FUTURE
CIRCULAR
COLLIDER

GOALS, CONTENTS AND ORGANISATION OF THE INITIAL STATE ANALYSIS

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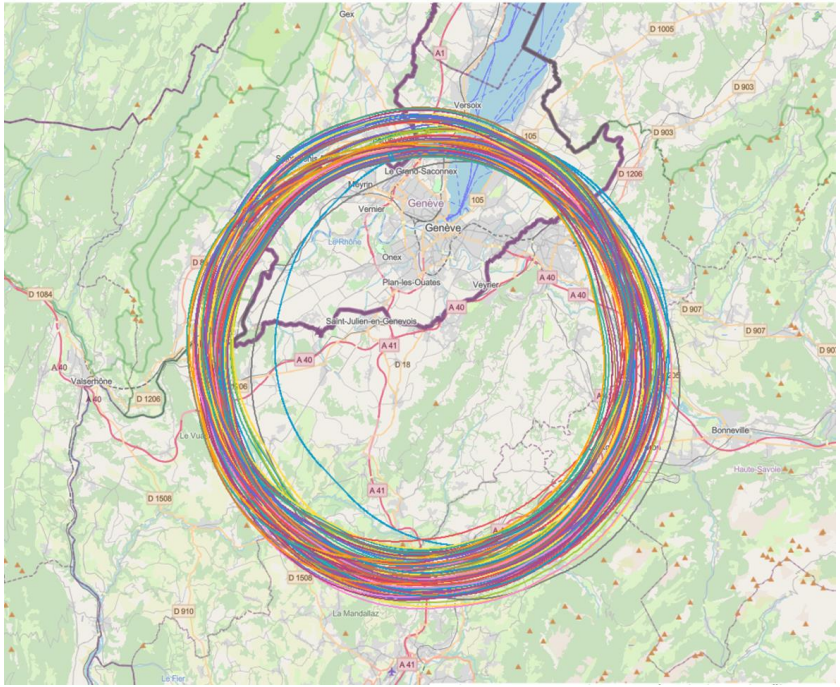

Figure 1: FCC theoretical traces

Introduction

The implementation of a project such as the Future Circular Collider (FCC) is a major challenge not only because of its technical aspects, but also in terms of integration of procedures and processes of the Host States, France and Switzerland.
In this sense, the project must meet the environmental requirements of both countries, especially in terms of the legal basis, construction permit procedures and the other resulting documents.

As the construction and operation of major installations may involve undesirable effects on the environment, it is necessary to integrate the environment into the design work.

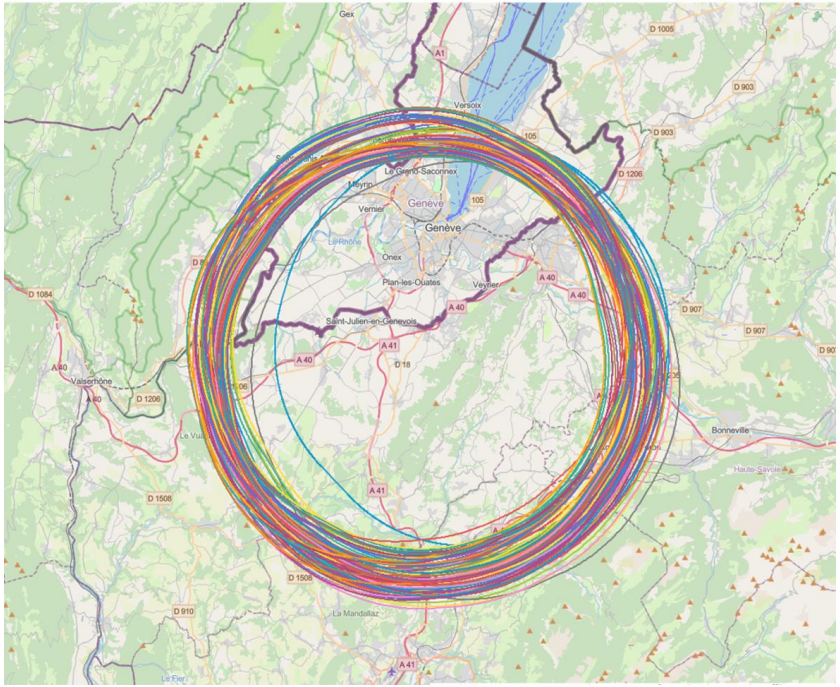

Figure 1: FCC theoretical traces

Introduction

Environmental Evaluation

The environmental evaluation accompanies the project process for these installations that may significantly affect the environment.

