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SOCIO ECONOMIC IMPACT ANALYSIS

Status of baseline assumptions

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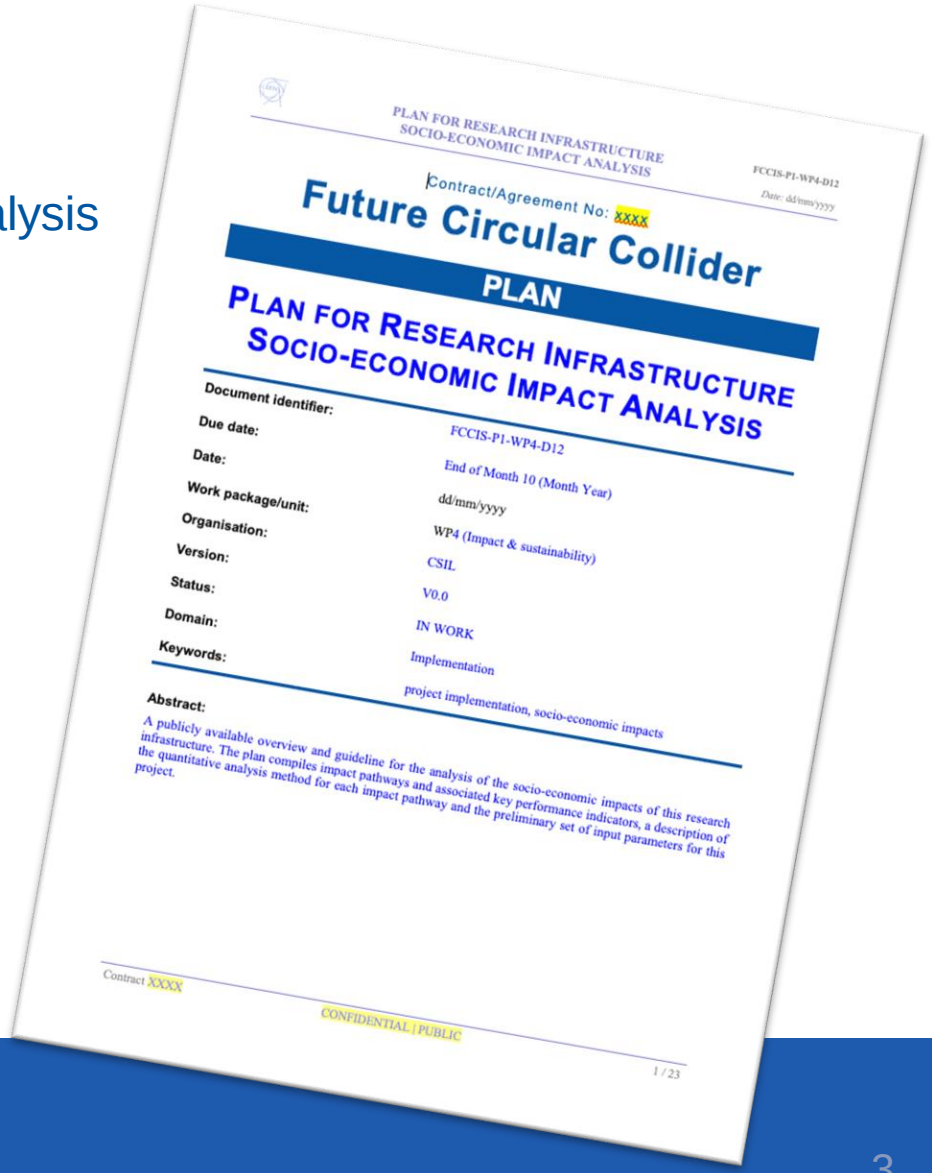
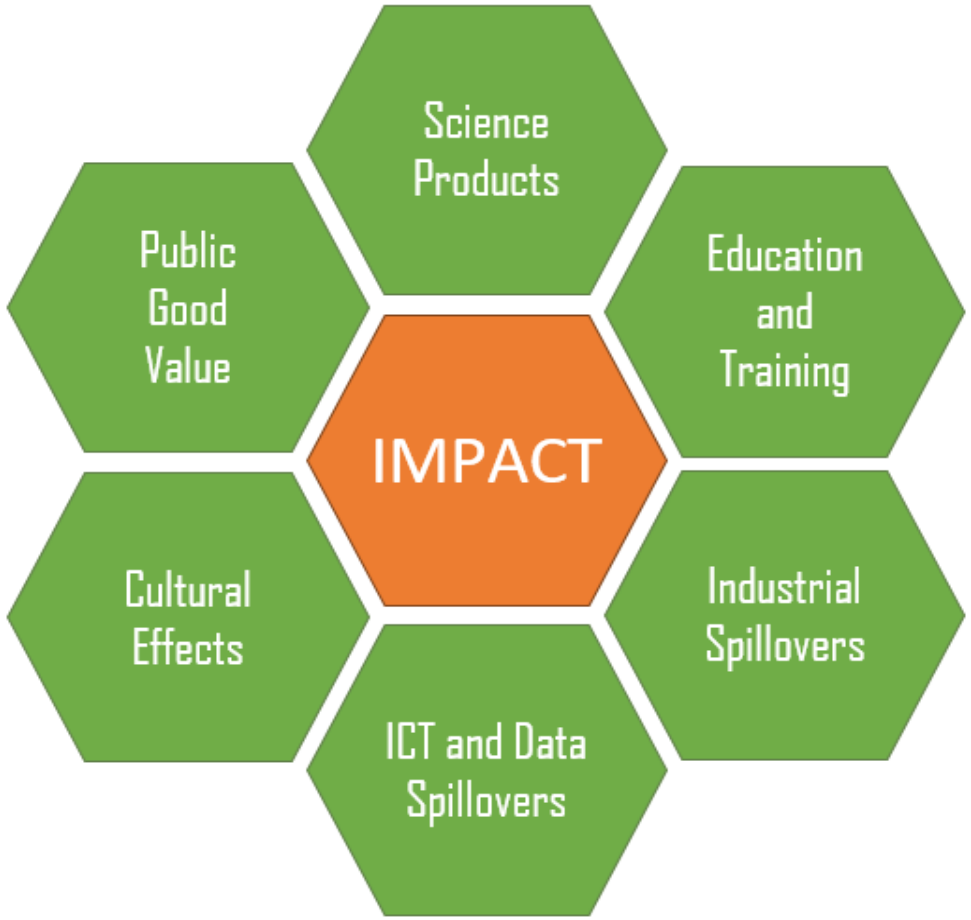
PREPARATORY WORK FOR SOCIO-ECONOMIC IMPACT ANALYSIS

