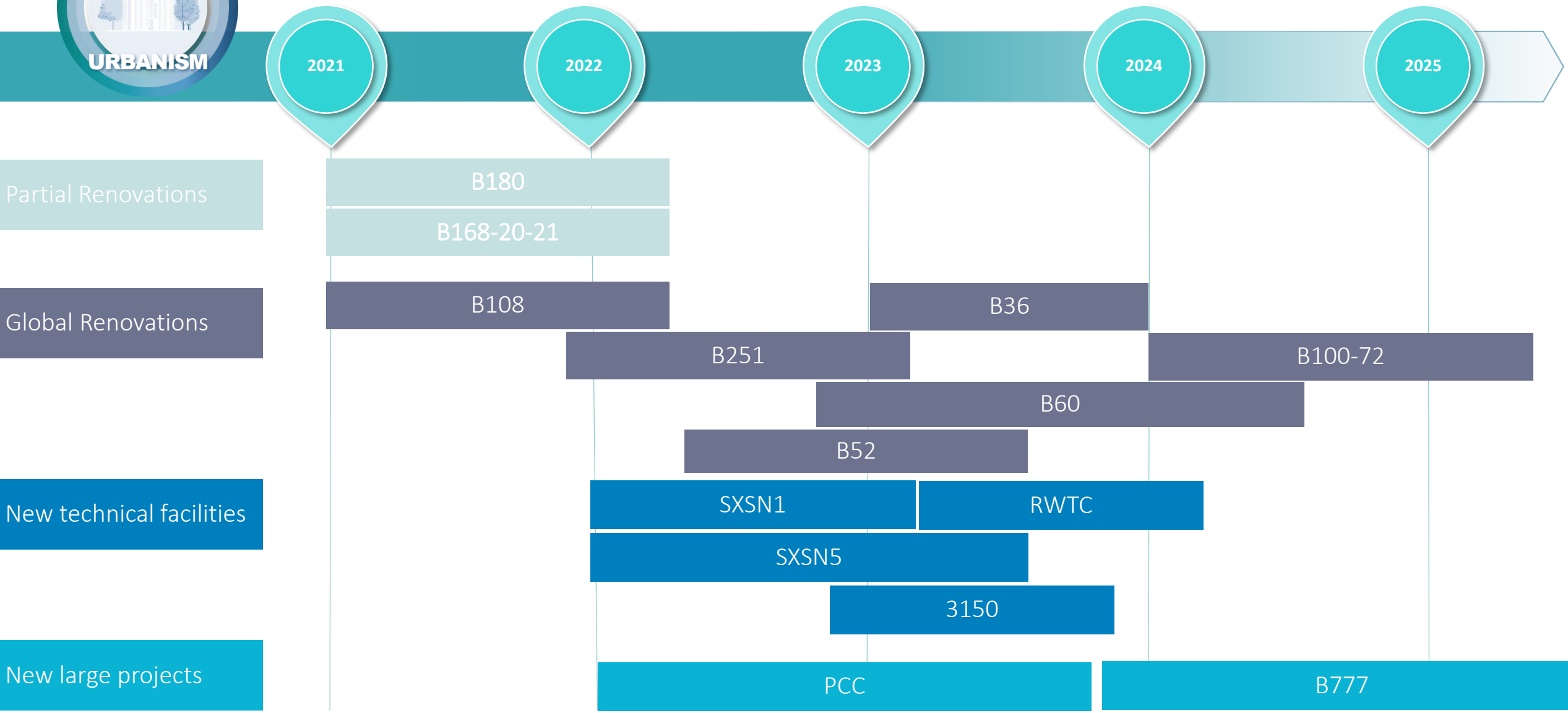
Impact on the site





- Infrastructure Request Process (IRP) procedure, IRP Board
- SCE Site Consolidation Steering Committee
- Global Space management
- Fluid dialogue with local communities/Host States

Projects



https://sce-dep.web.cern.ch/works-site

Prevessin Computing Center

Purpose : The Contract is for the design, construction and 10-year M&O of the building and equipment.

Needs : Initial capacity of 4 MW available for IT equipment with stepwise future increases to 12 MW.
To meet CERN's environmental goals the project incorporates the following considerations:

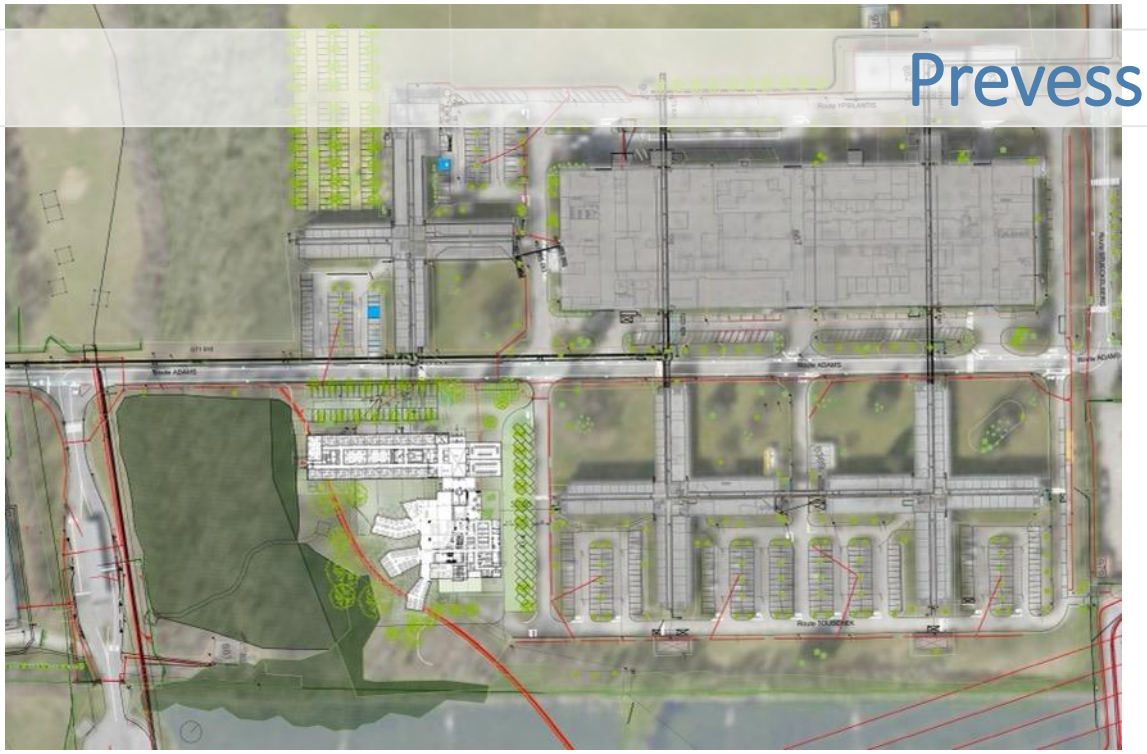
- The PCC is designed to be energy efficient with a target PUE (Power Usage Efficiency) of 1.10 (1.15 contractual)
- Optimised water consumption via a recirculation system lowering consumption in hot periods
- All cleared vegetation will be reconsolidated
- The acoustic study used for design of the building follows CERN commitments
- Green terrace on the roof
- A heat recovery system is foreseen for up to 4 MW of power to be recovered to heat the entire site

TESTING & COMPLETION :

- PCC Testing – Mar to Sept 23
- Operational from October 23

PREVESSIN SUSTAINABLE HEATING PLANT : 2026

Prevessin Office Center

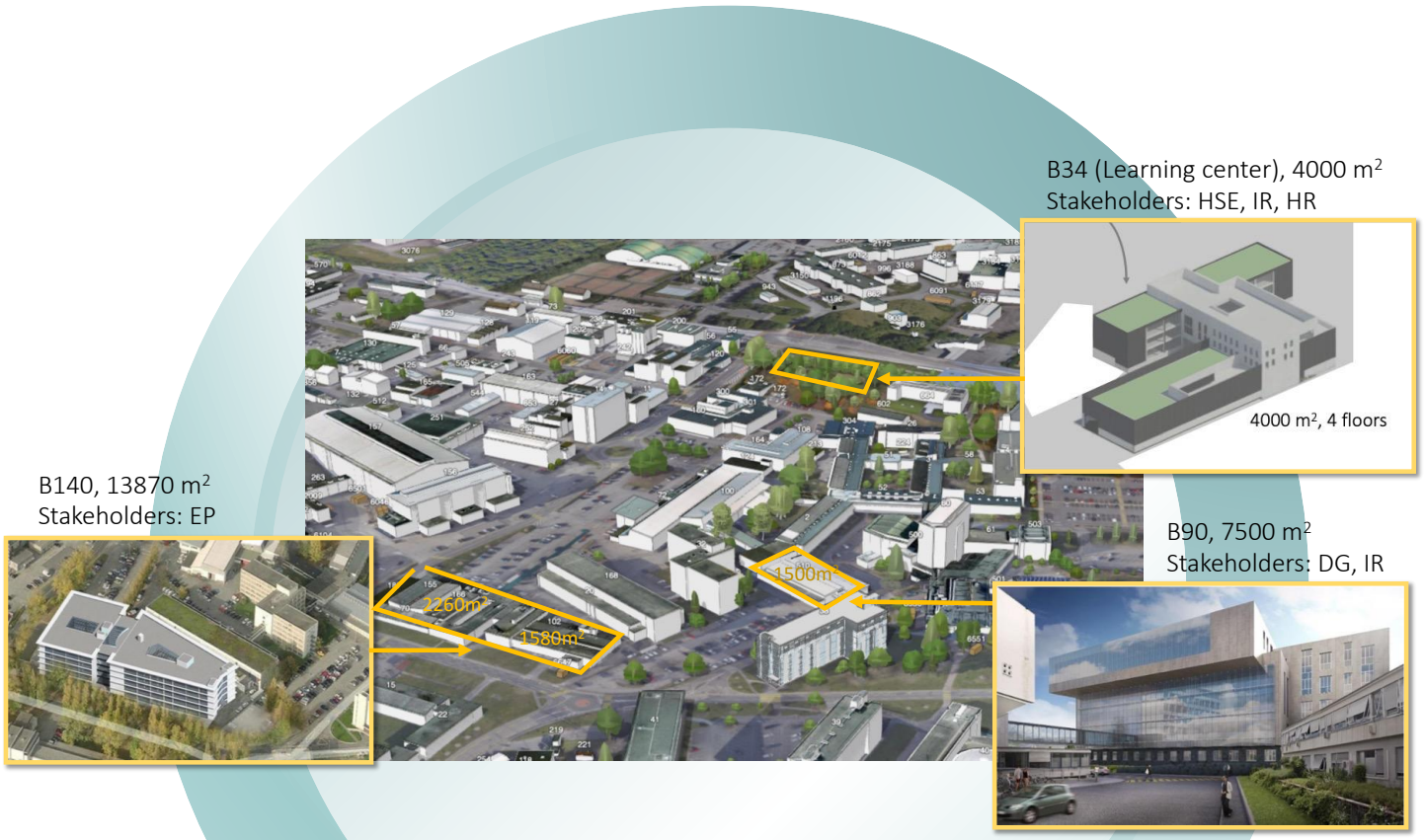


Key design information:

- Tertiary building (475 p.) + new restaurant (500 s.) + Parking
- Compliance Master Plan 2040
- Compliance RE 2020 (environmental regulation) ;
- Low embodied energy (mass timber structure)
- Preservation of near by forest
- Integrate soft mobility ;

2026 : end of works

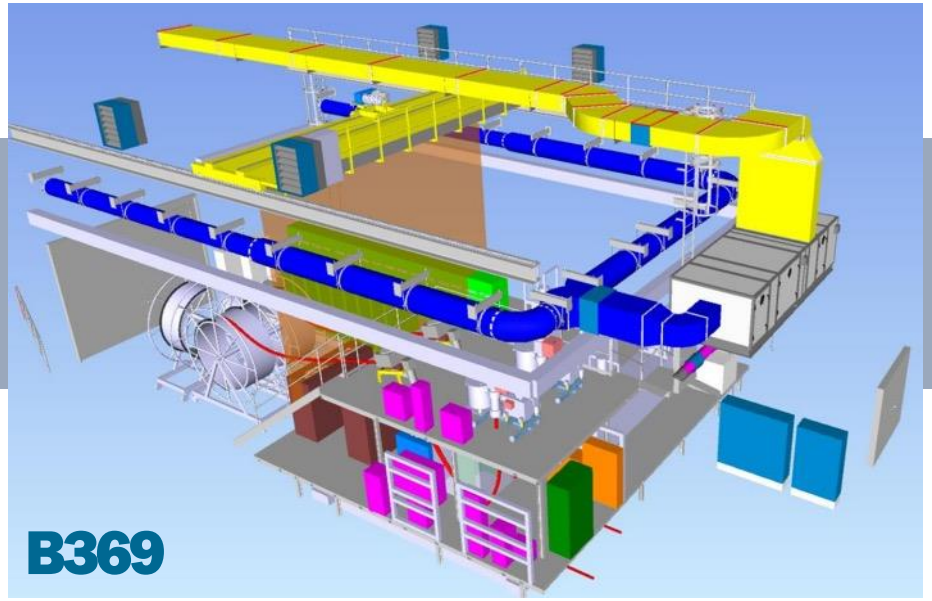
B140 – densification (Meyrin)



Base assumptions:

- 18000 m²
- Office building, training center, light laboratories, cafeteria & parking
- Emphasis on sustainable design & construction: Minergie, low carbon…
- Beginning of works at ~LS3 start

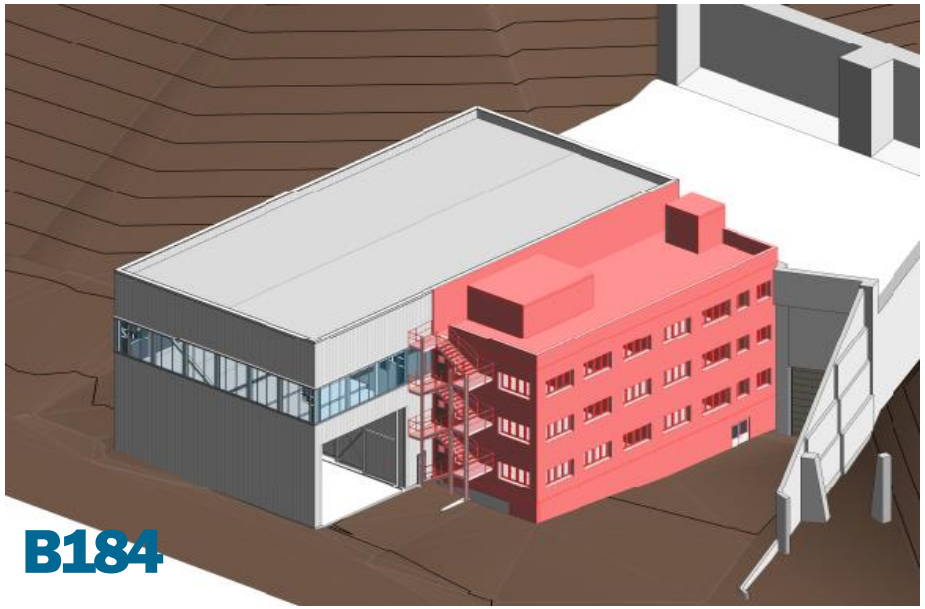
Construction of Technical Buildings



MTE kickers to house the relocated kicker's system and its operational equipment. Meyrin, 235 m^2, works 1/23 to 12/23

Extension and reconditioning of the Radioactive Waste Treatment Centre with offices and renovation of technical infrastructures. Meyrin, 315 m^2, works 12/22 to 12/23

Emphasis on sustainable design & construction



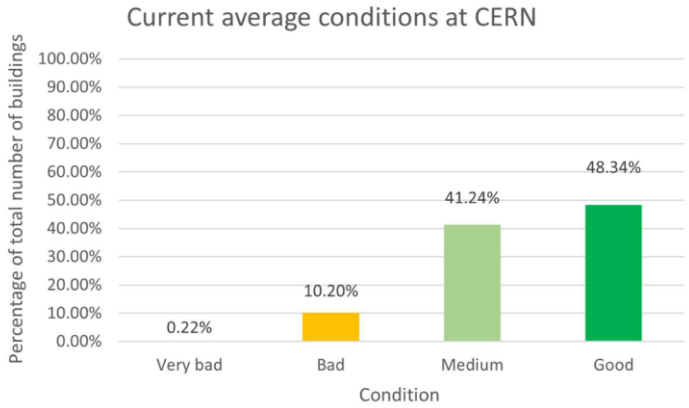
Site consolidation

Priorities

- Safety
- Strategic value with respect to scientific goals
- Sustainability: durability, environmental impact, energy performance

Process

- Data-driven decisions



- Standardization of requirements definition according to Masterplan, IRP approval process for execution
- 5 and 10 year views

Specifications

- Global renovations
- Regulations compliance
- Energy efficiency improvement: > 60%
- Monitoring heating, electrical and lighting consumption
- Operation of HVAC, Heating and lighting consumption according to the outdoor temperature, occupation of the premises, eco-mode
- Favor centralized networks

Renovation works

- Global renovation of up to 2 buildings/year
- Densify consolidated space
- Emphasis on sustainable design & construction
- Reduced maintenance & operation costs
- Demolish depreciated space

Procurement from Summer 2022

B36, design procurement phase from Autumn 2022, followed by construction

B100, procurement phase in 2023

Renovation works

Demolish obsolete barracks at P1 (~400 m2) and replace it by a pre-fabricated building doubling the capacity within the same footprint.