Environmental evaluation aims to:
- integrate the environment into the development of a project
- improve the decision by taking into account explicit and selective environmental considerations
- provide a solid basis for the management of the environmental consequences of development actions
- allow citizens to express themselves on foreseeable changes to their living environment
- promote the integration of the fundamental objectives of environmental protection and sustainable development

* FCC Study have not yet performed environmental evaluation – we may do that once the feasibility study has been completed, before the Council decides to advance so that the environmental evaluation process is engaged and established before the opportunity of the project is decided.

Introduction

Environmental Evaluation

In France, this process consists of:
- carrying out an impact study and drawing up an environmental impact report
- carrying out the planned consultations (with the Environmental Authority and Public)
- review by the competent authority authorizing the project

In Switzerland, this process consists of:
- carrying out an impact study and drawing up an environmental impact report
- its examination by the specialised service
- the public consultation and the authorisation

* This process is carried out in France in parallel with the process recommended by the Commission nationale du débat public (CNDP) for public consultation.

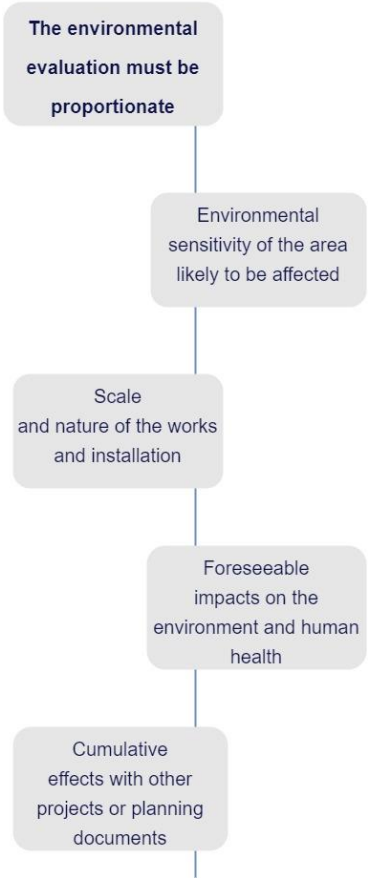

Figure 2: Environmental evaluation - requirements

Introduction

Environmental Impact Study

An impact study is a technical study which aims to assess all kinds of the consequences, in particular environmental, of a development project in order to limit, mitigate or compensate for negative effects.

The content of the impact study includes specific elements required by French and Swiss regulations.

*Environment: population and public health, air, land, soil, water, climate, noise, fauna, flora, biodiversity, cultural heritage, landscape, other aspects related to the project.

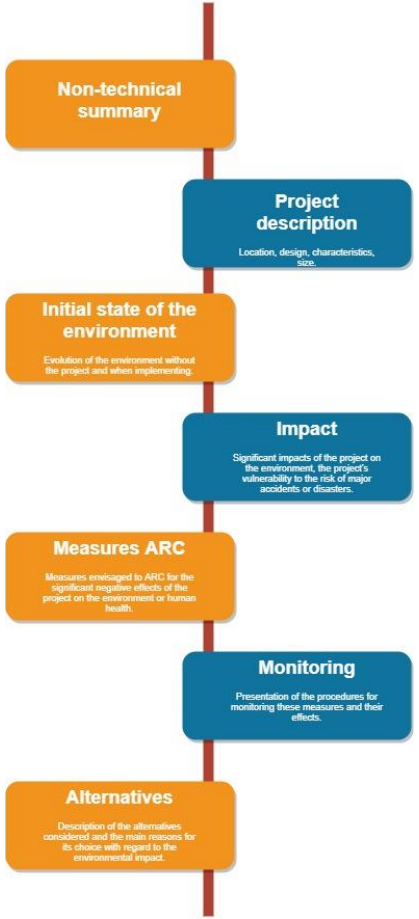

Figure 3: Content of the environmental impact study

Environmental Initial State Analysis

The environmental initial state analysis is an objective study carried out in order to determine the characterization of an area prior the development of a project and to establish the baseline state of the environment.

