

FCC Innovation Study Summaries of WP 3, 4 & 5 progress

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<https://wiki.cern.ch/FCC> and <https://twiki.cern.ch/twiki/bin/view/FCC/FCCIS>

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WP3: FCC layout and placement

The **FCC project** is composed of **3 segments**:

1. The **research infrastructure** (FCC RI)
2. National **development project in France**
3. National **development project in CH**

Placement process driven by an iterative **multi-criteria optimisation** (MCO) following the “**Éviter-réduire-compenser**” (Avoid-reduce-compensate) approach anchored in European and French national laws, accepted by Switzerland as a suitable approach.

Most suitable scenarios are < 92 km with 8 surface sites. Larger scenarios intersect with Vuache and Jura limestones or fall in territorially unfeasible or highly challenging areas.

Review with international advisory committee took place on 7 and 8 June 2021.

For a **91 km long scenario**, **geological risks can be controlled and territorial compatibility can likely be achieved**. Such a scenario is currently under development.

Studies based on maps and existing materials have been exhaustively carried out and consensus among experts during a dedicated review revealed that no further knowledge can be gained with these methods to verify the project's feasibility.

To be able **to advance**, **subsurface investigations** of high-risk areas, **surface site initial state analysis** and **verification of in principle feasibility with local authorities are now compulsory**.

Territorial **conditions evolve and constraints continue to increase!**

WP3: Environmental evaluation concept

Environment means (ISO 14001) “*surroundings in which an organization operates, including air, water, land, natural resources*”.

Concept for an **integrated environmental evaluation process in transnational context has been developed** following the **iterative “avoid-reduce-compensate” approach**.

1. Enhance the environmental performance
2. Fulfill compliance obligations
3. Achieve environmental objectives

Environmental assessment must be integrated in the project from the very early stage onwards. It is **already considered in the placement activities**.

Ratification of the proposal for the process **by the two host states is ongoing**. Is an administrative process, which requires time – the **environmental authorities (EA) in both host countries** to accompany CERN are **carefully identified by the two governments**.

Two countries with two different governance systems and a project with transnational dimension need to be carefully considered.

In Switzerland work with cantonal office for environment (OCEV) and consultancy between canton and confederation.

In France proposal has been officially transmitted to the “prefet” of the region Auvergne-Rhône-Alpes. Consultancy with the bodies for environmental evaluation ongoing (CGDD, CGEDD)

WP3: Administrative processes with the HS

Switzerland:

Plan for administrative procedures for project authorisation as a working baseline since 2018.

Update of the Plan Directeur cantonal to anchor the project on cantonal level started in March 2021. Is **pre-condition for any next step**. Serves also clarifying project invariants, needs and potential interactions with other cantonal plannings on the concerned time horizon.

Main challenge is modification of a zone from unconstructable to constructable state. Strong constraints at federal level impose limitations on the possibilities at cantonal level.

Common approach is a cantonal permission process. May be insufficient due to limitations that stem from zone modification and land acquisition.

Alternative: involvement at federal level, is time consuming and requires a consensus of all cantons. Feasibility of this approach is currently under study.

France:

Concertation structure has been created that serves regularly discussing matters that are needed to advance on the project feasibility.

Immediate next required step is contact with local authorities to **determine in-principle feasibility of placement scenario**.

WP3: Mining the Future – re-use of molasse

Host states require a plan for the management of the ~ 9 million cubic metres **of excavated materials**. Re-use of molasse, a heterogeneous sedimentary material is highly challenging – to date no valid approach is known. **Landfill is costly**, difficult due to **limited capacities** and **to be avoided from environmental points of view** as much as possible.

International, challenge-based innovation competition has been launched to solicit input from a global community of scientists, engineers, companies and innovators to propose **technically, commercially and societally valid** approaches to re-use the molasse material (TRL 3 or higher).

<http://cern.ch/registration-mining-the-future>

Deadline for application: **31 October 2021**



WP3: Mining the Future

Construction methods have significant impacts on re-usability. They are, however, not yet determined! Limits the outlook of the applicability of proposed approaches further. Pollutions of the materials are difficult to anticipate.