Minergie, low carbon footprint at construction and operation.

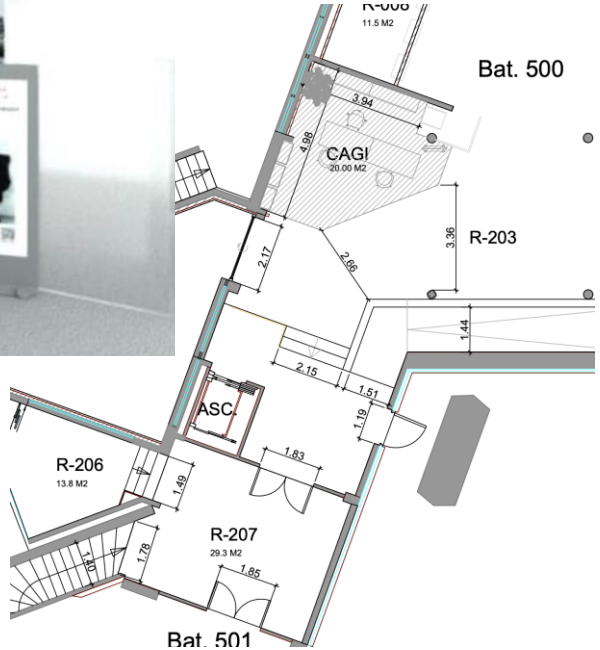
Works

LIBRARY B52

Mid 2023

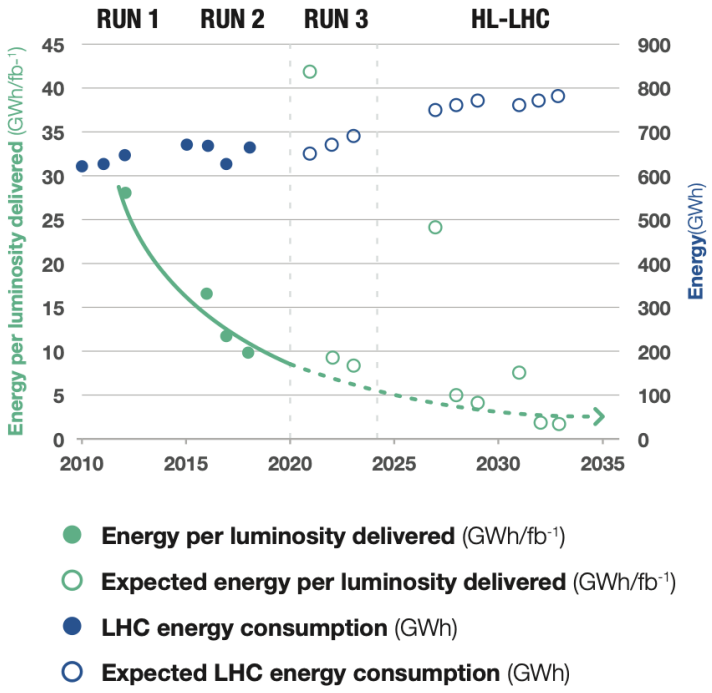
CAGI CULTURAL KIOSK

Sep 2022



Actions on Energy consumption

Increase efficiency



Use less

- Technology: PS East area power converters designed to supply the magnets on a cyclical basis, with an energy-recovery stage resulting into 90% electricity consumption reduction: (11 to 0.6 GWh/y)
- Campus: Building Global renovations for reduction of losses (energy, water, gas, cooling), densifying occupation
- Annual Virtual Energy Bills
- Energy performance plan & ISO50001

Recover

- Hot water from LHC cooling system (P8, 2 x 5 MW heat exchangers) to heat up a residential area (*20 GWh/y at peak*).
- Heat recover from the new Prévessin Computin Center to heat the FR site (3-4 MW)
- Heat recover from the LHC Cooling towers at P1 to heat the Meyrin CERN site (5-10 MW)

Actions on Biodiversity

ENVIRONMENT

	Ha	% Surface
Surface area of CERN	626	100
Fenced area	211	33,70
Meyrin	79	12,60
Prevessin	83	13,28
LHC Points and SPS	49	7,80
Green spaces:	101	16,00
On-street/parkings:	57	9,10
Buildings	39	6,23
Unfenced area	415	66,30
Woods, Forests	136	21,72
Fields	258	41,21