Baseline data are collected for a few main purposes:

- to provide a description of the status and trends of environmental factors against predicted changes that can be compared and evaluated in terms of importance
- to provide means of detecting actual change by monitoring

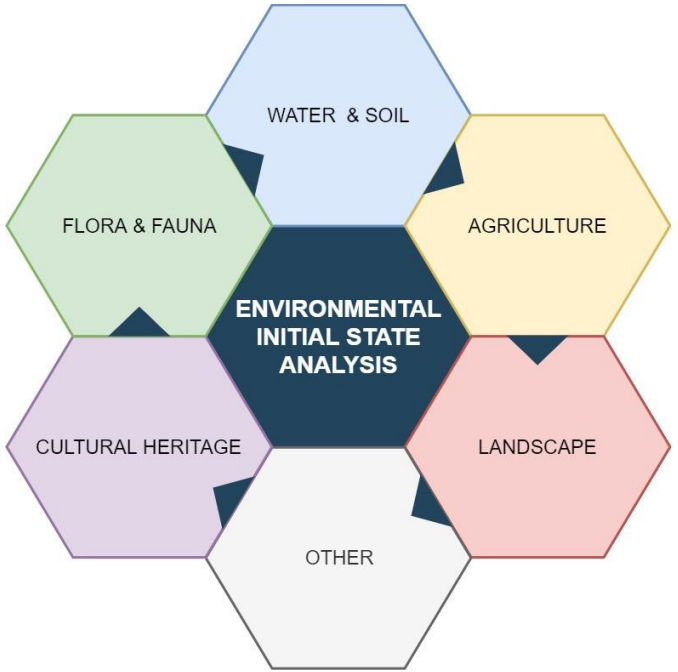

Figure 4: Aspects of the environmental initial state analysis

Environmental Initial State Analysis

Why is it important?

It is essential that the baseline information which is collected represents both the temporal and spatial trends of the parameters concerned.

Why?

- e.g. a particular habitat may be shrinking in size by 10% per year.
- was the loss of habitat natural or due to the development?

Without this trend having been established, the effect of a development in the future would be hard to assess and it would be difficult to determine the reason of the loss of habitat.

Understanding how the baseline environment may change in the absence of the proposed project is therefore important in order to understand what difference the project will make.

Environmental Initial State Analysis

Our goals

Knowing the initial state of the environment helps to understand the current conditions of the area, and improve the way of the project implementation.

Knowing the environmental constraints allows selecting the most appropriate methods of avoiding, reducing or compensating for negative effects and assessing the potential impact of the project on the environment.

