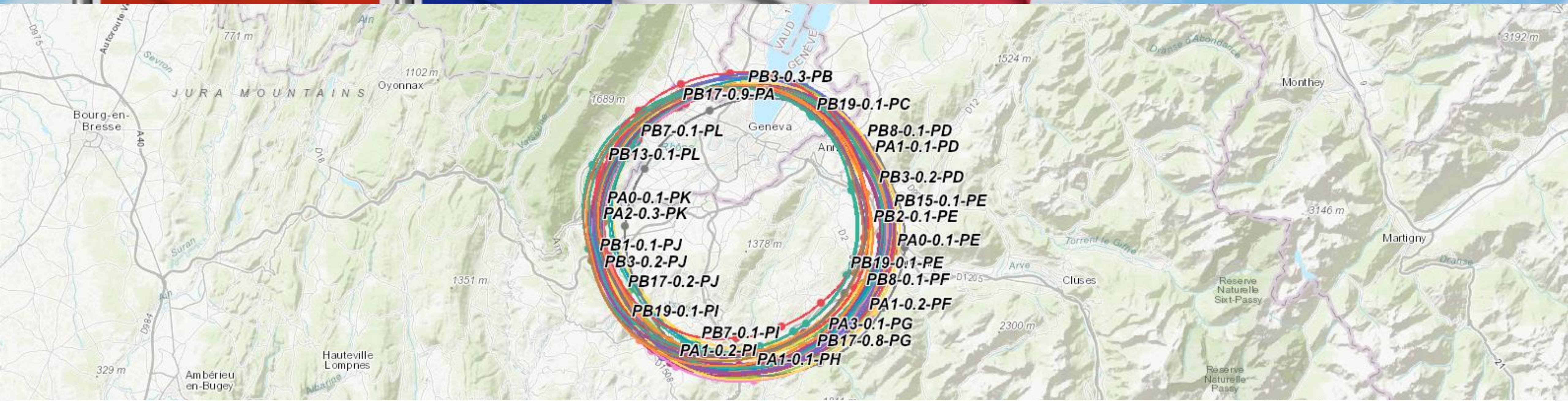


WP3 INTEGRATE EUROPE WORK PROGRAM GOALS AND PLANS

J. Gutleber (CERN)
10 November 2020



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the European Union's Horizon 2020 research and innovation programme under grant agreement No 951754.

WP3 Objective

- **Develop an implementable project scenario for the territory**
 - Project description,
 - Layout and placement variants considering mission-critical invariants and territorial constraints, resource needs, risks, socio-economic synergy potentials
 - Project preparatory phase schedule including legal and administrative processes.

Adopt an integrating approach from an early stage on ensures that the preparation phase is entered with a project scenario that has been validated by key stakeholders (population, host states, scientists, funding agencies).

The project can only be implemented if both a territorial implementation scenario is societally acceptable and if the required performance for scientific research can be delivered.

Link to WP 2, which technically optimises the particle collider design

Link to WP 4 integrating socio-economic aspects.

