

Table 2c: Detailed scientific, technical, engineering and management product dissemination plan.

WP	Planned products	Planned contents
1,2,3,4,5	Project deliverables as openly-accessible documents on Zenodo.	All public project deliverables will be put on EOSC and will be linked on the project website.
5	Openly-access design report volumes.	Design report and physics programme published in Springer's open-access EPJ C (impact factor 4.843 in 2018) and ST (impact factor 1.6 in 2018) journals with an expected 5 000 reads within one year.
4	Public strategy document for implementation, financing and in-kind contributions.	A plan that describes how to build up the capacities to start a decision process to construct a new particle-collider based RI as the pre-condition to negotiate the international commitments.
5	Publicly available open collaboration agreement framework.	The organisational structures, processes and resources to be put in place to initiate international collaborations for developing technical proposals so that eventually a user community of more than 10 000 can exploit the collider from the beginning.
1,4	Publicly available excavation materials management plan.	Innovative excavated materials management plan handed over to host state authorities and made openly accessible at international level as an example of responsible resource management in large-scale public projects.
4	Public reports, conference and workshop contributions on socio-economic impact analysis. Examples of peer-reviewed journals include Industrial and Corporate Change, Journal of Economic Policy Reform, Elsevier Research Policy, Elgar Teaching Benefit-Cost Analysis, Technological Forecasting and Social Change, Elsevier Resources Conservation and Recycling.	Documentation of the RI impact analysis model . Documentation of the socio-economic impact analysis results, showing the benefit potentials and impact pathways published as a technical report and an openly-accessible journal article. The analysis will indicate how society, governments and companies can directly profit from the new RI. This includes the effects of science diplomacy strengthening European cohesion and creating stability within the ERA and among participating organisations worldwide. Reports in the potentials for intellectual property creation in RIs, on preliminary analysis of industrial spillovers, training and education, the value of open data and software, the estimated value of public good and cultural goods.
2	EPJ C, ST, T, Plus and JHEP, Acta Phys. Polon., APS PRAB, Elsevier NIM, Construction and building materials, ICFA beam dynamics newsletter, Phys. Rev. Lett. Contributions to international JACoW ⁹⁷ conferences like IBIC, ICALEPCS, IEEE NAPAC, IPAC, JINST, SRF, IOP Conference Series, FCC Week and FCC physics workshop proceedings.	Scientific peer-reviewed articles on results that emerge from the progress in this project concerning the accelerator design, accelerator technology and particle detector related advancements, theoretical and experimental physics studies. Topics include collider performance optimisation, beam optics and lattice studies, emittance tuning, impedance mitigation, single-beam collective effects, top-up injection scheme, interaction region design, machine-detector interface design, background control, polarisation and energy calibration, luminosity measurement, beam diagnostics, vacuum system design, electrical networks and powering, practical verification of beam optics design and optimisation.
1,2,3,4,5	Openly accessible master and doctoral theses.	Each WP will engage master and doctoral level early stage researchers in the work programme. Completed theses will be made openly accessible through international library systems in which the universities participate and on Zenodo.
1,2,5	Submissions to Springer-Nature, Scientific American, Forbes, Economist, CERN Courier, Science & Vie.	General project-explaining articles covering a variety of scientific, technical, engineering and economics related topics reporting intermediate results emerging from the project. All consortium members are committed to write articles for these media, but

⁹⁷ The Joint Accelerator Conferences (JACoW) produce open access proceedings since more than 20 years, www.jacow.org