Judging panel is internationally staffed with highly qualified experts from subsurface engineering, material sciences, management of large projects and economics.

Data from existing bores and the HL-LHC have been developed for use by participants in this competition. They have been **published on the Zenodo open data platform**.

Audience reach of a campaign (Arctik, Brussels, BE) to announce the competition worldwide is high, 70 interests to apply exist so far.

Spread the word!

- **Like and share our posts on social media**
@FCC_study on Twitter
@FCCstudy on Facebook
FCC study LinkedIn
- **Use #miningthefuture to post about the campaign yourself.**
- **E-mail your contacts** who might want to apply or can help make noise.
- **Include the contest in your newsletter**
- **Send out our flyer** in English or French
- **Or post about us in your blog!**

Toolkit to make that easier for you:
www.dropbox.com/sh/j3l6sl7y6cs8yh8/AADYOTjRo96mYaWs_vlipzh0Sa

WP3 - Excavated materials management plan

Deliverable D3.4 is one of the main outputs of this WP. It will be a **critical component to show the feasibility of the project**.

Captures project owner's strategy with respect to excavated materials, high-level approaches and guidelines.

A specific management plan considering preferred placement scenario and chosen excavation methods has to be developed as part of the environmental evaluation process.

Concerning the management of the materials, benefits for the project and environmental aspects will have to be balanced. This leads to a process to control uncertainties, risks and to control the cost.

Structure of the plan has been established

Tasks for contents development within the working group distributed.

Schedule for chapters established.

Core group: CETU, Cerema, CERN, Montanuniversität Leoben, GESDEC (canton of Geneva)

Working group invites additional experts on a per-need basis

Plan scheduled for end of 2022.

WP4: Socio-economic impact analysis

Recommendations for a cost-effective and sustainable infrastructure

Estimates of ranges and likelihood of different impacts

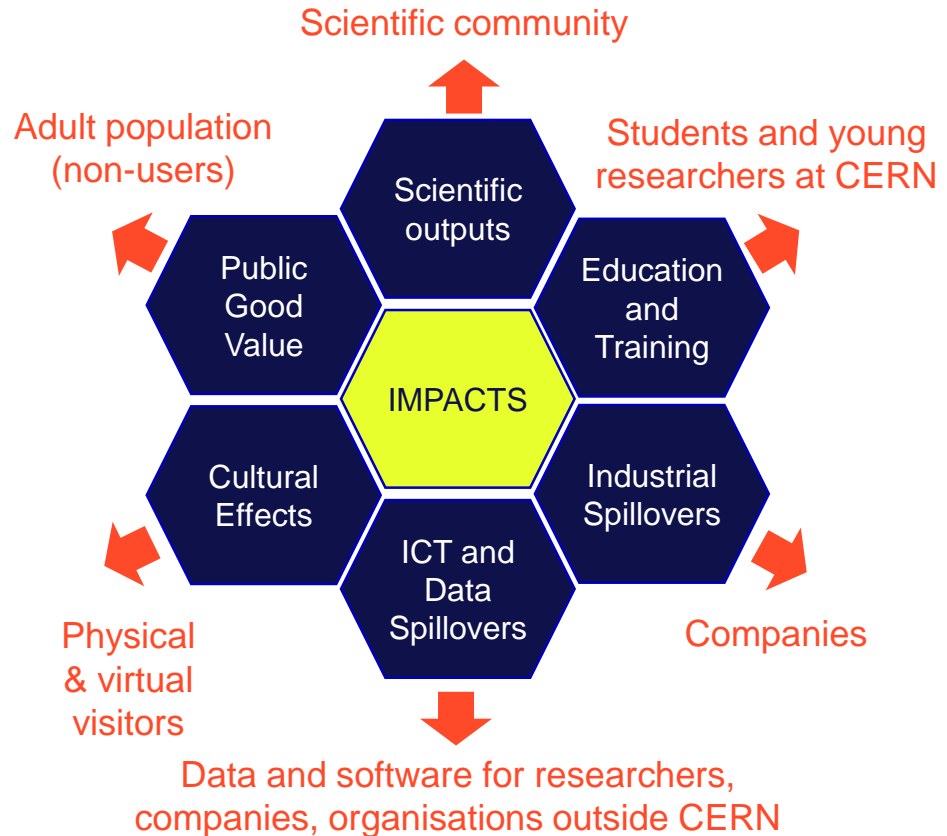
Develop the financial roadmap of the project