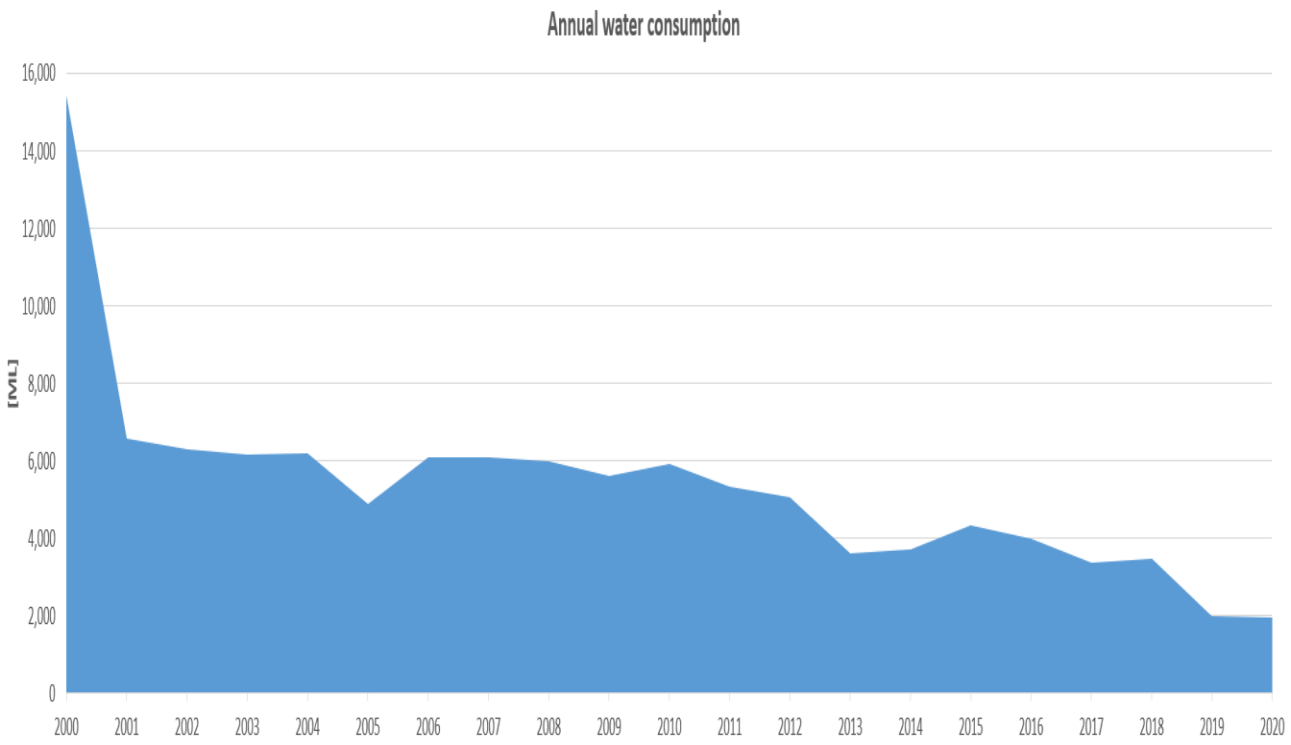
Linked to CEPS, HSE chaired a Working Group dedicated to biodiversity at CERN in 2020/2021 in collaboration with SCE: proposal of an action plan with 14 environmental measures

SCE and CEPS funding to work in 2021/2022 on priority measures linked to the integration of biodiversity in planning and implementing urban development:

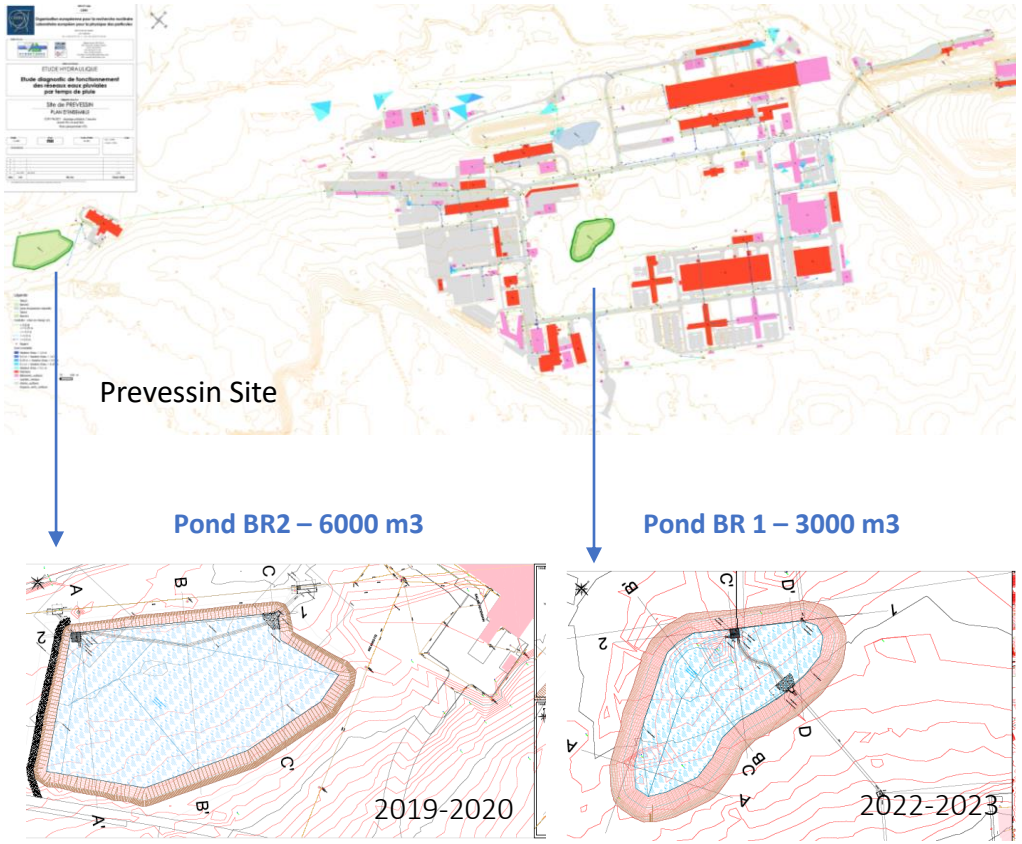
- Formal integration of biodiversity into the **IRP process** – details within the Design Study template
- Identification of **CERN areas of biological interests**, floristic and faunistic inventories, diagnostic and integration into the CERN GIS
- Plantation of **trees**, tree heritage, internal compensation policy