Innovation potentials are explored along the activities in this project

WP3 key participants



Work package lead: J. Gutleber



Work package deputy: P. Boillon



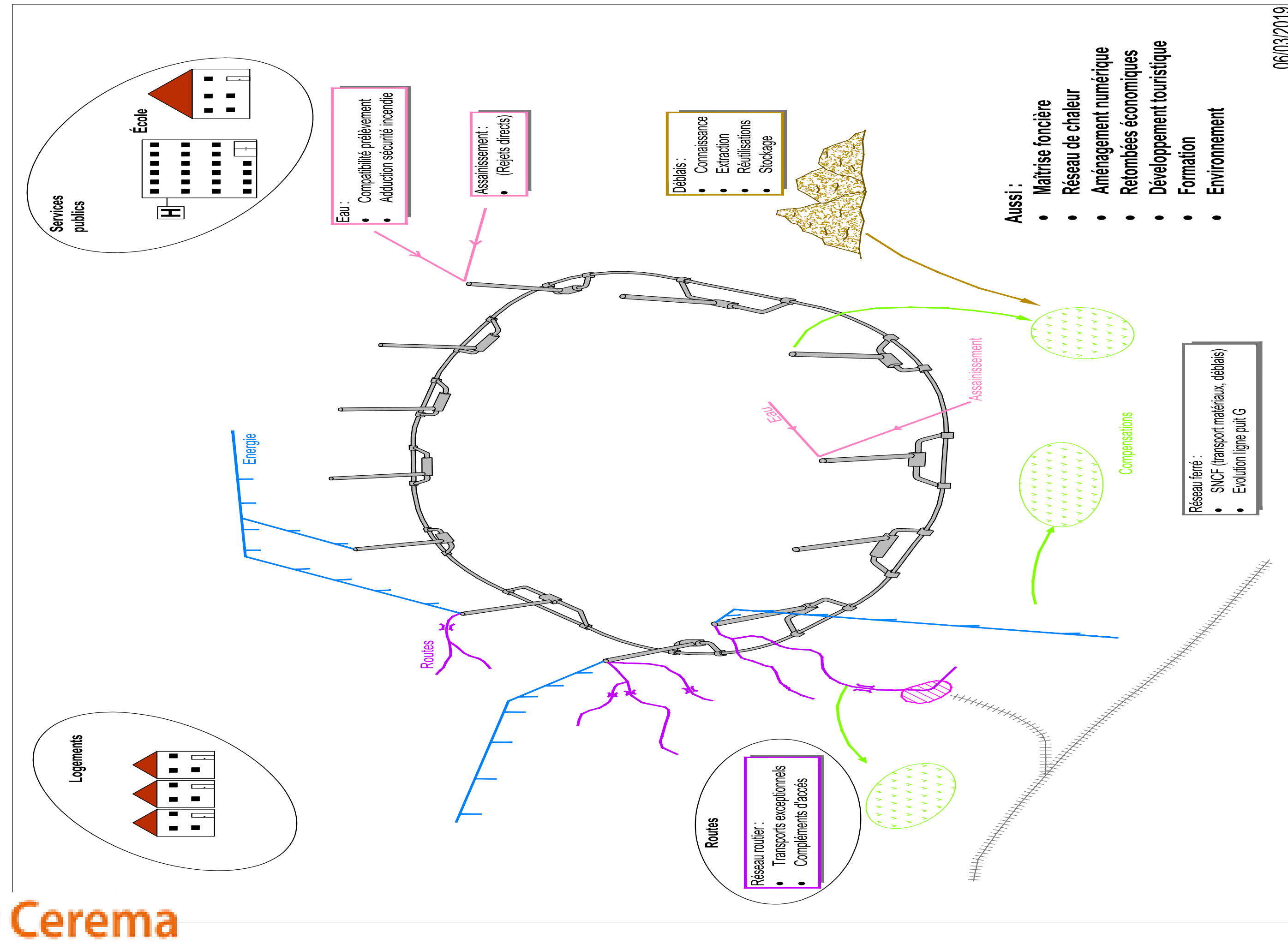
Scope of the FCC project

The legal frame in Europe in general and in France in particular requires the **definition of the project scope in a wide sense.**

The "entire project" is composed of sub-projects for which **different project owners with different project responsibilities** exist.

- **Research Infrastructure** consisting of injectors, collider, experiments, technical infrastructures required for the operation of the machine and detectors
- **Development project in France**
- **Development project in Switzerland**

As preparatory work for FCCIS the project scope has been developed together with french and swiss host state partners.



Tasks

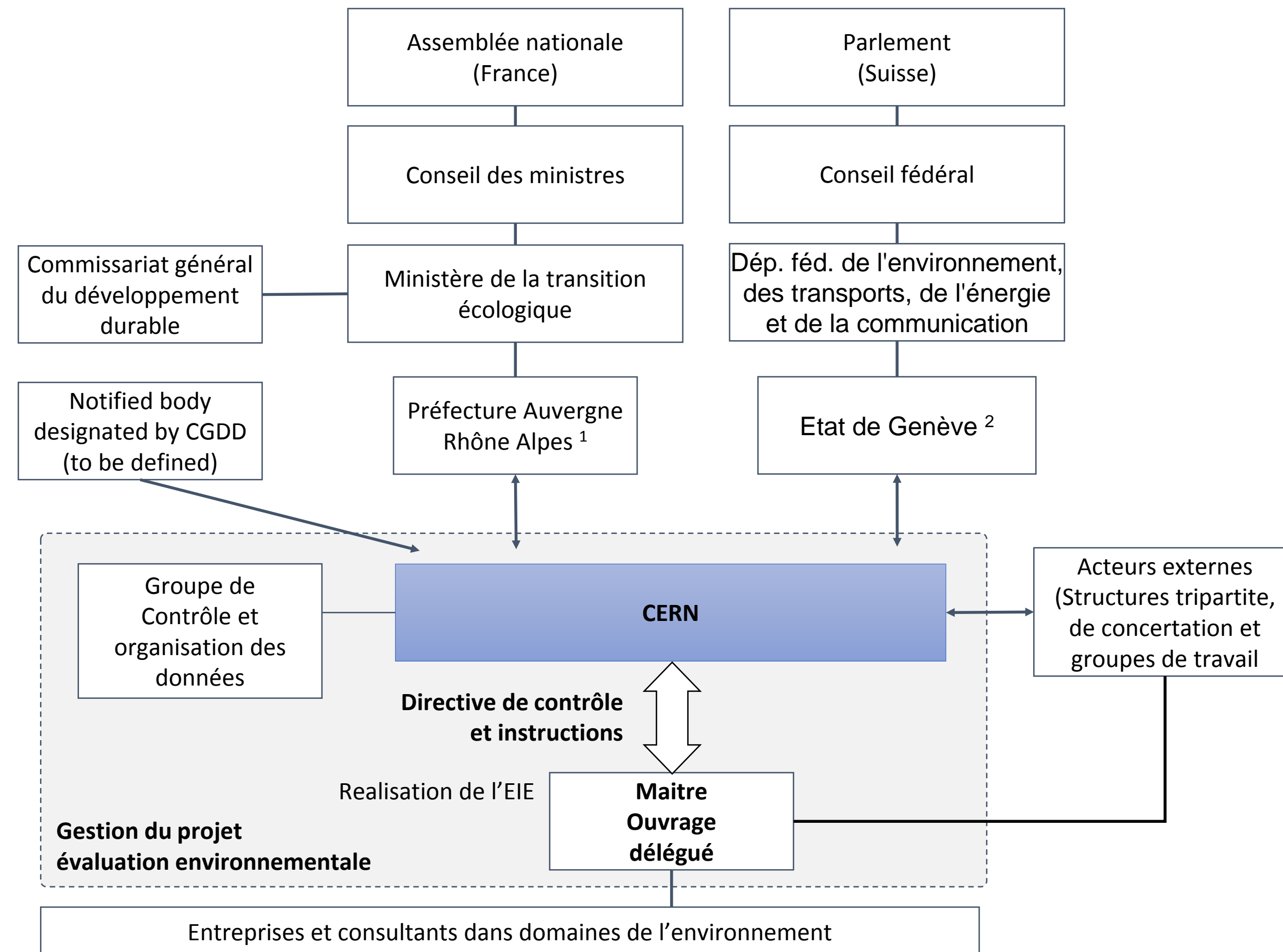
- **T3.1: WP coordination (CERN)**
- **T3.2: Placement optimisation (CERN)**
 - Work carried out together with Cerema (France),
 - Involves notified bodies of the region Auvergne-Rhône Alpes (DDT74/01), France
 - Involves Etat de Genève (DT sector representatives, OCAN, GESDEC, SERMA), Switzerland
- **T3.3: Transnational environmental evaluation framework (CERN)**
 - Development of the concept in co-operation with Cerema (France) and Latitude Durable (Switzerland)
 - Notified body in France (Commissariat général au développement durable (CGDD)) for verification and planning of a informal study phase before engaging the formal process
 - Notified body in Switzerland (Service Environnement, Risques Majeurs et Accidents) for verification and planning of a informal study phase before engaging the formal process
- **T3.4: Management of excavated materials (MUL)**
 - Working group moderated by CERN
 - Co-operation with notified bodies in France (CETU, Cerema)
 - Co-operation with notified bodies in Switzerland (GESDEC)
 - Carry out an international challenge-based competition to identify molasse re-use innovations (innovation = a new product or service for the market)
 - Forges strategic partnership with notified bodies and projects with similar characteristics (e.g. TELT)