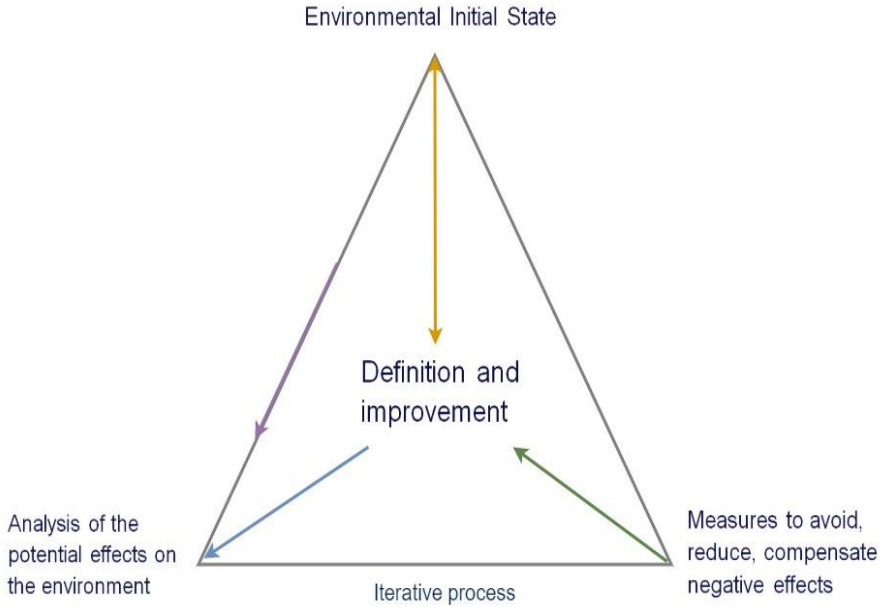

Figure 5: Iterative process of environmental evaluation

Environmental Initial State Analysis

Why is a placement scenario needed?

To carried out the environmental studies a specific placement scenario is required as working hypothesis to:

- determine where the initial state analysis should be carried out
- be able to estimate any constraints onto the technical designs and any effects of the RI onto the environment
- be able to make an environmental evaluation within limited budget, human resources and time

FCC Initial State Analysis

Taxonomy of environmental aspects

For the purpose of the environmental initial state analysis, the FCC project-specific taxonomy of environmental aspects has been established.

It has been developed from legal and regulatory frameworks in France and in Switzerland and it integrates best practices from reference environmental impact assessments in these countries.

Table 2: Natural Environment

Level	Topic ID	Topic	Description	Type of data used for criticality	Methodology
I	**NAT**	**Natural Environment**	**Inventory of components in the natural areas of the project scenario regions**	**Criticality maps summarizing the aspects listed below**	**CR= FLO + FAU + BIO + HAB + FOR + SPZ**
II	NAT_FLO	Flora	Inventory of all plant life present in the studied area	• Occurrence • Rarity • Protection status • Type (e.g. native, alien, invasive, anthropogenic)	CR= Occu + Rari + Prot
II	NAT_FAU	Fauna	Inventory of animal life present in the studied area	• Occurrence • Rarity • Protection status • Type (e.g. native, alien, invasive, anthropogenic)	CR= Occu + Rari + Prot
II	NAT_BIO	Biodiversity	Diversity of animal and plant species, microorganisms, habitats and ecosystems present in the study area	• Species richness • Species evenness • Rare species occurrence	CR= Rich + Even + RarOcc
II	NAT_HAB	Habitat	Inventory of areas with specific environmental conditions characteristic for specific groups of animals and plants	• Type of habitat • Conservation status • Protection level	CR= Type+ Stat + Prot
II	NAT_FOR	Forest	Inventory of areas dominated by trees	• Type (e.g. needleleaf, mixed, sparse, silviculture mixed, silviculture mono) • Occurrence of protected species • Function of the forest • Forest protection type • Forest biodiversity index	CR= Occu + Func + Prot + FBinx
II	NAT_SPZ	Protection zones	Inventory of all officially protected zones as defined by legal authorities in France and in Switzerland	• Protection type • Protection level • Protection perimeter • Number of protection zones in the area	CR= Prot + Peri + Numb

Figure 6: Taxonomy of environmental aspects – natural environment

Taxonomy of environmental aspects

The taxonomy is based on a 3-level scheme:

1. High level domains that are to be taken into account in environmental studies (e.g. project's physical environment, heritage and landscape)
2. More specific aspects that make up one high level domain (e.g. for the physical environment: topography and geology of the area or the presence of groundwater)
3. Data and maps that are needed to create the indicators at the second level (e.g. the isolines indicating the altitude of the topography and the slope steepness values, maps of subsurface water layers)

The same data set can be used in different aspects of Level 2.

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Figure 6: Taxonomy of environmental aspects – natural environment

FCC Initial State Analysis

Taxonomy of environmental aspects

The selection of environmental aspects at the three levels took the layout and placement of the FCC candidate scenarios consisting of subsurface structures (tunnel, caverns, shafts) and surface features (land plots, typical functional and construction elements) and their specific potential positive and negative impacts into account.