- As preparatory work, the baseline assumptions and impact analysis input paramters need to be compiled.
- The results are captured in deliverable D12.951754.



TOPICS FOR THE SOCIO-ECONOMIC IMPACT ANALYSIS



FUNDAMENTAL ASSUMPTION – TIME RANGE

- Will be based on the project schedule.

First time signficant spending occurs:

Year #	Year	Experiment project	Accelerator project	Infrastructure project	Comment
-	2026		Design 1	Tender 1	
-	2027		Design 2	Tender 2	
1	**2028**	**Design 1**	**Design 3**	**Preparation 1**	First significant capital expenditure
2	2029	Design 2	Design 4	Preparation 2	marks first project year for socio-economic impact analysis
3	2030	Design 3	Design 5	Construction 1	**Start of underground constructi**
4	2031	Design 4	Design 6	Construction 2	
5	2032	Design 5	Construction 1	Construction 3	
6	2033	Design 6	Construction 2	Construction 4	
7	2034	Construction 1	Construction 3	Construction 5	
8	2035	Construction 2	Construction 4	Construction 6	
9	2036	Construction 3	Construction 5	Construction 7	**Civil engineering completed**
10	2037	Construction 4	Construction 6	Construction 8	
11	2038	Construction 5	Construction 7	Construction 9	Technical infrastructure completed
12	2039	Construction 6	Construction 8	Commissioning	Technical infrastructure commissioning
13	2040	Commissioning	Commissioning		Injector and booster commissionin
14	2041	Data taking 1	Op. Z pole 1		**Low luminosity / physics commissioning**
15	2042	Data taking 2	Z pole 2		
16	2043	Data taking 3	Z pole 3		
17	2044	Data taking 4	Z pole 4		RF re-configuration
18	2045	Data taking 5	WW 1		
19	2046	Data taking 6	WW 2		RF re-configuration
20	2047	Data taking 7	HZ 1		
21	2048	Data taking 8	HZ 2		
22	2049	Data taking 9	HZ 3		
23	2050	Upgrade	Upgrade		RF upgrade (800 MHz)
24	2051	Data taking 10	Top 1		
25	2052	Data taking 11	Top 2		
26	2053	Data taking 12	Top 3		
27	2054	Data taking 13	Top 4		
28	2055	Data taking 14	Top 5		Last year of operation
29	2056	Analysis 1	Retirement 1		
30	2057	Analysis 2	Retirement 2		

Until 2 years after the end of the programme:

Only look at the research infrastructure:

- Particle accelerators.
- Experiments.
- Technical infrastructures required to operate the accelerators and experiments.

