



# Future Circular Collider

## Local Communication & Environment studies

20 January 2023

J. Gutleber (CERN)



# Future Circular Collider

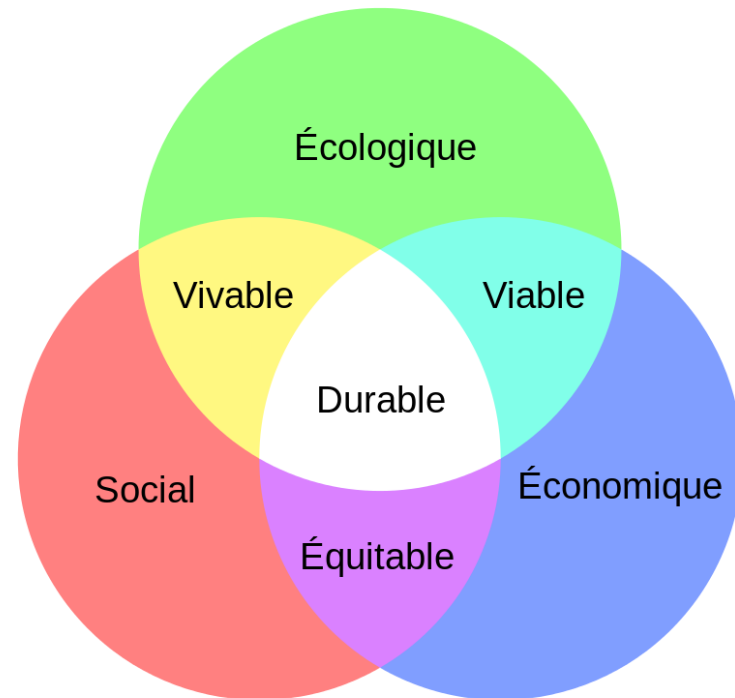
## Territorial dialogue & Environment studies

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# Term: “Environment”

- Embraces **everything into which the project is “embedded”**
- Includes “natural” and “artificial” elements
- Applicable legal frameworks require an **interpretation in the “large sense”**
  - Unordered set of exemplary topics: climate, soil, water, air, energy, subsurface, natural resources, biodiversity, habitats, patrimony and heritage, landscape, human environment, traffic and mobility, public health, technical infrastructures and risks, nuisances, waste, different types of radiation (light, magnetic, ionising), demography, economy, education.

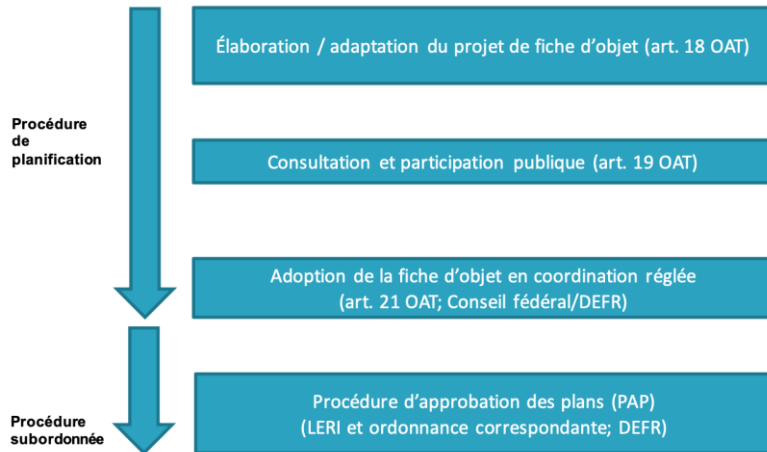


# Motivation: project authorisation process

## Switzerland

Development of a so called “**plan sectoriel**” to establish a legal framework to **provide planning security for CERN’s future projects.**

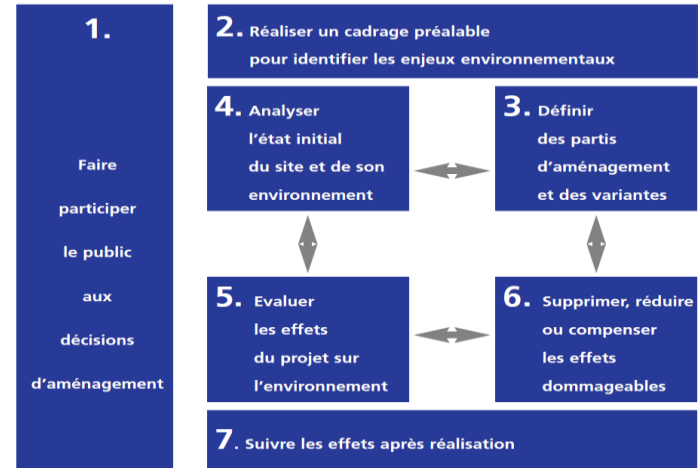
### 2 step authorisation process:



## France

To be further developed. Large scale projects are **typically authorised via a so called “procedure unique”** based on an “environmental evaluation” that **encompasses a diversity of topics.**

Usually it is put in place with a particular law (similar to the “Sektorplan”) to be voted in the national assembly.



# France/Switzerland: commonalities & differences

## Commonalities

Requirement for **public engagement and dialogue** throughout the entire process.