Environmental aspects are at taxonomy level not prioritised. However, for the purpose of the project's initial impact analysis, the environmental aspects will be prioritised according to the likelihood and impact severity of typical project specific effects on the environment.

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Figure 6: Taxonomy of environmental aspects – natural environment

Environmental Information System

Our goals

The initial state of the environment for the baseline scenario will be documented using an Environmental Information System (EIS) built on the Geographic Information System (GIS).

EIS is an extended geographic information system that serves as a tool to capture, save, and present spatial, time-related, and content-specific data and at the same time to describe the condition of the environment in terms of impacts and risks.

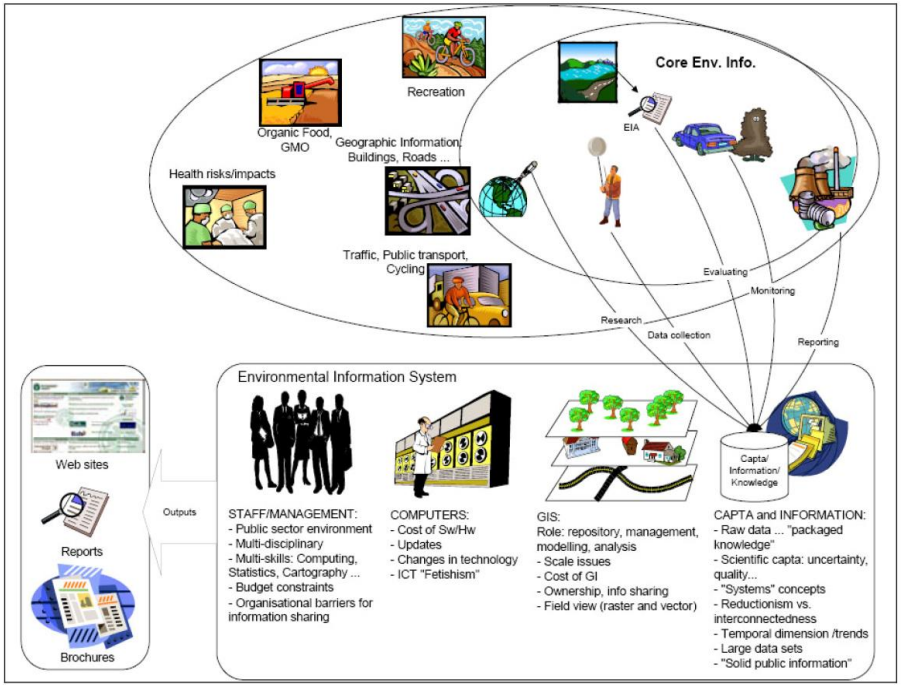

Figure 7: Environmental Information System (Haklay 2001)

Environmental Information System

What does it offer?

The FCC EIS will offer opportunities for search and classification of the data according to what one wishes to find as information.

The following dimensions can be cited as an example:

- The project phase: design, construction phase, operation, closing phase
- The aspects: air protection, water management, noise, landscape, etc.
- Compensation measures
- Location: with a cartographic system that highlights the constraints and territorial assessment
- Keywords: specific and targeted requests for the entire impact study