Socio-economic impact analysis

Cost estimates

Regional and territorial benefit potential identification

Implementation, financing and in-kind contribution strategy



WP4: Progress on value of training impact study

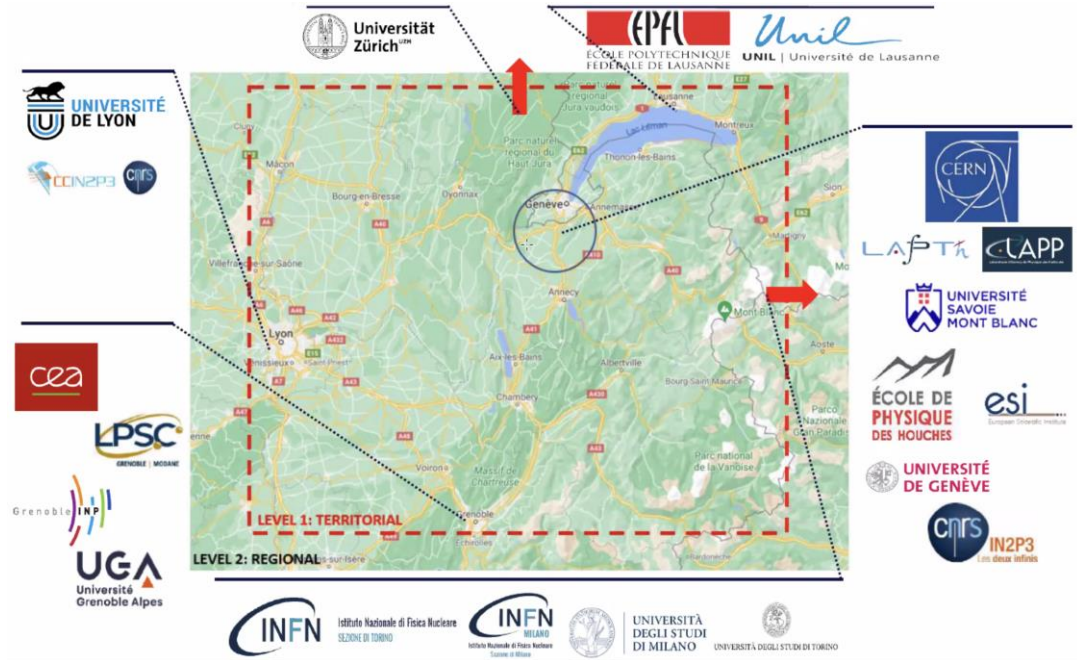
- Impact of education and training in **FCC-ee from construction to end of operation**
- Benefit in terms of career development **measured as an incremental lifetime salary premium** starting after the years of activity in the project
 - 2028 – 2057 set as observation period
 - Applicable for people younger than 30 years when they leave the project
 - **Long-term survey** among early-stage-researchers in LHC experiments **ongoing**
 - Controlled against existing salary and job announcement databases
- Main **added values for persons revealed**: (a) deepening their domain-specific knowledge, (b) development of new, useful skills, (c) working in an international environment abroad, (d) increase the chance to find a job
- **Correlation between duration in project and lifetime salary premium** determined
- Preliminary **confirmation of a 5% to 12% lifetime salary premium per person**
- **More than 215'000 people will participate in the FCC-ee programme.** A fraction will profit from benefits. Determining the fraction is the next step, then estimate benefits.