Requirements for

- 1) Analysis of the **initial state** of the environment
- 2) Assessment of territorial **evolution with and without the project**
- 3) Presentation of **variants and versions**
- 4) Application of the **Avoid-Reduce-Compensate** approach in the project and project element design
- 5) Environmental **impact assessment of the specific plans** in the project location.
- 6) **Socio-economic impact generation**

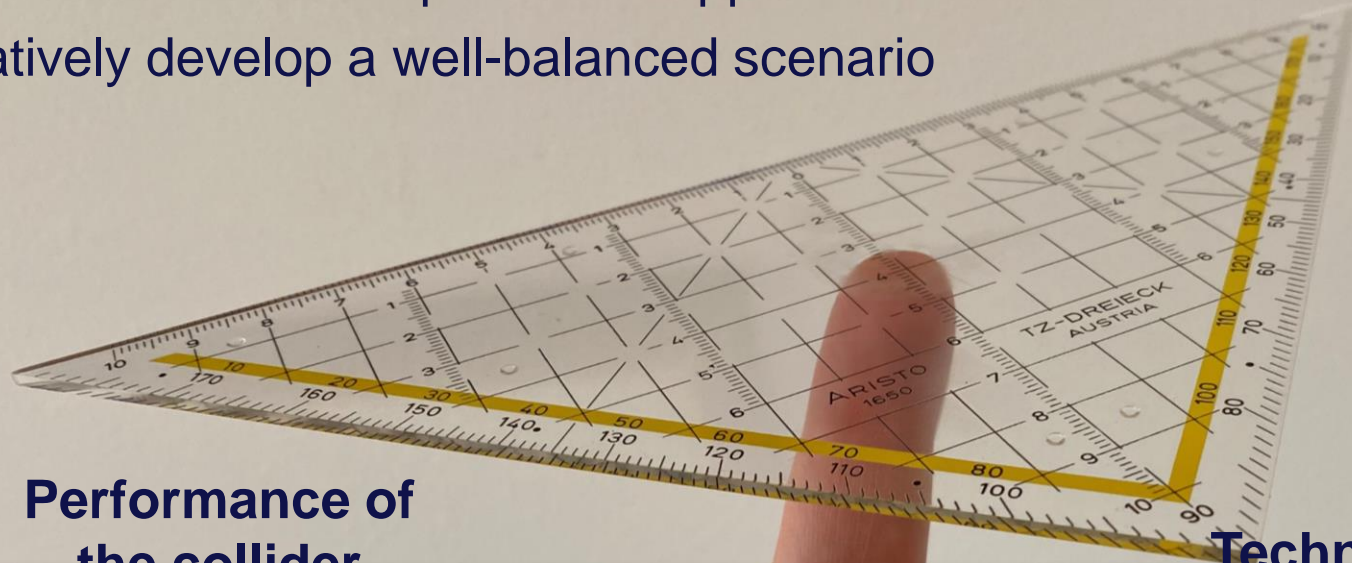
## Differences

- Project scope definition
  - Materials and methods for the analysis
  - Limits and threshold values
  - Scope of the topics to be assessed
  - Possibilities for improvement and compensation actions
  - Formalisms of processes
  - Decision and arbitration bodies
  - Types, number and levels of notified bodies
  - Default perimeter of the stakeholder engagement (from national to local, from institutional to private)
- > Differences have significant impact potential on the authorisation process duration.

# A balance of stakes

« **Avoid-Reduce-Compensate** » approach to iteratively develop a well-balanced scenario