SCIENCE PRODUCTS

What is existing today as starting point:

Experimental physics publications from the LHC experiments (P0) (1993-2025)	**Publications citing P0 (P1)** (1993-2050)	**Publication citing P1** (1993-2050)
22 900	242 600	862 100

What remains to be done to have the baseline parameters for the study:

- **Extend analysis to technology and engineering publications and scientific products.**
- **Improve the bibliometric model**, to include also pre-prints, conference proceedings,...
- Obtain additional reliable data on the citations (common with Springer Nature).
- Consider the weight of the impact factors (refereed journals, conference precentations, pre-prints).
- **Improve the estimation of the economic value** → Economic value proxied (e.g.) by the production **opportunity cost.**

EDUCATION AND TRAINING

What is existing today as starting point:

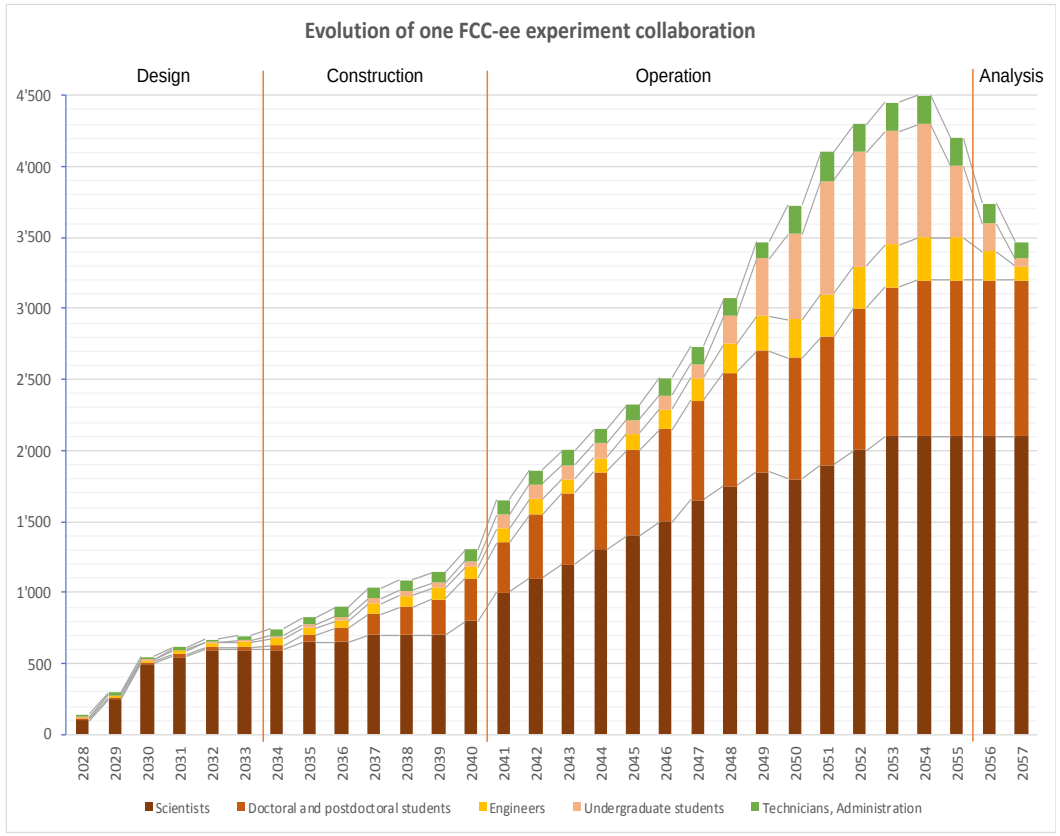
- Statistical inference on survey data demonstrated the **existence of a salary premium** experienced by early-stage researcher that participate in a large-scale experimental physics programme as compared to their peers (i.e. without the training experience at CERN). The salary premium ranges from 5% and 12%.