Resources: water

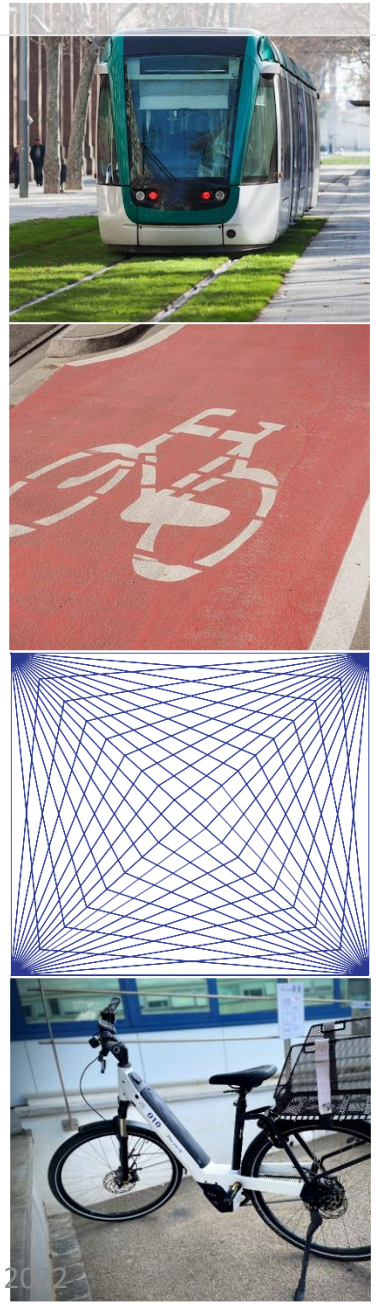
Consumption



Quality



Masterplan 2040 :
Framework objectives and measures



PARKING
Optimise the car-parking facilities and their management :
- Limit car parking
- Privilege car parks close to the main road network
- Continue the development of facilities for soft-mobility
- Develop communication promoting a reduction of the impact of people's mobility at CERN

CIRCULATION
Promote efficient and fluid access to and circulation on the CERN sites :
- Optimise the fluidity of access to the CERN sites.
- Improve the hierarchy of the road network.
- Continue developing accessible facilities for people with reduced mobility

ALTERNATIVES
Encourage alternatives to individual motorised transport for commuting :
- Encourage car sharing.
- Improve the continuity, safety and comfort of soft-mobility routes and provide parking for bicycles

INTERSITE TRANSPORT
Promote alternatives for travelling between the CERN sites :
- Continue developing facilities associated with collective transport on site.
- Optimise the management and supply of CERN vehicles.
- Expand and diversify CERN's bicycle fleet.
- Continue developing the network of foot and cycle paths on site

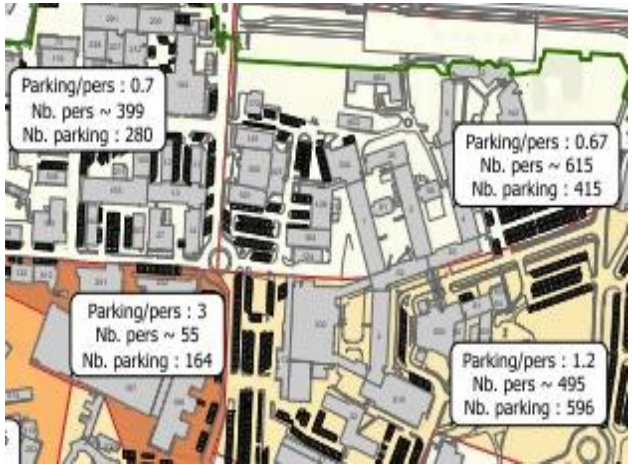
Mobility

Strategic principles

- Focus on people needs
- Integrate transport modes
- Adaptable to the future needs of the organization
- Sustainable and eco-responsible
- Communicate, cooperate with local actors, and involve the community

Roadmap

- Data driven
- Targets
- KPIs



Actions

- 10 km Cycle paths (2020)
- 80 E-bikes (2021-2022)
- +40% Bike parkings (2022)
- E-charging stations for professional use (2022…)
- Increased car-sharing (2022)
- Optimization of the car fleet (2023)
- Mobility Report (yearly)

Masterplan 2040 :

Framework objectives and measures

INTEGRATION WITH SURROUNDING LANDSCAPE

Integrate the CERN sites with the surrounding landscape :

- Integrate sites harmoniously with the existing features of the overall landscape and with the views onto that landscape
- Enhance the CERN site perimeters by planting diverse hedgerows that will contribute to the overall ecological network
- Implement an architectural strategy to enhance the image of CERN's buildings and emblematic public areas

LANDSCAPE IDENTITY

Develop a landscape identity :

- Harmonise and enhance the attractiveness of the landscape developments and gathering areas, and create a furniture and signage catalogue
- Reduce islands of heat and plant trees and shrubs close to existing and future paved or tarmacked spaces, car parks and roads