**Territorial impacts**  
= **Societal acceptance**

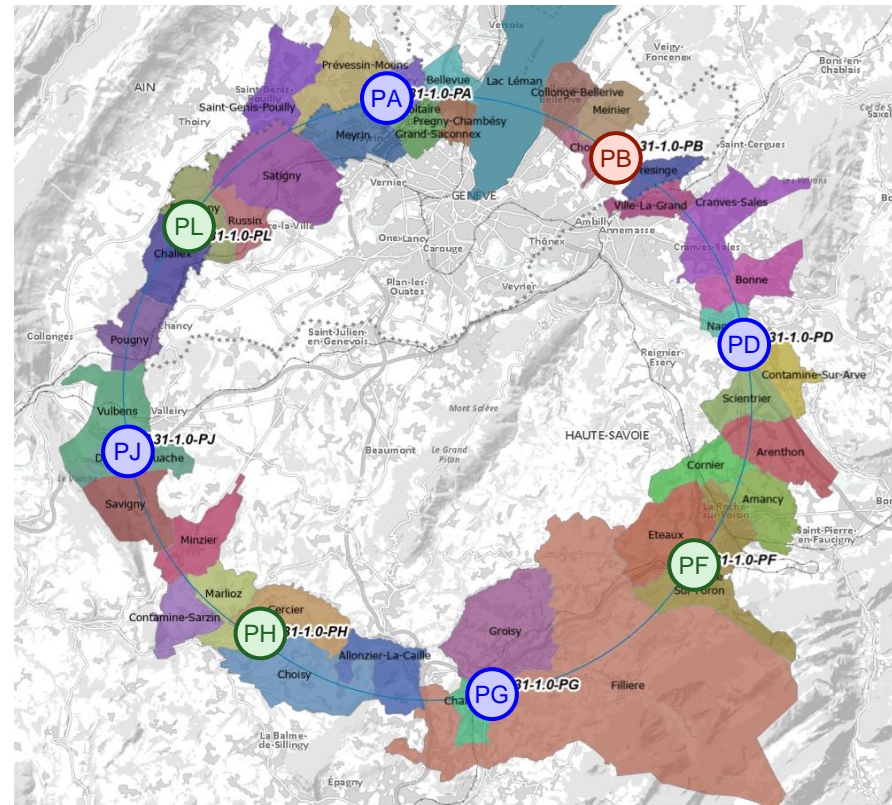


**Performance of the collider**  
= **Scientific excellence**

**Technical feasibility and cost**  
= **Acceptable risks**

# Reference scenario PA31

1. **PA** – Ferney Voltaire (FR, 01) – experiment
  2. **PB** – Choulex (CH) – technical
  3. **PD** – Nangy (FR, 74) – experiment
  4. **PF** – Etaux (FR, 74) – technical
  5. **PG** – Charvonnex/Groisy (FR, 74) - experiment
  6. **PH** – Cercier/Marlioz (FR, 74) – technical
  7. **PJ** – Vulbens/Dingy en Vuache (FR, 74) – experiment
  8. **PL** – Challex (FR, 01) – technical
- 1 site in Switzerland
  - 7 sites in France



FUTURE  
CIRCULAR  
COLLIDERFCC – SYNTHÈSE DES CONTRAINTES ET  
OPPORTUNITÉS D'IMPLANTATION

10.5281/zenodo.7569138

13/12/2023

Grant Agreement number: 951754 — FCCIS — H2020-INFRADEV-2018-2020 / H2020-INFRADEV-2019-3

# Future Circular Collider Futur Collisionneur Circulaire

## RAPPORT LIVRABLE

### SYNTHÈSE DES CONTRAINTES ET OPPORTUNITÉS D'IMPLANTATION

<b>Identifiant du document</b>	FCC-2107150900-CER 10.5281/zenodo.7569138
<b>Date de la version</b>	11/12/2023
<b>Groupe de travail</b>	FCCIS – WP3 Intégrer l'Europe
<b>Organisation</b>	Cerema - CERN - LD
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<b>Statut</b>	Publié
<b>Domaine</b>	Implémentation
<b>Mots clés</b>	FCC, implémentation, impacts environnementaux, opportunités territoriales



Ce projet a reçu, de l'Union Européenne, une subvention du programme d'aide de recherche et d'innovation Horizon 2020 sous le numéro d'agrément : 951754.

## Single source of information for the implementation scenario

- Periodically updated via editorial process, about once per year
- **V2.0 published in December 2023**
- 120 persons contributed to this work



<https://doi.org/10.5281/zenodo.10369593>



# Our voluntary anticipating activities since 2021

## Environment and sustainability studies

Not linked to the feasibility, which was confirmed earlier based on maps and databases. Complete and validate the knowledge, reduce the potential impacts, prepare the environmental assessment.

Called “**état initial**” or “état zero” analysis.

Identification of **environmental aspects** of the project as far as state of technology developments permits.

**Road access** and **railway access** as well as excavated **materials disposal analysis** completed.

**Electricity** access, initial **renewable energy** supply and **waste heat supply** analysis completed.

**Excavated materials re-use field trials** for agriculture and forestry on an open sky field laboratory at P5 in Cessy (1 ha) are being prepared and planned for at least four years.

## Engagement of host state stakeholders

Regular information meetings and exchanges with **cantonal services** in Switzerland, **prefecture of the region** and the **departments Haute-Savoie and Ain in France**.

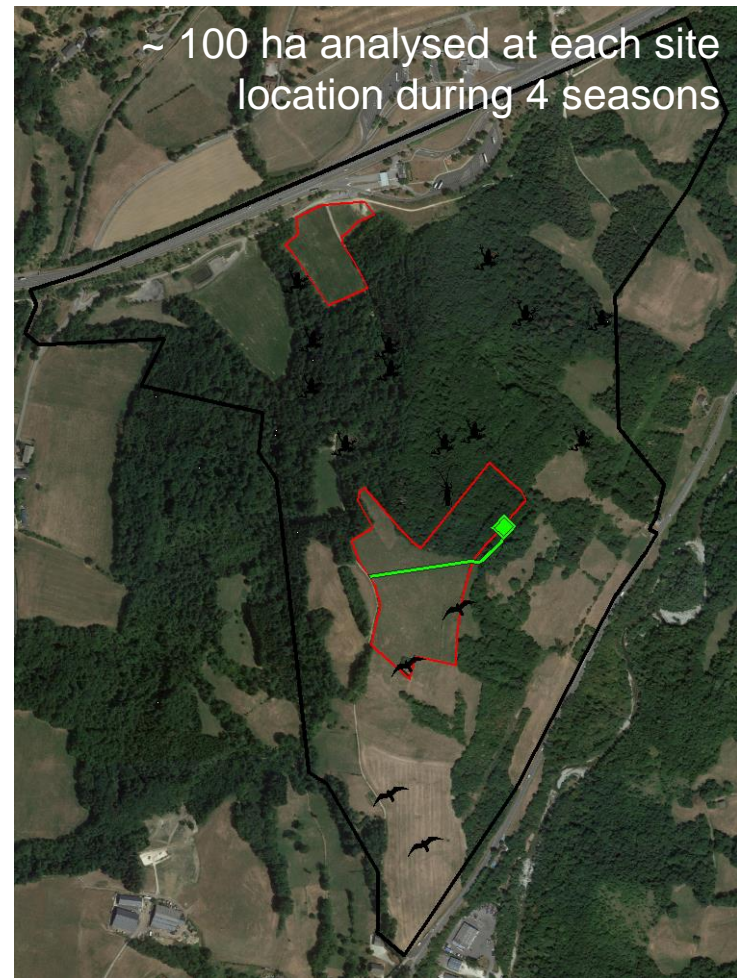
Periodic meetings with **the mayors and municipal councils** of the communes affected by the surface sites and the subsurface investigations