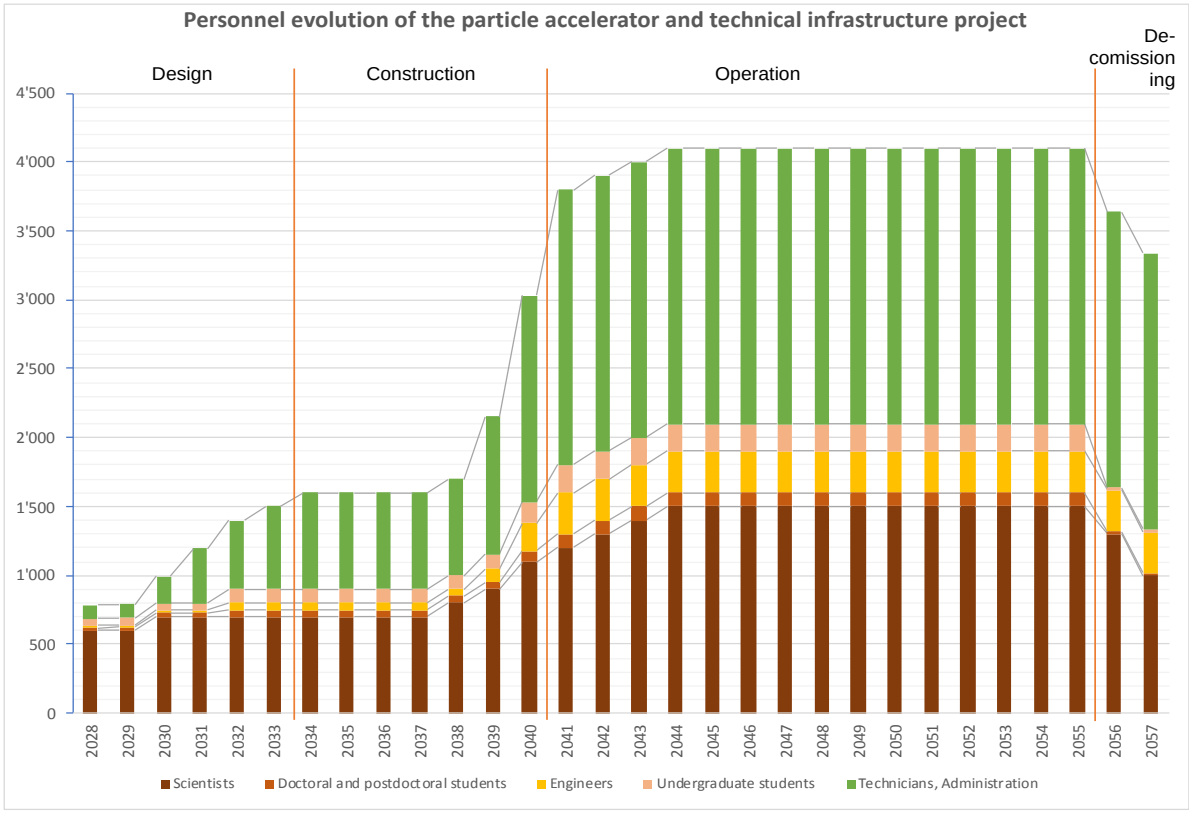
- **Monetary value** → on average **150 000 EUR cumulative salary increase** per student throughout his/her career (hypothesis 30 years career).

What remains to be done to have the baseline parameters for the study:

- **Extend the analysis to the particle accelerator and technology sector.**
- **Extend the analysis to highly qualified professionals** (large amount of engineers and technicians will be required for the FCC construction).
- **Ongoing 3 years survey** based on primary data from a new, targeting current and former doctoral students.
- **Salary premium study** based on desk research and secondary data analysis to reveal salary premium with respect to persons not participating in an experimental physics research programme.
- **Objective → extend and fine tune** the existing assessment of the salary premium.

FUNDAMENTAL ASSUMPTION – PERSON INFLOW FORECAST





INDUSTRIAL SPILLOVERS

What is existing today as starting point:

- Data obtained from the time period between 1995 to 2015 (LHC programme)

COMPANIES	COUNTRIES	CONTRACTS
4 204	47	33 414

- **Increase in the profitability of a company contributing with high technology intensity level works** after having obtained a contract for a large scale research infrastructure project.
    - Past studies since the 1980ies **demonstrate a positive effect for high-tech suppliers.**
    - The estimation relies on the average utility/sales ratio (USR).
    - Past studies estimated an average USR around 3:
        - The company manages to obtain 3 times the contract value through follow-up projects/contracts.