WP4: Progress on value of SRF procurement

- Direct **benefits for suppliers documented in the past** and **model exists**
 - Impact is **directly correlated to the procurement volume**
 - Exists if there is a **tight and continuous cooperation of client and supplier**
 - Is **mainly productivity**, quality, profitability on **high-tech suppliers**
- New: **What is the spatial distribution of the benefits from high-tech developments?**
 - Labour (mobility), products and services (outside research), capital (firms and acquisitions), ideas (publications, follow-up projects)
- **Superconducting RF cavities used as a case study** to develop a model
 - Existing projects analysed (XFEL-DESY, FRIB-MSU, CEBAF-JLAB)
 - Individual interviews with the small number of companies existing ongoing
- Preliminary finding: **benefits mainly for labour sector due to the mobility** of involved, highly trained scientists and engineers
- Next steps:
 - Include more relevant technologies; cavities affect a limited amount of companies
 - What are the effects of this high-tech worker mobility? In which countries?

WP4: Work on territorial opportunities

- Cerema and LAPP focused on defining a local and a wider perimeter and identifying potential key players in the perimeter
- Pre-construction, construction and operation phases are looked at
- **Goal: provide elements that contribute to the acceptability of the project**
- Start with reviewing existing activities, **diagnose perspective of territorial evolution by 2050** (e.g. Grand Ancecy plan with specific objectives, Grand Genève vision)
- Work **with regional authorities**



Evolution of infrastructures in the french territory

1. The accelerator and detector infrastructures, the technical/access pits and experimental pit with the detector access

→ Delocalizing the infrastructures along the ring

→ Aimed at transport minimization, reducing environmental impacts, improving benefits, combining cost-effectiveness sustainability and social wellbeing...

2. A second « core » CERN technical pole

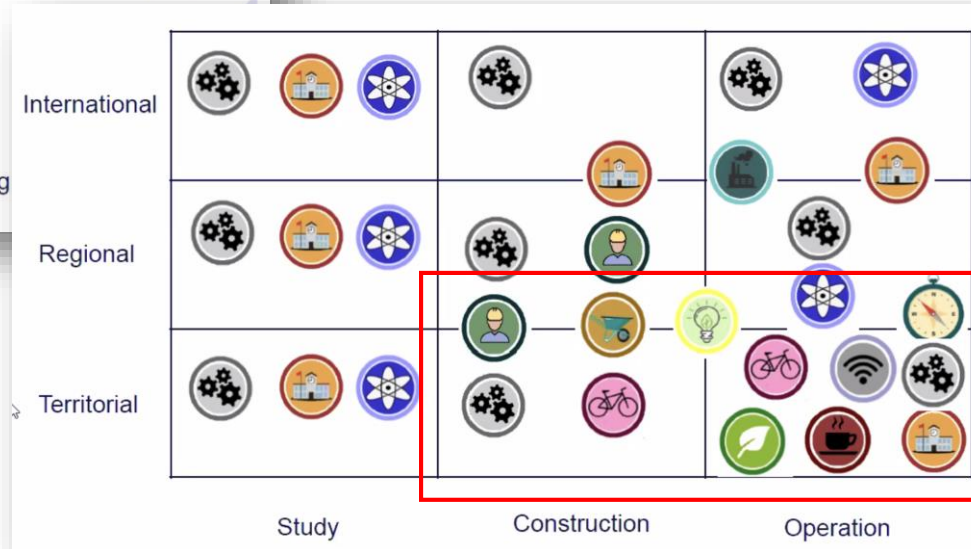
→ Delocalizing the operation facilities along the ring
(Storage, technical workshops, accelerator and machines control room, services and infrastructures control site...)

3. A southern CERN hub

→ Partnership of Science with Society
(Innovation, culture, education, coworking, training on site, ICT services sharing...)