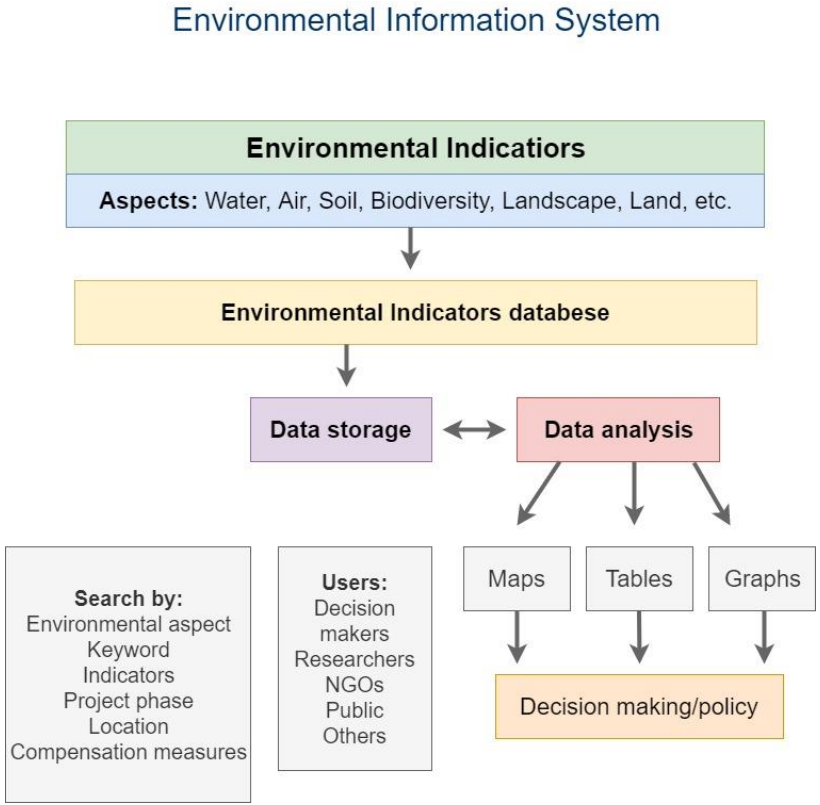

Figure 8: Environmental Information System - Indicators

Environmental Information System

Summary criticality maps

Information from the ISA will be provided in the form of summary criticality maps for each environmental aspect at level 2 and for combined high-level information at level 1 for areas for interest that concern the FCC project scenarios.

The geo-localised summary criticality indicators for each environmental aspect will be derived from quantitative and qualitative analyses. These analyses will rely on existing databases and maps or on field studies or on a combination of both in the FCC scenarios areas of interest.

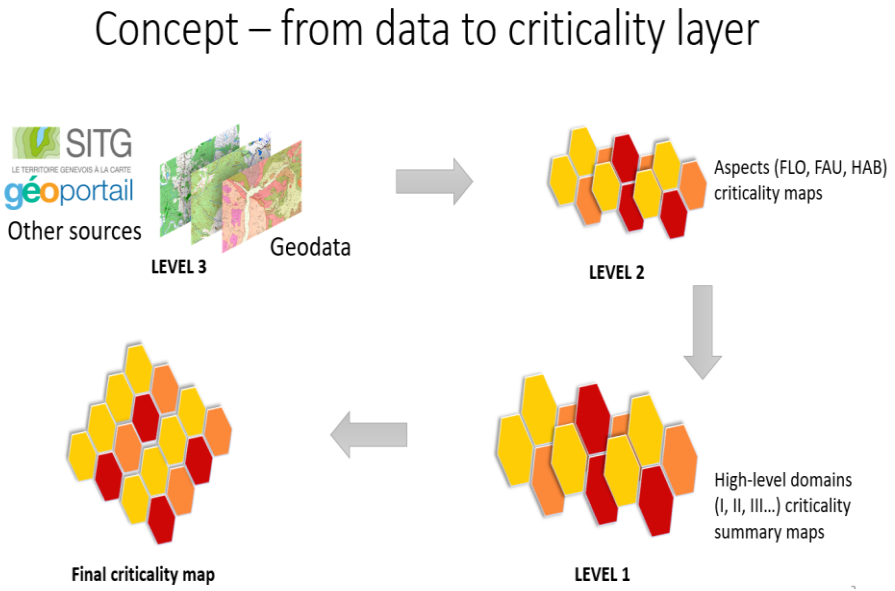

Figure 9: Concept of the criticality maps

Environmental Information System

Environmental Performance Indicators

The criticality indicators (Environmental Performance Indicators) for a particular environmental aspect represent the importance value of that specific aspect at different geographical locations in an area of interest (e.g. biodiversity index at different geographical spots identified by coordinates on a map).