Deliverables and Milestones

M/D		Status	Month	Date
MS2 (3.1)	“Mining the Future [®] ” challenge call open	Not started	5	March 2021
D3.1	Transnational environmental evaluation requirements and framework	In progress	16	March 2022
D3.2	“Mining the Future [®] ” innovation challenge results	Not started	24	October 2022
D3.3	Particle collider layout and placement assessment	In progress	34	Sept. 2023
D3.4	Preliminary excavation materials management plan	In progress	45	Aug. 2024

Environmental Evaluation Framework

- **Environment = all topics that the project affects.** It includes for instance nature, land, urbanism, public health and safety, economic losses and benefits as well as impacts across national borders.
- In France, environmental evaluation is a process anchored in the the law (R.122-5 code de l'environnement) to show that the project is planned such that the smallest possible impact to the environment according to the “avoid-reduce-compensate” approach is generated.
- In Switzerland (federal ordonance OEIE and cantontal regulation concerning the adoption of the OEIE K 1 70.05) the process aims at showing that the project satisfies the requirements of the applicable laws.
- Representatives of both host states agree that one singled integrated process for the entire project is an appropriate concept.
- The **environmental evaluation leads in both host states to the necessary authorisations of the project.**
- This project will develop and deliver the concept for the **integrated process that is the pre-requisite for its implementation.**



¹ Représentée par le Préfet de région

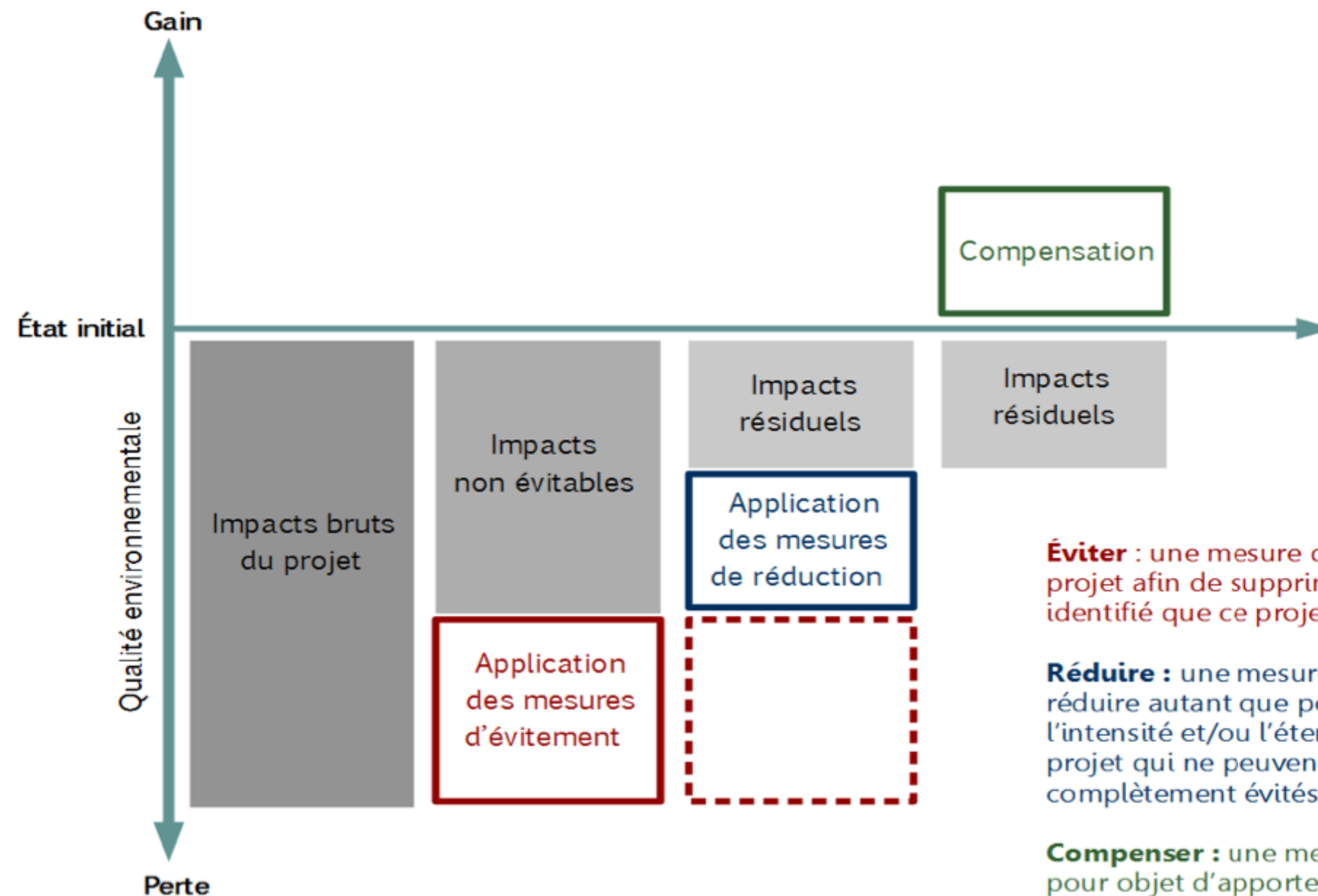
² Représenté par le Département du territoire (DT – OCEV – SERMA)

The environmental evaluation concept development includes the drafting of an appropriate organisation structure for this process.

Methodology Avoid – Reduce - Compensate



- The sequence “**Éviter, réduire, compenser**” (ERC) is anchored in the french law “Code de l’environnement” L.110-1
- The sequence is a requirement for the “**project authorisation procedure**” that is implemented as an “**environmental evaluation**” process.



Éviter : une mesure d'évitement modifie un projet afin de supprimer un impact négatif identifié que ce projet engendrait.