Targeted meetings with **regional industries** where a likelihood for synergy developments has been identified (e.g. water supply and treatment, cheese producers, farmers, fruit producers, service providers)

# Example of nature analysis

Results of the field investigations guide the optimisation of the surface site exact locations, shapes and give guidelines for the layout, site design, improvement and compensation measures to be developed at a later stage.

Management is informed and engaged.

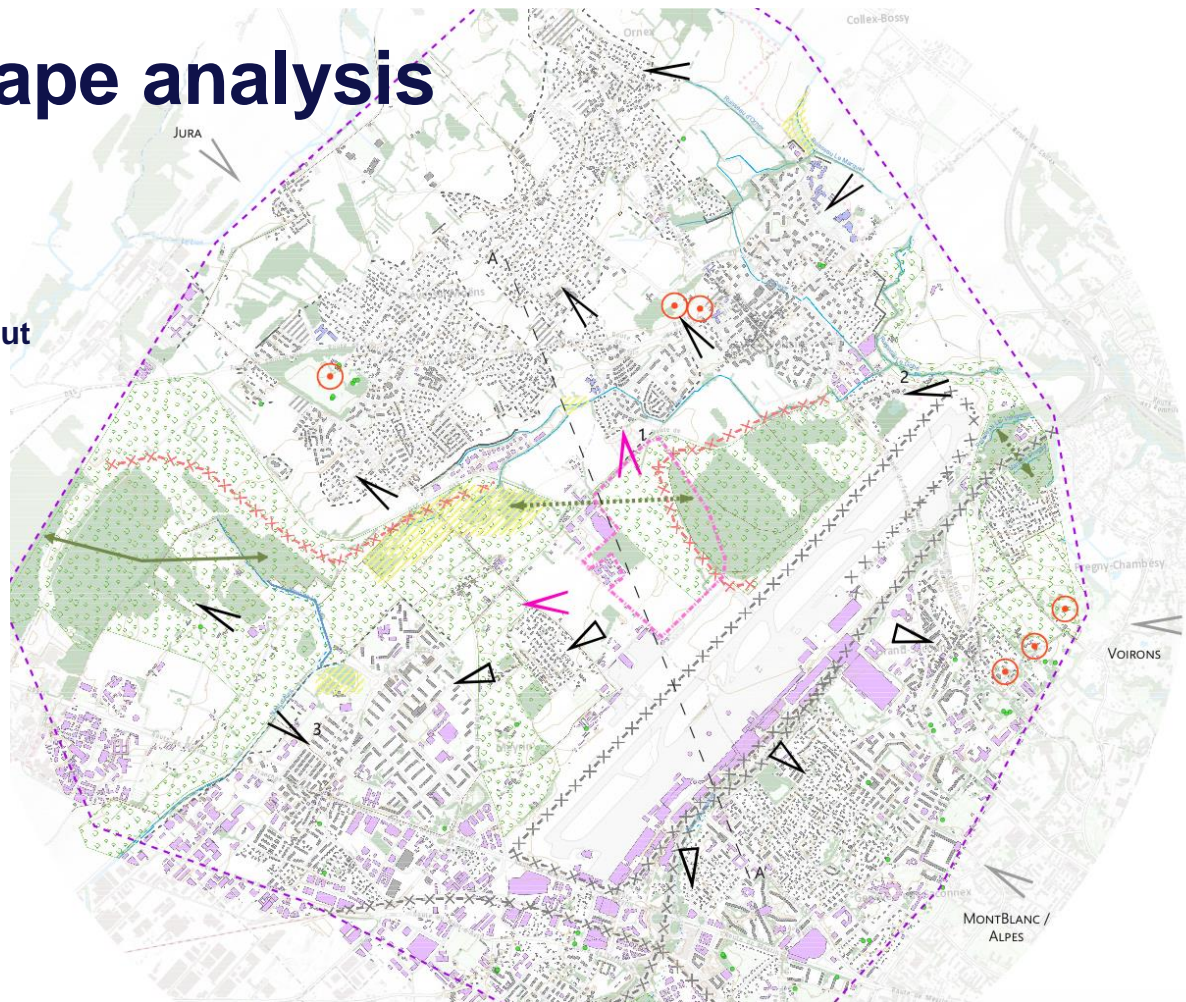
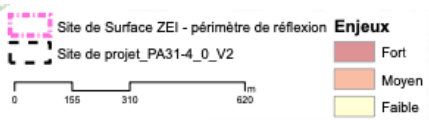
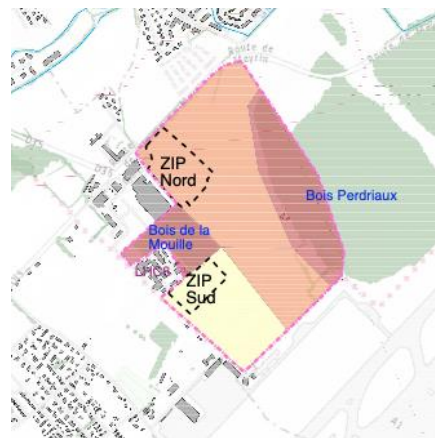