The criticality value that will be calculated based on environmental aspect indicators (e.g. species richness, distribution of species, the type and number of protected species) at a geographical location for a particular environmental aspect will be a real number between 0 and 1.

- value 0 ("null") means the absence of the criticality value at that location
- value 1 ("one") stands for an unacceptable criticality at this location that would require high compensation measures or, where possible, exclude that point for the project scenario.

The criticality at level 1 is a summary of the calculated criticalities at level 2.

Environmental Information System

What does it offer?

Benefits of the EIS and criticality maps solution:

- Communication: data and environmental information are important tools for communicating environment risks
- Empowerment of local communities: access to environmental information provides support for local communities when faced with negative impacts on their surroundings from external actors and helps during communication with stakeholders
- Cost-effectiveness and productivity: access to environmental information improves likelihood of making decisions and drafting policies with cost-efficient outcomes
- Support for decision-makers

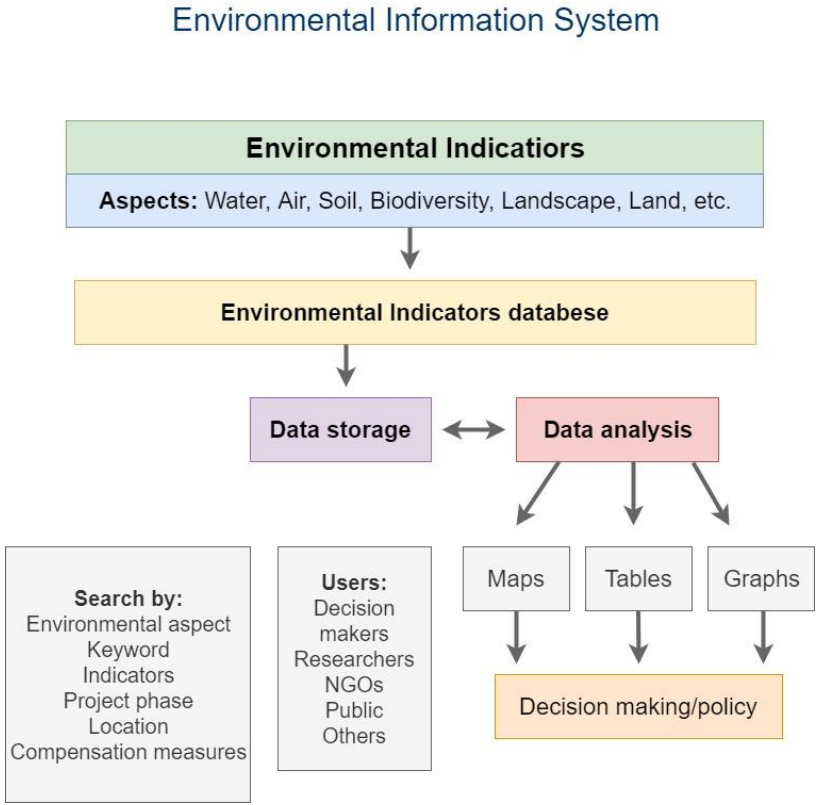

Figure 8: Environmental Information System - Indicators

Plan

Ongoing and next activities

- validation of the list of environmental aspects
- establishment of environmental indicators for aspects
- establishment of mathematical methods for calculating criticality
- creation of the environmental information system – long term task
- carrying out the environmental initial state analyses – long term task

Conclusions

The environmental evaluation accompanies the project process for these installations that may significantly affect the environment.
Environmental evaluation process is a pre-requisite for project authorisation by each of the two host states.

The environmental initial state analysis helps to determine the characterization of an area prior the development and to establish the baseline state of the environment in order to understand what difference to the environmental trend the project will make (task for coming two years).

The environmental impact assessment will be challenging, since not enough technical details are known about the project since the time scale is large (~20 years).

Information from the FCC environmental initial state analyses will be documented using an Environmental Information System (EIS) built on the Geographic Information System (GIS). This solution will ease the search of information by stakeholders, help during communication with stakeholders and respond to decision-makers' needs for information on the evolution of the environment, its impact on people's lives and the natural environment.

Thank you for your attention.