Outdoor Areas Study

- Lunch spot
- Coffee spot
- Bbq spot

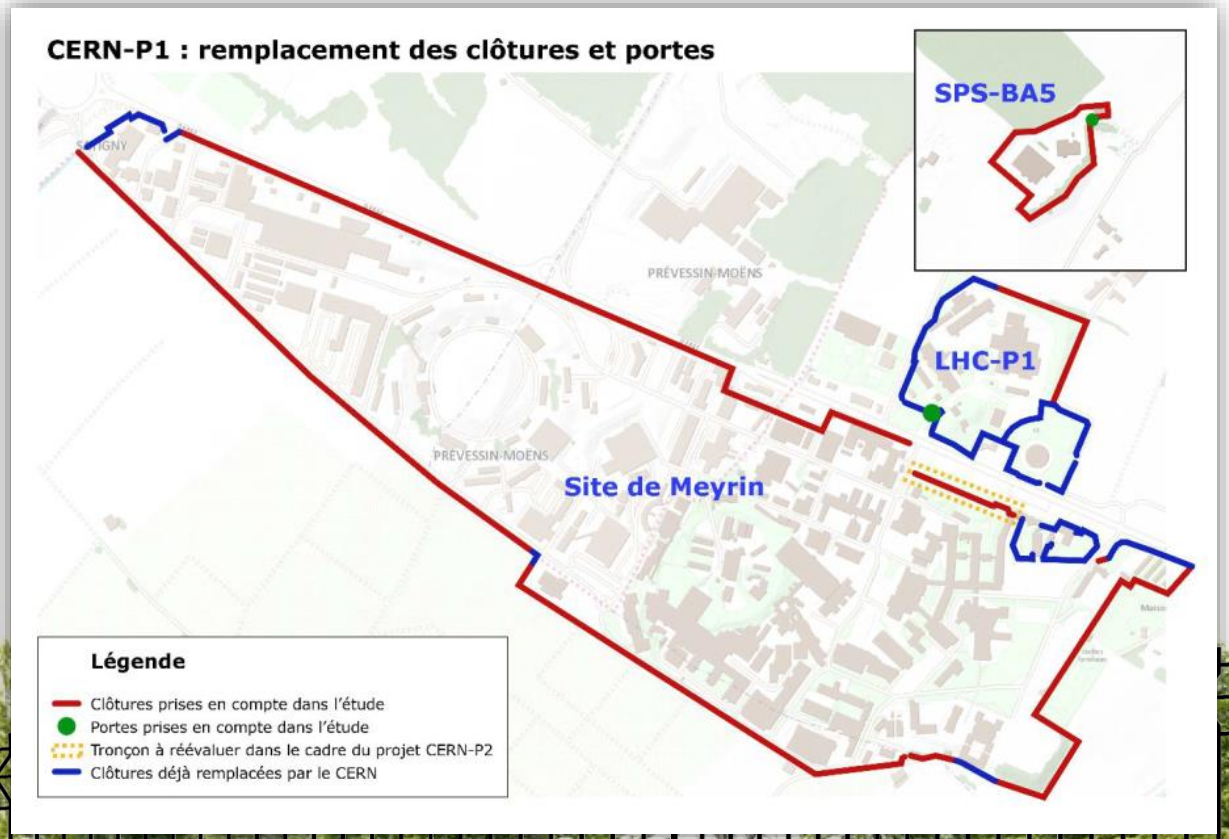
Objective:

- Complete CERN working spaces with outdoor social and informal work areas;
- Give an urban identity to outside spaces;
- Exposition areas to share knowledge.

Implementation Criteria:

- Potential public (population density);
- Existing green area;
- Soft mobility easy connection;
- Proximity to cafeteria or vending machine's room;
- User's proposals;
- Biodiversity interest;
- Mutualization of renovation works (roads, parking…).

Perimeter Security Project

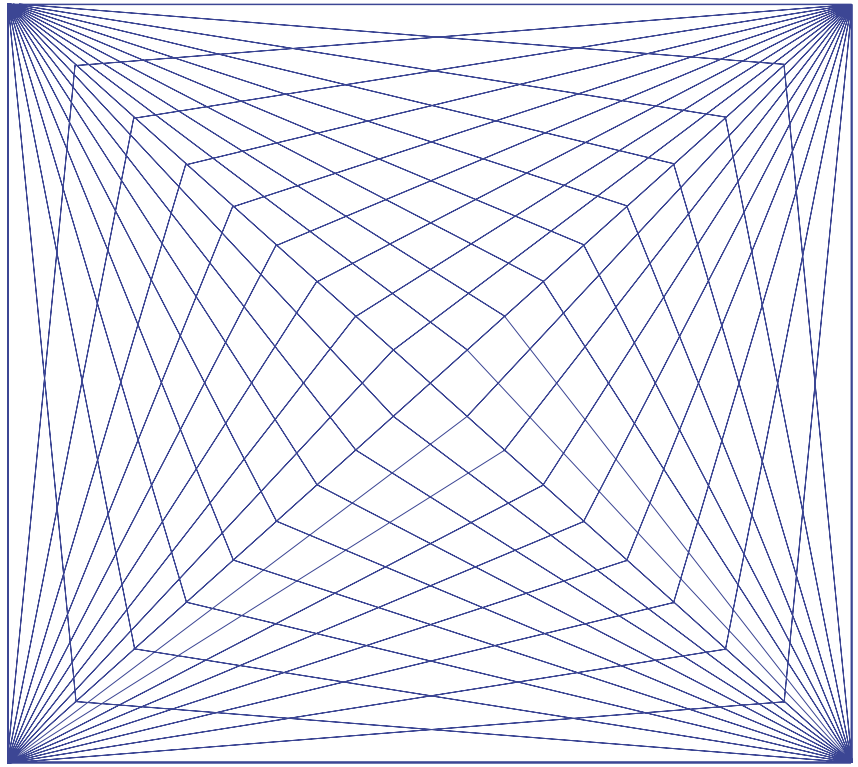


Masterplan 2040

CERN Masterplan 2040 conserves the vision and framework objectives of the previous Masterplan dating of 2015, but it has been updated to reflect the 2020 update of the European Strategy for Particle Physics and the changing context. In particular:

- the urbanisation measures have been revised compared to the Internal Guide for the Development of the Meyrin site. The satellite sites of the SPS and the LHC are included in this update, as well as potential land use for CERN's future evolution;
- the mobility measures have been aligned with the new Mobility Strategy;
- the environmental measures have been adapted to the CERN Environmental Reports and to the evolution of energy transition policies;
- the landscaping measures have been supplemented to take account of new challenges relating to integration on the territorial and local scales, as well as climate issues, an area where public policies have evolved considerably since 2015.