# Example of landscape analysis

## Understand the challenges:

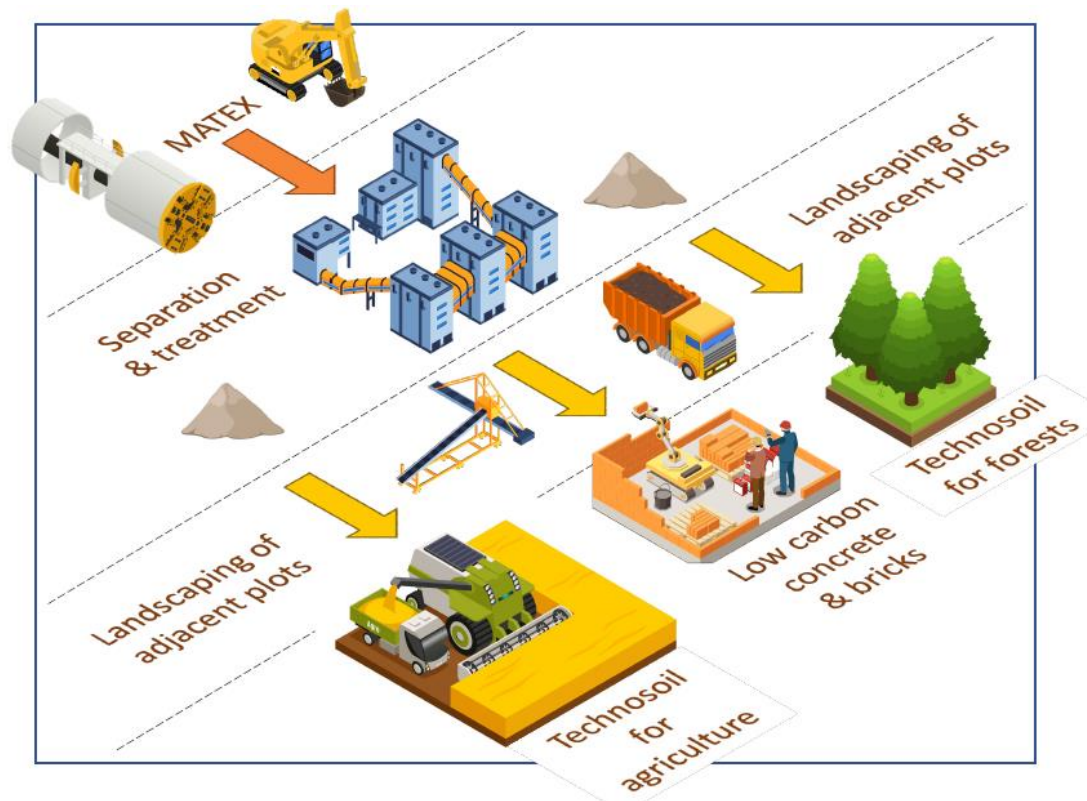
- views that would be obstructed
- visibility of the site from different directions

Develop **guidelines for the surface site layout** and implementation activities



# Management of the excavated materials: a key topic

- **Priority : reuse, minimize disposal**
  - Feasible disposal concept exists, but is very costly and comes with nuisances
- **Avoid and reduce transport**
  - In particular with trucks
- **Industrialisation of re-use pathways according to available resources**
  - Value creation for agriculture and reforestation
  - Improvement of acid and polluted plots
  - Recovery of wastelands
  - Use as construction materials within the project (e.g. compressed blocks)



# MATEX Open Innovation Example

"Mining the Future<sup>®</sup>" competition carried out in the frame of the FCCIS H2020 project revealed a number of credible processes and technologies to

- Develop approaches to **manage the 8 million m<sup>3</sup>** of materials once excavated (foisonné) and
- contribute in meaningful and relevant ways to the **ever critical issue in Europe of disposing (waste) excavated materials** from construction projects.

A consortium with academic & industrial partners is built to provide tangible evidence with a multi-year agricultural trial **on 10'000 m<sup>2</sup> at LHC P5 in Cessy** to

- convert **molasse to arable soil**,
- **promote reforestation** with climate fit trees and
- **reduce the carbon footprint** of construction projects
- **bring quality assured processes to market**



Accelerated soil  
transformation  
with funghi

# Agronomic studies

- **Agricultural study considering the french regulatory framework**
  - « Pilot » carried out in Nangy
- **Soil quality analysis, wetland zone analysis**
- **To determine**
  - Value of the plots consumed
  - Quantification of economic loss
  - Agricultural spaces that can be improved with treated excavated materials
  - Work ongoing and to be completed this year



VIAN Jean-François, VALLEIX Thierry, STAGNARA Delphine, LAÏDOUNI Patrycja, & GUTLEBER Johannes. (2023). *Méthodologie pour l'étude préalable agricole (Version V1.0)*. <https://doi.org/10.5281/zenodo.8403158>