Réduire : une mesure de réduction vise à réduire autant que possible la durée, l'intensité et/ou l'étendue des impacts d'un projet qui ne peuvent pas être complètement évités.

Compenser : une mesure compensatoire a pour objet d'apporter une contrepartie aux effets négatifs notables, directs ou indirects du projet qui n'ont pu être évités ou suffisamment réduits.

Further information:

<https://www.ecologie.gouv.fr/eviter-reduire-et-compenser-impacts-sur-lenvironnement>

An interactive approach driven by the environmental optimisation of the project

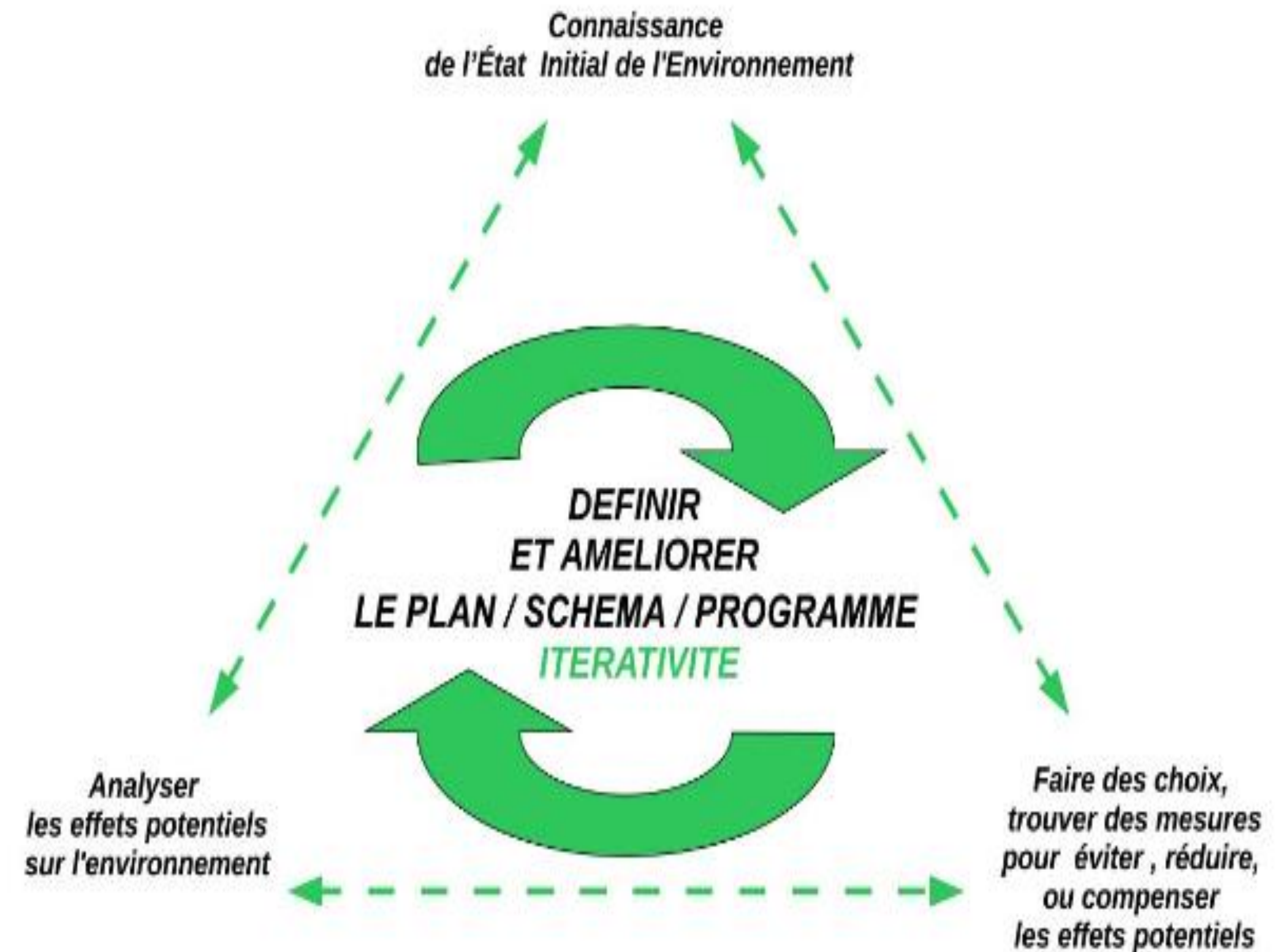
The approach is iterative following the international standards and best practices of project management

PLAN – DO – CHECK – ACT for each of the three phases.

In each phase the work starts with **establishing a knowledge base of the territorial conditions and the project requirements** (performance needs for scientific goals, technological capabilities and constraints, schedule and budget envelopes)

Next, the goals are set (plan). This may for instance be to identify suitable placement scenario classes or optimise identified classes or control the impacts of sites or compensate for any topics that could not be otherwise addresses. The ultimate goal is the presentation of two documented scenarios and the entire optimisation process.

After the **design work (do)** in the phase, the **results are fed back** into the knowledge base (**check**) and **avoid/reduce/compensate measures are set (act)**. Then the cycle starts over.



Avoid Phase

Topics to be considered in the Avoid phase

- Population
- Health of people
- Biodiversity with particular attention to species and protected habitats
- Land and soil
- Water
- Air
- Climate
- Material goods, cultural goods and landscape
- Interaction of the elements 1 to 8

The Research Infrastructure **placement is therefore with first priority laid out and placed according to avoiding potential negative effects.**

Invariants that are required to come to a feasible project emerge from this phase

Project invariants (sites and equipment on sites and required to supply the sites) **are further optimised** in the subsequent reduction phase.