What remains to be done to have the baseline parameters for the study:

- **Review USR** → update with more recent data.
- **Study regional impact potentials for high-tech** → by London School of Economics.

ICT and DATA SPILLOVERS

What is existing today as starting point:

- Analysis for **GEANT4** and **ROOT** existing as starting points.

What remains to be done to have the baseline parameters for the study:

- **Three new cases have been identified:**
  - **ZENODO** (CERN development, EU portal for publications and data in H2020)
  - **INDICO** (CERN development, event and meeting management)
  - **Protonmail** (CERN spinoff, secure e-mail platform and service)

- **Objectives:**
  - Establish **socio-economic impact analysis models** for different, selected ICT elements that can serve as **proxies for typical technologies** that will also be developed during the FCC period.
  - Socio-economic impact analysis for selected ICT elements, depending on the availability **of adequate econometric data and a validated impact assessment model.**
  - Evaluate the **Willingness to Pay** with surveys addressed to users for ICT services.

CULTURAL EFFECTS – CREATION and USE of MEDIA

What is existing today as starting point:

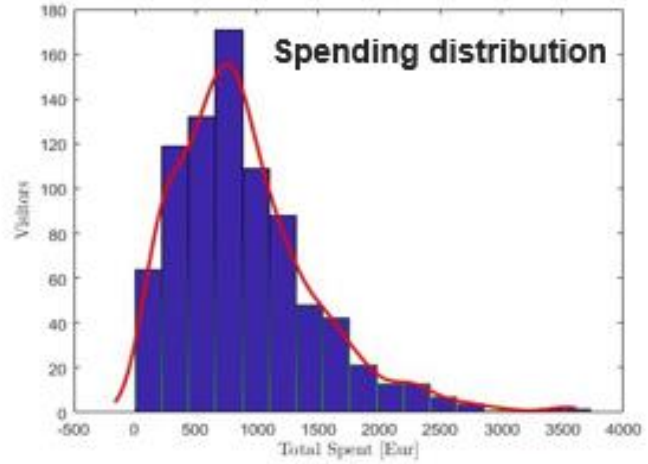
- **Consume time value based analysis for selected channels.**
- **Analysis of the volumen evolution for selected channels.**
  - Youtube.
  - Social media (Facebook, Twitter and Instagram)
  - Permanent exhibitions.
  - LHC experiment web pages.

What remains to be done to have the baseline parameters for the study:

- **Extend to newly upcoming social media channels.**
- **Review and establish the volumen estimates for the coming years based on historic evolution.**
- **Extend the time-based value analysis to the reactions, citations…** (social media is powerful because it amplifies initial information by decentralised distribution).

CULTURAL EFFECTS – ON SITE VISITORS

What is existing today as starting point:



- **Known number of visitors at CERN and LHC experiments.**
- **Spending and time value of these on-site visitors:**
  - Groups
  - Individuals
- Identified the **causal relation between visitors and LHC research programme**.
- Based on a **survey between 2018 and 2019**.

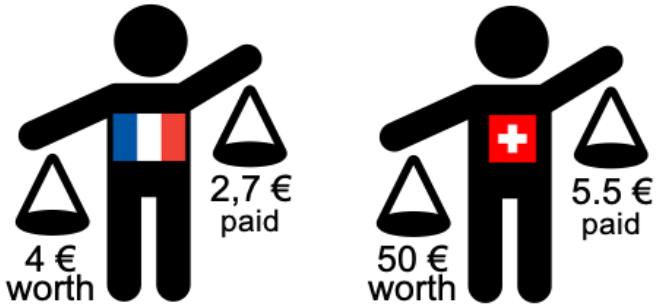
What remains to be done to have the baseline parameters for the study:

- **Establish an estimate of on-site visitors for the FCC programme (person inflow).**
- **Challenge: continuous refinement of on-site visitor spendings due to COVID19 situation.**

PUBLIC GOOD VALUE

What is existing today as starting point:

- **What an FCC is worth for a registered taxpayer per year** with respect to **what the taxpayer contributes per year to CERN** in France and in Switzerland.
- Revealed the **key parameters that determine the public good value**.



What remains to be done to have the baseline parameters for the study:

- **Establish a value model that can be applied for other countries based on the identified public good value key parameters.**

- **Estimate the public good value of a FCC programme in a set of countries for which the model can be reliably validated.**

I appreciate your questions concerning what I have presented to you.

THANK YOU

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