FUTURE  
CIRCULAR  
COLLIDERMÉTHODOLOGIE POUR L'ÉTUDE  
PRÉALABLE AGRICOLEFCC-2306231005-SEM-  
MethodologieEtudePrealableAgricole-fra-V0100

Date: 22/09/2023

Contract/Agreement No: B1722/SCE

## Future Circular Collider

### NOTE

### MÉTHODOLOGIE POUR L'ÉTUDE PRÉALABLE AGRICOLE

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#### Distribution list:

Johannes Gutleber, Patrycja Laidouni, Beatriz Arias Alonso

# Topics included in the work until end 2025

## MILIEU PHYSIQUE

### 1. Climat

- Température
- Pluviométrie
- Vents
- Changement climatique

### 2. Topographie et relief

### 3. Géologie et pédologie

- Géologie
- Pédologie

### 4. Eaux souterraines

- Masses d'eaux souterraines
- Entités hydrogéologiques affleurantes
- Usages
- Analyse de la vulnérabilité

### 5. Eaux superficielles

- Hydrographie
- Hydrologie
- Qualité des eaux
- Usages
- Analyse de la vulnérabilité

### 6. Risques naturels

- Risque inondation
- Risque de mouvements de terrain
- Risque sismique
- Risque d'avalanche

### 7. Outils de planification et de gestion des eaux

- Schémas directeurs d'aménagement et de gestion des eaux (SDAGE)
- Schémas d'aménagement et de gestion de l'eau (SAGE)
- Plan de prévention des risques naturels d'inondation
- Evacuation des eaux en Suisse

## MILIEU NATUREL

### 8. Zonages d'inventaire ou de protection et sauvegarde

- Zonages de protection réglementaire
- Zonages d'inventaires et autres zonages du patrimoine naturel

### 9. Habitats

### 10. Espèces floristiques

- Flore patrimoniale et/ou protégée
- Espèces exotiques envahissantes

### 11. Zones humides

- Selon une analyse des critères « végétation » et « sol »

### 12. Espèces faunistiques

- Mammifères dont chiroptères
- Oiseaux
- Reptiles et amphibiens
- Poissons
- Macro-invertébrés

### 13. Continuités et fonctions

- Fonctionnement écologique
- Fonctionnement économique

## MILIEU HUMAIN

### 14. Démographie et logements

- Population
- Habitat

### 15. Aménagement du territoire et urbanisme

- Occupation du sol
- Intercommunalité et urbanisme réglementaire

### 16. Activités économiques

- Contexte économique
- Industrie et activités commerciales
- Agriculture
- Sylviculture

### 17. Risques technologiques, sites et sols pollués

- Risques technologiques
- Transport de matières dangereuses
- Présence de sites industriels classés
- Sites et sols pollués
- Déchets et substances dangereuses pour l'environnement

### 18. Axes de communication, trafics et principaux réseaux

- Axes de communication
- Trafics
- Principaux réseaux

## CADRE DE VIE (SANTÉ HUMAINE)

### 19. Ambiance sonore

- Notions d'acoustique
- Ambiance sonore initiale

- Eventuelles mesures in situ de l'ambiance acoustique

### 20. Qualité de l'air

- Emissions polluantes
- Surveillance permanente de la qualité de l'air
- Documents de planification pour l'air
- Mesures éventuelles in situ de la qualité de l'air

### 21. Pollution lumineuse

### 22. Vibrations

### 23. Rayonnement (non ionisant et/ou ionisant)

### 24. Tourisme et loisirs

- A l'échelle régionale et départementale
- A l'échelle locale

## PAYSAGE ET PATRIMOINE

### 25. Paysage

- Contexte général
- Ambiance paysagères détaillées de la zone d'étude rapprochée
- Sensibilité paysagère

### 26. Patrimoine archéologique et culturel

- Patrimoine archéologique
- Patrimoine culturel

### 25. Patrimoine naturel

Total personnel engagement:

35 persons from contractors

5 persons at CERN

# Working meetings with 42 municipalities

Meetings with the affected communes have been carried out, sometimes more than once.