Les champs à étudier dans l'évaluation environnementale concernant les incidences notables directes ou indirectes du projet, plan ou programme sur l'environnement

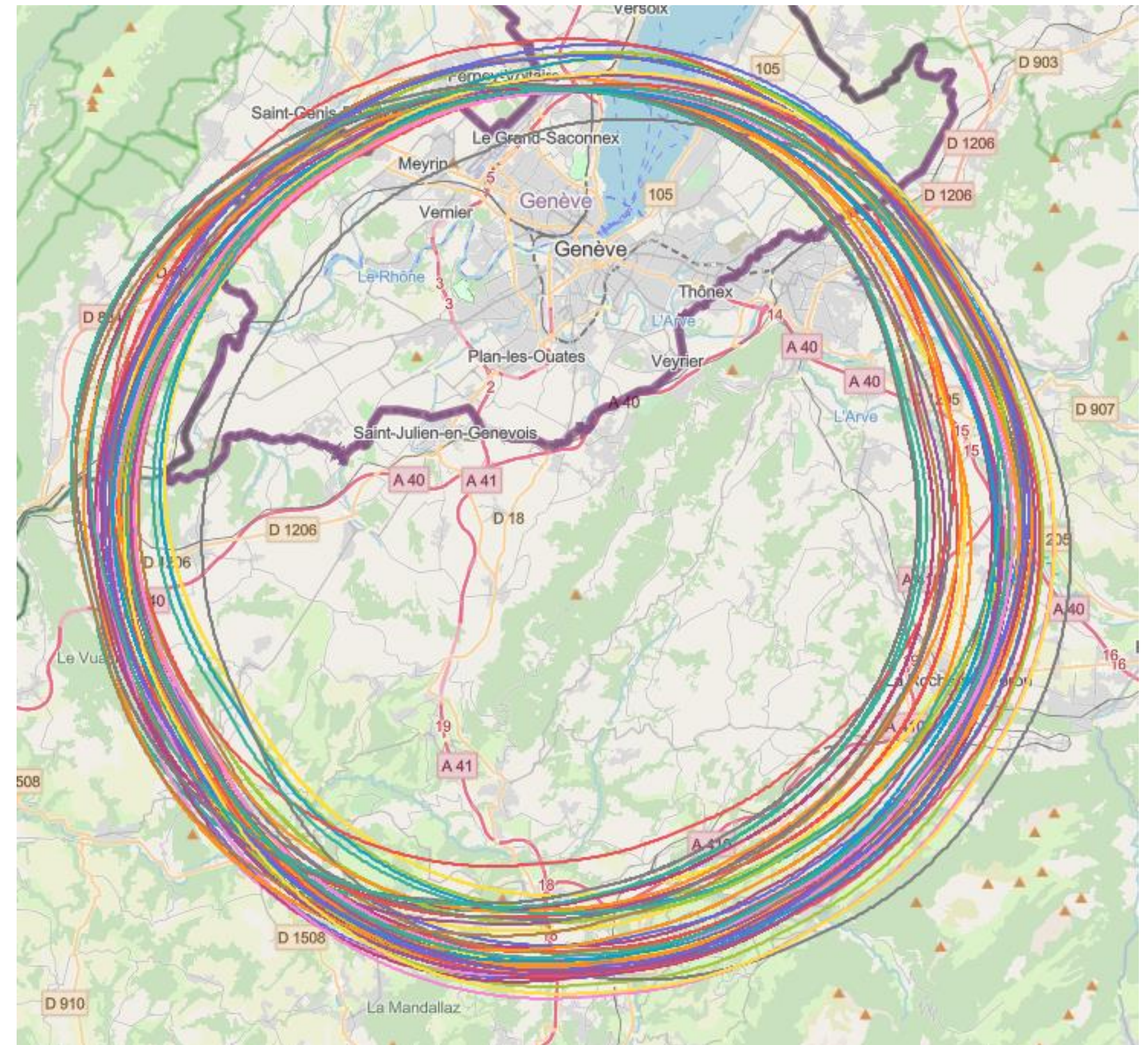
(Extrait de l'article L. 122-1 du code de l'environnement)

- « 1° La population et la santé humaine ;
- 2° La biodiversité, en accordant une attention particulière aux espèces et aux habitats protégés au titre de la directive 92/43/ CEE du 21 mai 1992 et de la directive 2009/147/ CE du 30 novembre 2009 ;
- 3° Les terres, le sol, l'eau, l'air et le climat ;
- 4° Les biens matériels, le patrimoine culturel et le paysage ;
- 5° L'interaction entre les facteurs mentionnés aux 1° à 4° . »

Progress since March 2020

To comply with EU and French law for the environmental evaluation process, the placement work follows an iterative process, applying the approach “reduce-avoid-compensate”.

- 1) **Establish a harmonised catalogue of territorial conditions for France and Switzerland considering national and regional conditions** (urbanism, nature, geological and hydrological situation, natural and technical risks, etc.)
- 2) **Apply the “reduce” approach to determine a set of potentially feasible baselines for further optimisation (WE ARE NOW ON THIS).**
 - Includes work with national „notified bodies“ at a high level down to PLU (France) and PDc (Switzerland).
 - Includes review of FCC technical matters such as collider beam optics constraints, civil engineering constraints, technical infrastructure constraints



45 scenarios out of hundreds were individually looked at and retained for further optimisation at micro-level

Tool development for more efficient exploration

New **Web App** produced by CERN (V. Mertens).

- Permits to **vary machine** and **geographical parameters** and **display** the resulting **access point positions in real time**.
- Various **base map types** and various **additional layers** can be selected.
- Allowed to **massively speed up exploration** of allowed parameter space and find first match with territorial constraints

Following that first step, results are output for further processing (transfer to ArcGIS, detailed site description/analysis, micro-optimisation).

Select base layers and overlays

Constraints maps

Vary machine and geographical parameters

For chosen parameters, check point positions in real time

Future Circular Collider Study

Input parameters

S_ARC cells (8-30)	19
L_ARC cells (62-84)	73
# 3-L ARC cells linked	<input checked="" type="radio"/> Yes <input type="radio"/> No
LSS_A, B, ... length [m]	1400
LSS_D, J length [m]	2600
Fixed point	<input checked="" type="radio"/> PA <input type="radio"/> CPB
LON_X [x x° E]	6.0676
LAT_X [x x° N]	46.2358
Azimuth_X [x x°]	26.4

Resulting parameters

S_ARC length [m]	4716.519
L_ARC length [m]	16221.023
Sum ARC lengths [m]	83756.170
Sum LSS lengths [m]	14000.000
Total length [m]	97756.170
# RBENDS	4672

Resulting parameters (ext.)