French: https://cds.cern.ch/record/2792531/
English: https://cds.cern.ch/record/2792532/



Masterplan 2050…

Technology

Innovation

Environment

Climate

Society

Education

Collaboration

CERN's Green Village

- From society to CERN to society
- **Enabling rapid access to CERN campus as a test site for technologies linked to environment and sustainability**
- Accelerating the commercialization of ideas, technologies and prototypes
- Involving Young Innovators, new ideas for unforeseen applications

Example Sustainability Challenges: waste management, zero-waste, smart mobility, energy efficiency for tertiary activities on campus, renewables, space management, IoT, urban analytics, intelligent buildings…

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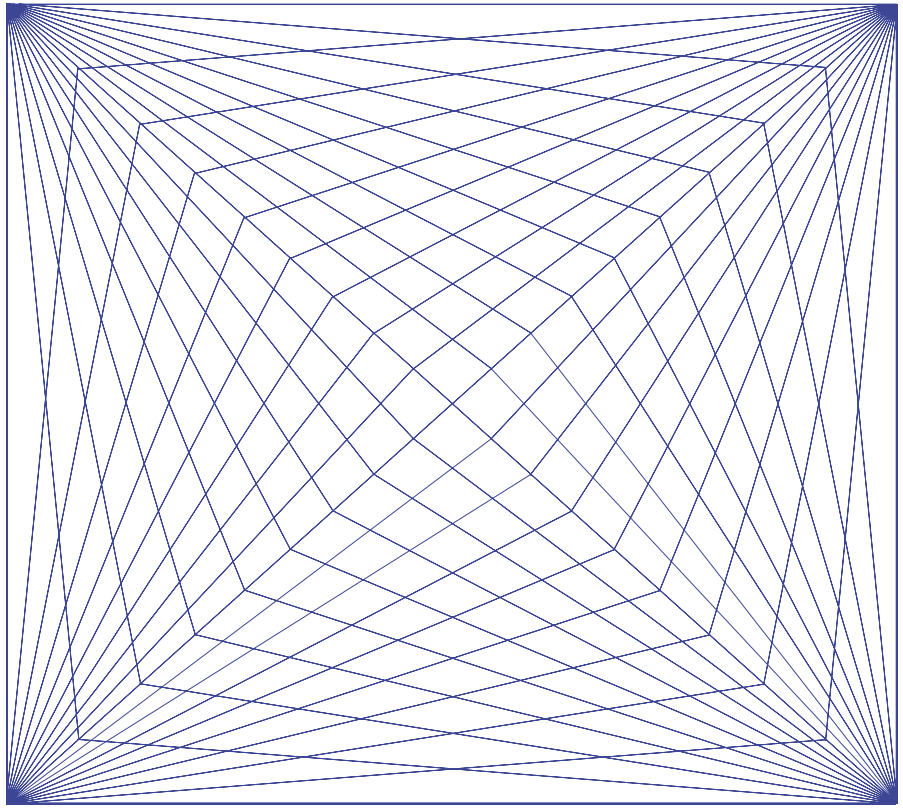

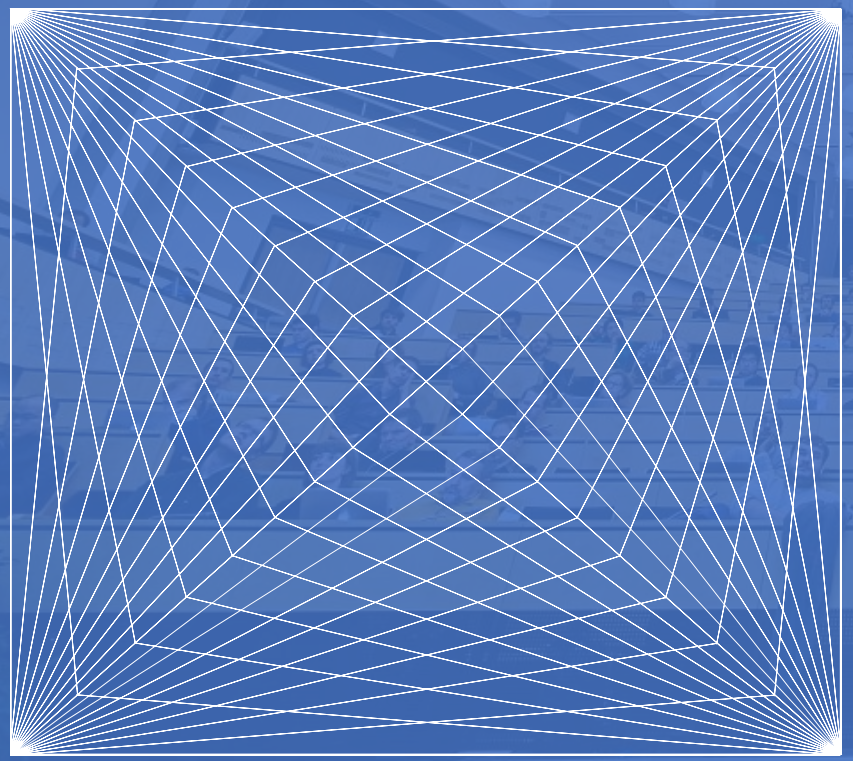

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