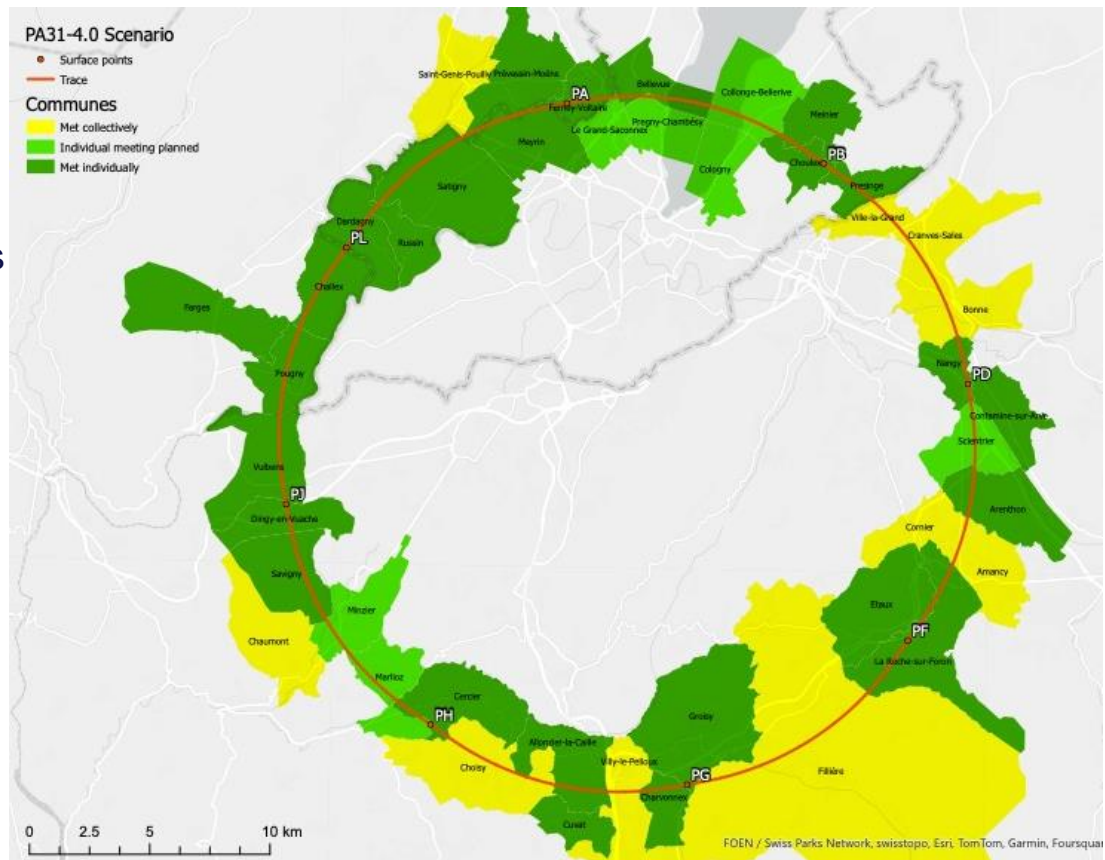
Focus is on very specific topics:

- surface site locations and sizes
- geotechnical and geophysical investigations

A host state representative is always accompanying CERN (prefecture or canton)



Chalex, Ain, France, 2023





# Main concerns expressed by people met

- **Loss of agricultural space** (1 ha is a lot for a municipality)
  - Typical questions: what do you need the space for? Do you really need it? Where is the access? What can you put underground?
- **How will you manage the excavated materials?** Where will they go? How?
- **What nuisances** will the construction cause?  
(noise, dust, traffic saturation due to trucks and workers)
- Visibility and noise of **evaporation towers** and plume generation
- **Visibility of sites** in general – size of buildings, construction style, fences
- What are the **adverse impacts concerning water** supply and availability?
- What are the **adverse impacts on wetlands?**
- Visibility of **electricity lines** and electrical substations
- Electrical **energy consumption** – will it affect other projects and development? How?
- What about impacts on **protected nature zones?**
- How will the **influx of additional workers** during construction period be managed in terms of housing, traffic, schooling, cultural integration?

# Concerns and “alternative” facts circulate online

We are analysing them and addressing them one-by-one with solid analysis and work.

We are convinced that transparency and professionalism is key to obtain the social license.

## Absence de sobriété

Le projet triplerait la consommation actuelle d'électricité du CERN, l'amenant à 4 TWh. (FCC-ee passerait de 1,4TWh à 1,9TWh puis FCC-hh à 4TWh)

## Bilan carbone électrique (MWh-EDF)

Avec les chiffres EDF actuel (0,1 t eq CO<sub>2</sub> le MWh) :  
FCC-ee à 190'000 t eq CO<sub>2</sub> par an  
FCC-hh à 400'000 t eq CO<sub>2</sub> par an

## Emission CO<sub>2</sub> du chantier

Émissions de CO<sub>2</sub> liées au chantier du FCC :  
1,4 mio t eq CO<sub>2</sub>

## Emission CO<sub>2</sub> fonctionnement FCC-ee

Emission de CO<sub>2</sub> du fonctionnement du FCC-ee : 200 000 t eq CO<sub>2</sub>  
La principale source de pollution de GES au CERN c'est le Gaz fluoré (Fgaz)

## Danger « inconnu » sur les **Nappes Phréatiques**

Souhaite connaître l'**impact climatique** ainsi que les exigences de l'étude d'impact sur l'environnement du projet

Que faire des matériaux d'excavation ?  
(Aujourd'hui 32% sont exportés, 53% sont évacués dans les gravières.)

En fonctionnement FCC-ee :  
injector : < 250 m<sup>3</sup>/an (faible activité)  
< 10 m<sup>3</sup>/an (moyenne activité).  
Collider : < 1450 m<sup>3</sup>/an (faible activité)  
< 70 m<sup>3</sup>/an (moyenne activité)

6400 m<sup>3</sup> de déchets du chantier de démontage du FCC-ee lorsque ce dernier cédera la place au FCC-hh

Estimation du cout total du FCC : 68 milliards (Rappelons que la construction du LHC, initialement budgétée à CHF 2,6 milliards, en a coûté 10.)

## Questionnement

Qui va payer le FCC ?