Parameter sets

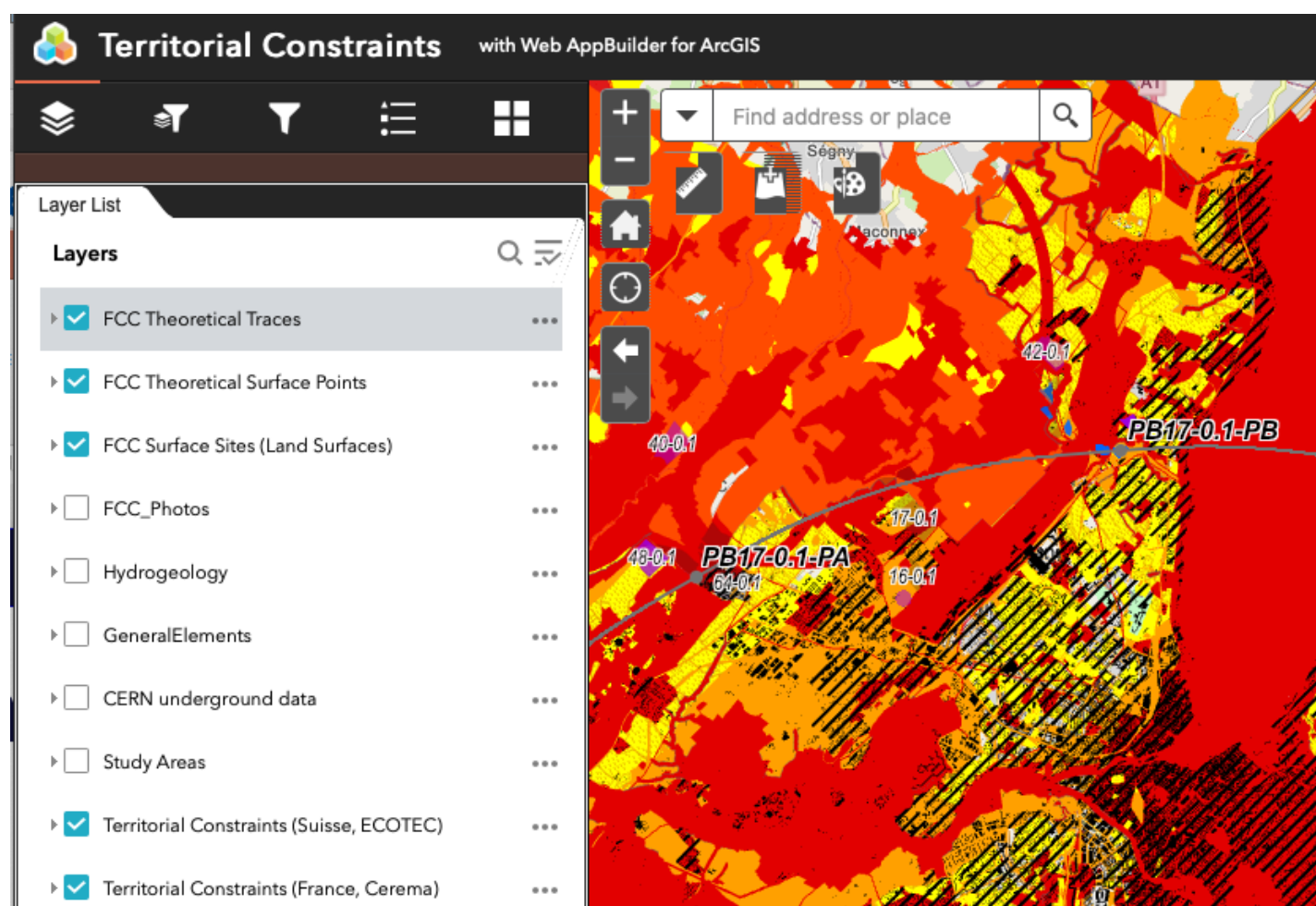
File download

Messages

22:17:40 FFE2 01beta (3.6.2020)
 22:17:40 Load CH constraints syntheses (SITG)
 22:17:40 Load FR constraints syntheses (Cerema)
 22:17:40 Load FCC trace
 22:17:40 Load LHC trace
 22:17:40 Load "Zones of interest" (Cerema)
 22:17:40 Load TOT boundary
 22:18:12 Open help window

„Assisted pre-search“ (additional module varies machine parameters automatically within chosen limits and outputs candidate scenarios with enough hits in target zones for manual optimisation).

Documentation framework



Site Description Information Sheet		Site Name:	PB	Version:	PB13-0.1-PB-0.1
Document identifier	FCC_2007071000_AVE_SiteDescriptionInformationSheet_PB13-0.1-PB-0.1	Land Surface Name:	91-0.1		
Date:	2020-10-14	Doc. Version:	0.4		
Approved by:	Last name, first name, organisation	Approval status:	IN WORK		
Created by:	Verdier, Anne-Laure, CERN	Approval date:	YYYY-MM-DD		
E-mail:	anne-laure.verdier@cern.ch	Phone:	+41 75 411 5106		
Geographic location:	Lambert 93 Easting: 940403.6m Northing: 6578233.4	WGS84 Lat: 46.26120003 Long: 6.12190054	LV95 Easting: 2498478.3719m Northing: 1124161.776m		
	Town: Bellevue	Canton or Département: Genève	Country: Switzerland		
	Parcels, owners, classification (PLU, PD): 371, 376, private owners Additional parcels for evaluation: 372, private owners		Approximate Size: 4.4 ha for the sum of all plots		
Map:					