- **Analyse**, how an integration of CERN with CNRS/LAPP can be envisaged
- **Diagnose needs for territorial service evolution**

- Analysis of impact domains has started.
- **Very long time horizon is a challenge.**



WP5: Innovation - Collaborative writing & publishing

- Cooperation between Overleaf and Springer Nature active
- LaTeX template prepared
- e.proofing advancing: differences between source files and proff before publishing to ease correction process
- Automated metadata extraction from sources to reduce publication efforts
- Workshop on FCC design reports planned



WP5: FCC communication strategy

Communication strategy document draft developed.

Sketching a plan for communication and public engagement over several years started.

Communication initiatives are born.

Storytelling workshop to help people getting active is prepared.

Cooperation with partners is set up: CERN ECO, EPPC, ULIV, FCC national ambassadors

PHYSICS FOR A NEW ERA

Global, Collaborative, Sustainable

FCC IS A CONSTANT STREAM OF
INFORMATION
THAT MAKES THE PROJECT
RELATABLE AND RELEVANT TO
EVERY AUDIENCE

HINT & RECOMMENDATION:

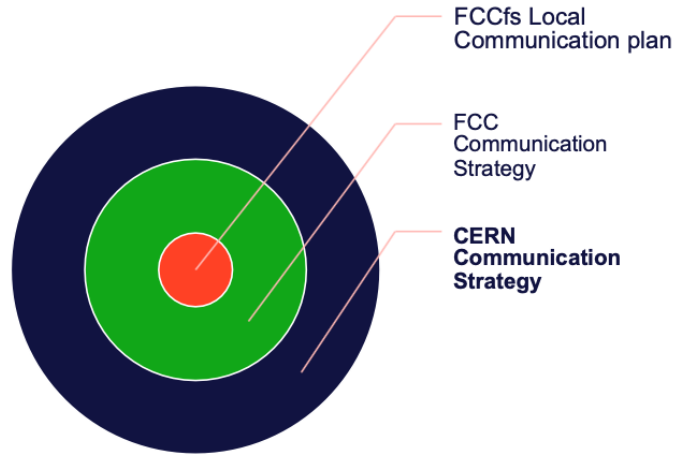
Adopt the FCC visual identity, more info at
<https://twiki.cern.ch/twiki/bin/view/FCC/LogoDesign>

COLLIDER DIARIES 




NEW VIDEO
EVERY SECOND THURSDAY

<https://www.youtube.com/channel/UCIEScaRSCBf4YptAErwjPKg>

WP5: Institutional and local communication



Communication strategy and local communication plan are under development.

- 
1. Brochure
 Local authorities (General public)
- 
2. Video
 Local authorities (General public)
- 
3. Document for Local authorities
- 
4. Standard Presentation
 Local authorities

Development of fundamental materials as support during imminent communication with local authorities to verify the in-principle feasibility of a placement scenario has started.

WP5: User capacity building

Recall: Prerequisite for a new Research Infrastructure is existence of a committed user community that exploits the facility from the beginning onwards.

Scientific excellence needed to attract the largest possible communities on a global scale for a duration as long as possible.

Requires work on the physics research programme through community process.

Requires creation of communities on a global scale via a two-sided approach.

Collection of peer-reviewed essays and papers with each FCC or physics week

Presentations by G. Bernardi (IN2P3), M. Chruszcz (IFJ PAN) m T. Lesiak (IFJ PAN), E. Tsesmelis (CERN)



Strategy based on two symbiotic pillars:

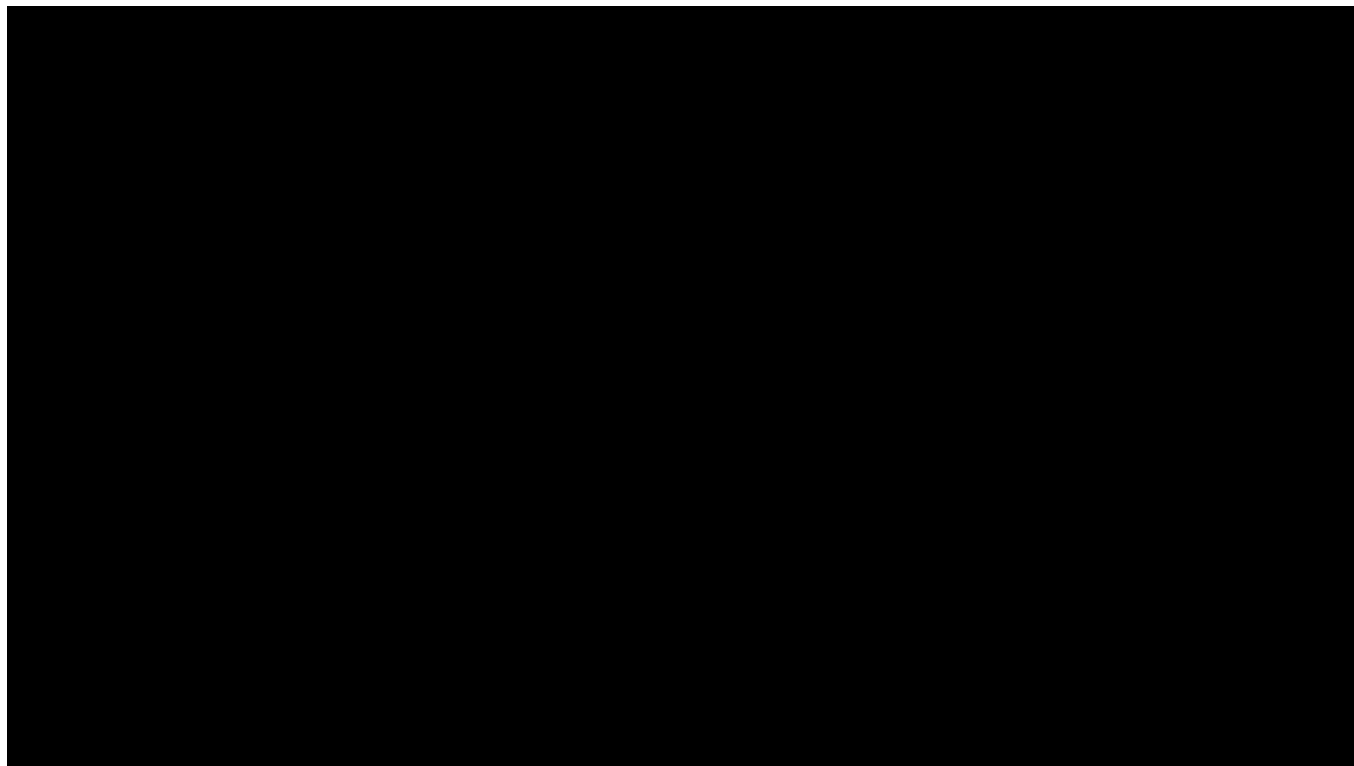
1) formal approach fostering the conclusion of agreements with organisations in different countries through MoU/Addendum and bilateral agreements (**FGC**)

2) informal approach to leverage interests at national level, create sparks through a bottom-up, community based approach (**PED IFNC**)

Take home messages

- **Council agreement to study the feasibility of first stage of integrated programme that provides a vision for a global community for 70 years** (infrastructure and FCC-ee)
- **91 km baseline scenario under development**
 - Low implementation risk, good territorial compatibility, good science performance
 - Interaction at local level is next required step to verify the feasibility
 - Stakeholder engagement plan under development
- Environmental evaluation
 - Includes socio-economic impact assessment. **First quantitative estimates of training value expected soon**
 - **Excavation materials strategy being developed** in working group with host state participation.
 - **International challenge-based innovation competition has started!**
- **User community building is key** to FCC feasibility
 - **Start of global coordinated effort to build a community of committed collaboration partners**
 - greatly helped by official clarification of implementation sequence (ee first, hh ultimate)
 - **MoU update in progress** and **national interest groups are forming**
 - Next stop: **FCC physics community workshop Liverpool (UK) 7 February 2022**

**Most
important:**
FCC is
a platform to
grow for a
generation of
people who
will build
this machine
in 20 years
from now!



<https://www.youtube.com/watch?v=40DvVqzXGbg>