Il n'existe pas d'analyse Utilité sociale/(Coût + Externalités négatives) sérieuse du FCC

« *Le CERN pratique la stratégie du fait accompli sur le projet* »

« Impossible de préciser en quoi la société profitera de leurs travaux »

# Principal general re-occurring questions

- **What is the goal of the research you want to carry out concretely?**
  - Explicit request to be able to **respond with less than 2 sentences and in half a minute without jargon** terms. This is a challenge!
- **How will the surface site look like?**
  - A major challenge, since it is very hard for institutions and persons not involved in science and engineering to accept the iterative technical development process of a project that will operate in 20 years from now.
  - It is a high risk to publish “block-style” surface site layouts, since people cannot detach from the drawings once they see them and keep interpreting them as the design-to-build. Not showing raises equal worries, incorrectly assuming the CERN hides information.
- **What is the site bringing in terms of added value to my municipality and its immediate surrounding?**
  - Typically an iterative process in which the individual interests are identified.
  - Subsequently we develop potential benefits jointly.
  - A process that requires ample time and dedicated personnel resources.

# Information kit to accompany field investigations

Communication plan has been established in the frame of a “tripartite territorial dialogue group”

This body has been established to assure that CERN, France and Switzerland can proceed “in phase”.

Mid-term review revealed that web and in particular social-media presence needs netter planning and work. Consequently we will put a focus on this with a dedicated expert in “concertation publique”, leveraging existing experience of other large projects and platforms in place for such activities in France.



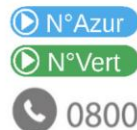
Éléments de langage



Protocole



Dépliant



Numéro téléphonique



Site web



Formulaire de demande d'information



Réseaux sociaux



Réunions d'information

**CAMPAGNE DE MESURE DANS NOTRE RÉGION**

Le CERN, Laboratoire européen pour la physique des particules, effectuera des 2023 des relevés dans le canton de Genève ainsi que dans les départements de l'Ain et de la Haute-Savoie afin d'étudier l'environnement et les sous-sols de notre région. Découvrez pourquoi et comment.

Étude d'une nouvelle génération d'accélérateur circulaire souterrain à l'horizon 2040

FUTUR COLLISIONNEUR CIRCULAIRE  
Campagne de mesure

## Privilégier le dialogue



Les élus des communes de Pougny, Farges et Saint-Jean-de-Gonville se sont réunis pour une première rencontre avec l'équipe de l'étude de faisabilité du FCC.

Photo : Lise Benoit-Capel / DL

**Le CERN souhaite que la conduite de cette étude repose sur un dialogue permanent avec les collectivités territoriales, les associations, les habitants et l'ensemble des acteurs locaux des territoires traversés.**

Web site:  
[fcc-faisabilite.eu](http://fcc-faisabilite.eu)

C'est dans ce conseil municipal de la commune de Farges en grande partie financé par le FCC par une délibération en présence de la Mairie de Marcelot, mais aussi de Monsieur Graziotti, maire de Saint-Jean-de-Gonville et Monsieur Michel, maire de la Région des E...

- QUI?
- QUOI?
- OÙ?
- POURQUOI?**
- COMMENT?
- QUAND?

### Pourquoi?

- Quelle est l'utilité de la recherche au CERN ?
- Pourquoi le besoin d'un nouveau collisionneur de particules ?

**N'hésitez pas à nous présenter vos idées**

# General summary

**Reference scenario is established, communicated and reviewed by host states and with municipalities hosting sites.**

**Engagement** is overall **positive**, but worries and concerns exist and are expressed.

**Associations are teaming up against CERN** and the situation leads to a “one-sided” painting of the project picture, e.g.  
<https://www.change.org/p/le-cern-peut-il-tout-se-permettre>

**We are not able to answer to some of questions and worries** exhaustively (yet).

- If we knew it all, we would not need to study.

**Development of synergy potentials** with municipalities has **started**.

**Environmental aspect analysis is ongoing.**

**Managed documentation** exists

**Environmental Information System** rolled out.

The **territory is continuously evolving**. No obvious alternative feasible scenario has been identified.

# Summary of work with institutions

A **project scope and splitting** has been proposed to the host states. It is currently under review. An agreement between France, Switzerland and CERN on this proceeding is a pre-condition to be able to advance on the preparatory tasks for a project.

Subsequently, targeted participation of host state services in both countries are required in the near future to be able to assure a timely preparation of a potential construction project, before a decision is taken and before a project authorisation is issued.

The development of the authorisation / permitting processes in the two host states has started.

**Land plot reservation for study purposes has started** in France and in Switzerland.

# How can we make the FCC happen?

1. **Unite as a community**
2. **Formalise collaborations**
3. **Be publicly visible as an entity with a vision**

**Explain** to your partners, families, friends, companies you work with, people you meet in a bar, at the airport, at the train station, in the supermarket, on the bus, in the elevator, in the taxi, in the shops, on the beach, in the hotel, at school, at the kindergarten, ...

**Please listen to the worries**, the fears of the people.

**Respect, accept and understand the criticism.**


**Sustainability of a Research Infrastructure relies on the long-term commitment of a sufficiently large and determined user community.**

**Opponents aim at dividing the community. Unity is a fundamental pre-requisite.**

The New York Times

## *Particle Physicists **Agree** on a Road Map for the Next Decade*

A “muon shot” aims to study the basic forces of the cosmos. But meager federal budgets could limit its ambitions.

 Share full article



 96



# Your engagement counts!

Help us to develop easy to understand and short explanations

**WHY** do we want to carry out research with a future circular collider?

**WHAT** is the scientific research we want to do?

[fcc-what@cern.ch](mailto:fcc-what@cern.ch)