Criteria	Sum values	Sum scores	Scores %
LAND STATUS	9	19	14.39
Plot availability	2	4	3.03
Clean and clear title	2	4	3.03
Plot price	2	4	3.03
Time for acquisition and expected challenges during acquisition	2	4	3.03
Cost of development	1	3	2.27
CONNECTIVITY	4	8	6.06
Distance from transport, industrial and other relevant infrastructures	2	4	3.03
Distance from populated areas	2	4	3.03
RAW MATERIALS AND SERVICES	4	8	6.06
Availability of raw materials	2	4	3.03
Proximity to service providers	2	4	3.03
PHYSICAL FEATURES	15	33	25.00
Plot size and shape	1	3	2.27
Topography	1	3	2.27
Shaft depth	1	3	2.27
Drainage conditions	2	4	3.03
Surface (soil) conditions (from sensibility sheet)	2	4	3.03
Water resources	2	4	3.03
Accessibility	2	4	3.03
Subsurface conditions (physical)	2	4	3.03
Subsurface conditions (regulatory)	2	4	3.03

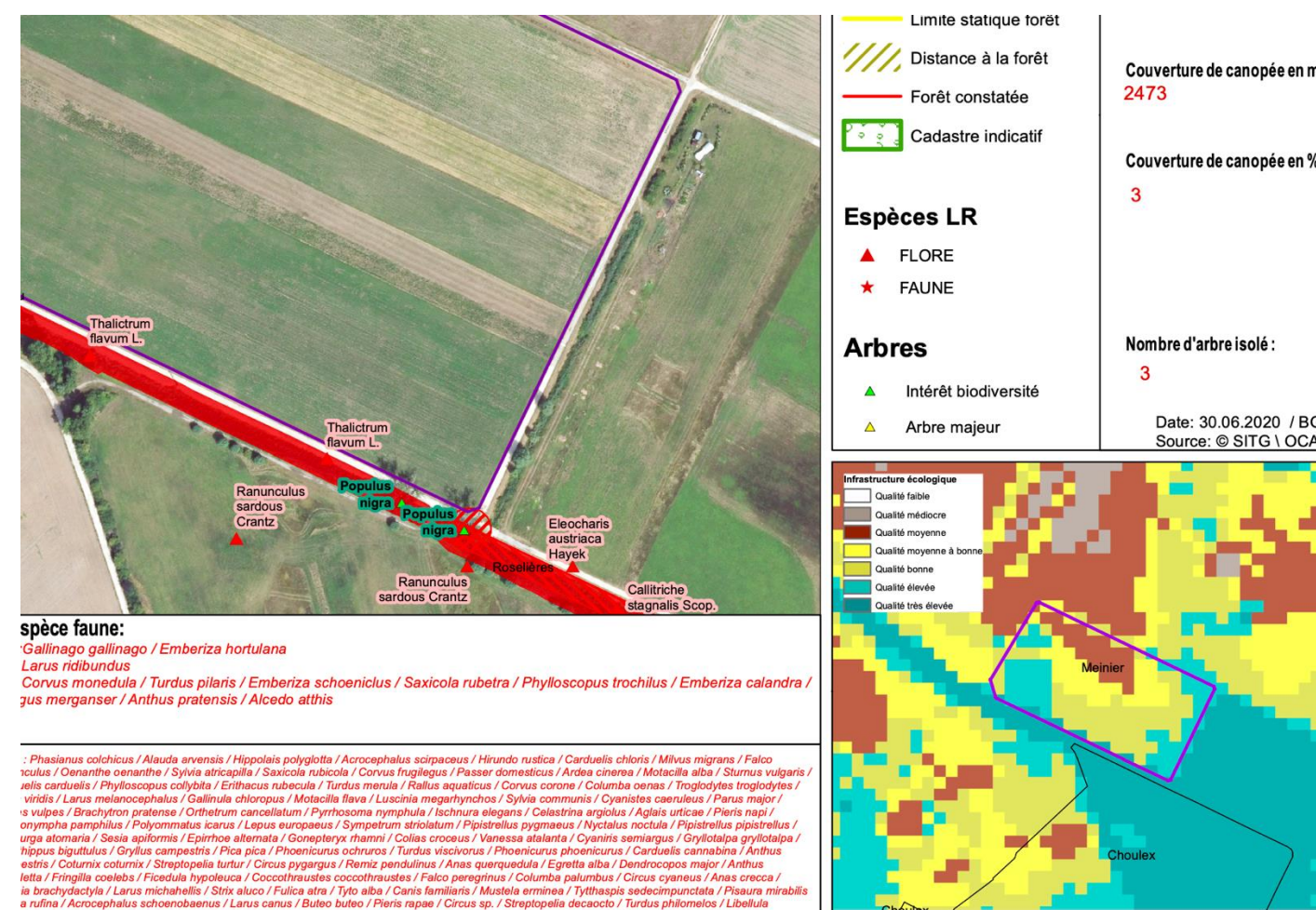
GIS system for information integration

Site description sheets for all potential plots

Multi-criteria analysis for all sites and the entire scenario

N°	Commentaires	Photo miniature	Latitude (DD)	Longitude (DD)
001	Les photos correspondent à la partie Est du site. Les courbes de niveau sont parallèles à la RD 5. Les parcelles sont à peu près horizontales au niveau des prairies disposées le long de la RD : elles pourraient recevoir des bâtiments associés au puits, sauf dans les parties boisées plus pentues. Les milieux ouverts sont occupés par des systèmes prairiaux mésotrophes récemment fauchés de bonne valeur agronomique. La flore est banale avec la présence d' <i>Arctium nemorosum</i> , <i>Symphytum officinale</i> , <i>Silene latifolia</i> , <i>Heracleum sphondylium</i> , <i>Hypericum perforatum</i> , <i>Mentha longifolia</i> , <i>Prunella vulgaris</i> , etc...		45,989350	6,248630
002	La lisière avec la forêt mixte est plus riche avec la présence d'espèces moins courantes : <i>Hylotelephium anacampseros</i> et <i>campanula trachelium</i> , notamment.		45,989515	6,248748
003	Aucune espèce protégée n'a été observée.		45,989325	6,248973

Site visit descriptions (Cerema SCOUT)



Setup of work with Host States

Switzerland

- **Structure de Concertation Permanente** with representatives of the confederation (DFAE), permanent mission of Switzerland at the international organisations and the state of Geneva.
- Dedicated sub-working groups with the **Département du Territoire** (DT) with representatives of different cantonal zones.
- Cantonal office of Agriculture and Nature (**OCAN**).
- Service of geology and waste (**GESDEC**).
- Service of environmental and major risks (**SERMA**) as the body notified by the federal office for environment as primary contact for FCC environmental evaluation matters.
- **Commission foncière Agricole** for land plot economic value study.
- Different entities for targeted inquiries (e.g. airport, SIG, lawyer offices concerning land ownership status, environmental experts for topical inquiries).

France

- **Cerema** as a decentralised public body that accompanies large scale project in France for work on the high level territorial optimisation (integration point of information from different national, regional and local sources) and as the body that instructs about environmental and territorial requirements for surface and subsurface investigations (water, risks, waste, agriculture as required by different laws). Acts also as AMO to facilitate the compliance with the project owner's requirement to ask for permits to enter sites for investigations.
- **Prefecture de la région in Lyon** (Secretariat General) for transversal integration of topics (placement, excavation materials, environmental evaluation, administrative processes and processes involving the public, link to departments). Link with DREAL (Direction régionale de l'Environnement, de l'Aménagement et du Logement). **Represents the french government.**
- **Direction départementale des Territoires (DDT)** for Haute Savoie (74) and Ain (01) for the micro-optimisation of retained scenarios. This link will be established in December and a dedicated working group will start in 2021, mandated by the préfet of the AuRA region.

Excavation Materials Management Plan

- The **legal frameworks in both host states require the development of a management plan** for the about 9 million cube metres of expected excavated materials.
 - Management plan accompanies the specific materials handling plan needed for the construction authorisations.
- France and Switzerland have different requirements, approaches and processes for the adoption of a strategy of management of excavated material in large-scale projects.
- The strategy to be described in the FCC excavated material management plan **must be compliant with the existing requirements in both, Swiss and French planning documents.**
- A **tripartite working group** has been created to develop :
 - - **Template and guideline** of the management plan
 - - **Strategic matex management plan** that will be in future updated with complementary information that will arise from the refinement of the subsurface geological model and socio-economical studies of the region.

Working group on the development of an excavation materials plan is established with the following participants:

- CERN : L. Ulrici (moderator), M. Haas, M. Poehler
- CETU (France): E. Premat, L. D'Aloia, F. Robert, L. Mongeard, A. Cherrey
- MUL (Austria): R. Galler
- GESDEC (Switzerland): J. Martelain

Collaboration with external experts :

- Regulatory framework: University of Lyon 3,
 - 3D subsurface modelling: University of Geneva, GESDEC, University of Grenoble, Université "La Sorbonne" (Paris)
- **Working meetings** will be intensified with a pace of **ca. 10 meetings per year** and additional subject-specific working meetings per topic.



MATEX work session on
Tuesday (10.11.) at 13h30

Mining the Future Challenge

- **Pitch:** The FCC publicly funded research infrastructure project would not only serve as a **European flagship for science** that **increases cohesion** among the participating countries and **serves a world-wide community** of scientists **until the end of the 21st century**. It also aims at being an innovation factory in many domains.
- Considering the goals of circular-economy to use and **re-use materials in this project wherever appropriate, economically viable** and **where it leads to a added value for the society**, the international FCC collaboration decided to launch a Challenge-based Innovation Competition to identify **credible means for the innovative re-use of the molasse materials** that are expected to be encountered during the construction phase.
- **Goal** of this international competition is to **identify technologies and processes that help reducing the amount of excavated materials that will have to be disposed in landfills**.
- **Competition aims at identifying new products and services** that can be used in the course of this construction project.
- **Technologies need also have the potential to be used in comparable endeavours** for a long-lasting period.
- A **jury of internationally renowned experts** from subsurface-engineering, excavation materials re-use, and innovation management will **accompany the competition over a period of about one and a half years** to select the most promising proposal.
- Winner of the competition is awarded the development of a business model for the new product or service or to protect the intellectual properties of the proposed re-use approach.



Mining the future work session on
Thursday (12.11) at 08h30

Next steps

Placement optimization (time frame March/April 2021)

- Complete development of 2 baseline scenario classes
- Document the scenario candidates
- Validate with host state representatives

Transnational environmental evaluation framework (before the end of the year)

- Review and validate concept document with host state representatives
- Establish requirements document for maître d'ouvrage délégué
- Develop project schedule

Excavated materials management plan (time frame January/February 2021)

- Consolidate a draft of the matex management plan document (structure and responsibilities)
- Plan the work to develop the contents (topics and schedule)

Mining the future challenge

- Establish the participation guidelines (ongoing)
- Confirm that data and description of the molasse useful for participants will be on the Web by March 2021
- Establish the jury
- Put up the registration website
- Develop the marketing materials
- Establish the contracts for the announcements

Practical Information

- **Regular WP status meetings once per month (host state project coordination) on WEDNESDAYs 09h00 (1 hour)**
 - See: <https://twiki.cern.ch/twiki/bin/view/FCC/GeneralMeetingSchedule>
 - Meeting **organization and invitations by Julie Hadre (Julie.Hadre@cern.ch)**
 - Meetings take place **via ZOOM**
- **Meetings serve**
 - Highlighting the current activities in a concise form
 - Raise the need for coordination with other group members or external parties
 - Early warning for potential showstoppers
 - Presentation template will be placed in Twiki (<http://twiki.cern.ch/FCC>)
- **Twiki is the project documentation site (if you need editing permissions, ask)**
 - Familiarise with <http://twiki.cern.ch/FCC>
 - For MATEX: <https://twiki.cern.ch/twiki/bin/view/FCC/ExcavationMaterials>
 - For WP3: <https://twiki.cern.ch/twiki/bin/view/FCC/FCCIS> (see right box on top)
- **All technical documents and data must be publicly deposited on ZENODO (www.zenodo.org)**
 - Please familiarize yourself!
 - Please have a look at the data management plan: <https://twiki.cern.ch/twiki/bin/view/FCC/GeoDataDataManagementPlan>
- **Project-internal document and data storage**
 - Please familiarize yourself with **cernbox.cern.ch**
 - We will have IT support from January 2021 onwards. Until then Johannes Gutleber adds project members to the ACL