		acceptance of articles is subject to the editorial policies and reviews of the individual media channels.
1,2,5	Input documents to the European Particle Physics Strategy Update process (EPPSU), input to the ESFRI roadmap process, information documents for EI-ROForum, GSO, GSF and a RI scenario description for the EC DG R&I.	Targeted executive briefing documents on the physics research programme and the collider research infrastructure project with scenarios, impact assessments, physics research opportunities and funding concepts. EPPSU will use this input during the strategy development process to be able to take a decision about construction of a new RI. Through the MoU signed in 2009 between CERN and the EC, the EPPSU is recognised as the policy making body for joint activities in this research domain.
3	Open data sets on Zenodo.	Geological data for the “Mining the Future Future ^{CC-BY-ND} ” challenge, measurement data associated with verification of collider performance enabling concepts.
3	World Tunnel Congress, Int. conf. underground construction, Int. congress on rock mechanics, Eurock, Rock mechanics and engineering, FZ. F. Ingenieurgeologie, BHM, AFTES congress, Swisstunnel congress.	Engineering articles and peer-reviewed contributions as presentations about materials re-use, resource and cost-efficient tunnelling advances and subsurface engineering project management approaches for large-scale, publicly funded projects.
3	Data sets and maps on CERN’s publicly accessible geographical information system, on French and Swiss open data platforms.	Documented evolution of the project layout and placement with territorial and socio-urbanistic constraints will be made openly accessible as a collaborative effort between CERN and partners EdG (Switzerland) and DRRT (France).
3	Public report made available on Zenodo and cross-linked at CERN, CETU, CSIL and MUL.	Innovation potentials in the area of re-use of excavation materials.
3	Public report made available on Zenodo and cross-linked at CERN, CETU, CSIL and MUL.	Project performance and cost benefit potentials resulting from innovative tunneling technologies.
3	Input for EdG (Gesdec), CETU, Cerema updates of information documents on managing excavation materials.	Information based on the results of this project that Cerema, CETU and EdG (Gesdec) as well as other notified bodies in EU member states can incorporate in the updates of guidelines and information documents on managing excavation materials .
3	Booklets by Cerema, CERN and LD developed with the cooperation of partners EdG and DRRT concerning the administrative processes for a future RI project.	Briefing information for funding agency executive management and government agencies concerning the administrative processes required in France and Switzerland for the preparation of the construction of a new research infrastructure in a transnational context (in French with translations to further official EU languages to be defined).
3	Technical report on requirements for environmental impact assessment accessible on Zenodo.	Publicly available requirements specification concerning the environmental impact assessment of a new transnational research infrastructure, considering the specifics of France (EU), Switzerland and the Espoo ⁹⁸ convention.
3,4	Briefing booklet on regional development opportunities by Cerema, CNRS, CERN and LD developed with the cooperation of CSIL, EdG and DRRT.	Information for funding agency management and government agencies, for potential partners from industry and academia concerning regional and territorial development opportunities with investment and benefit estimates and recommendations for funding instruments for preparing project development plans.

⁹⁸ UNECE, “Guidance on the Practical Application of the Espoo Convention”, ECE/MP.EIA/8, 2006, <http://www.unece.org/fileadmin/DAM/env/documents/2006/eia/ece.mp.eia.8.pdf>

4	Concise socio-economic impact analysis of the envisaged research infrastructure.	Concise summary of the socio-economic impact analysis results with the impact and sustainability maximising recommendations targeting non-economics audiences in addition to the technical analysis published as an openly-accessible report on Zenodo, cross-linked on consortium organisation websites.
5	Openly-accessible, reviewed FCC Week and physics workshop scientific proceedings.	Proceedings published by SN for 3 FCC Week conferences and 3 FCC physics workshops that are accessible free-of-charge. The production will be supported by using a collaborative authoring tool (e.g. with partner Overleaf) and a manuscript submission and review system (e.g. OCS). The process of producing high-quality, peer reviewed contents will be facilitated by involving professional editorial consultancy services.

2.2.2 Strategy and plan for the exploitation of the results

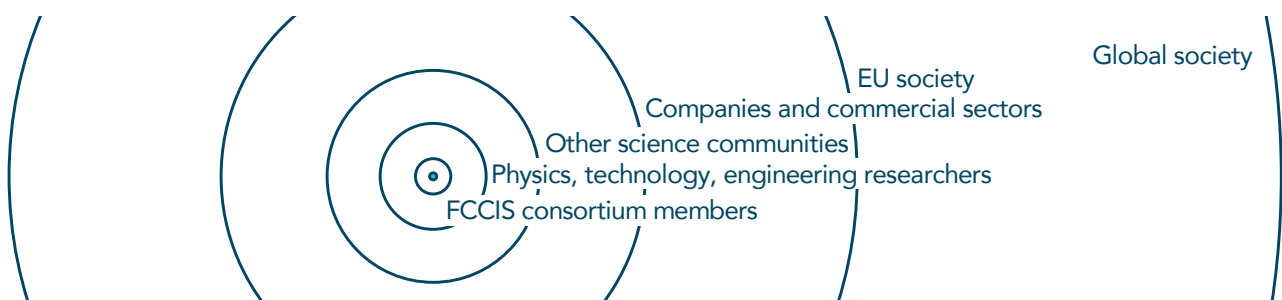


Figure 17: Exploitation of project results following the impact wave model.

The strategy and plan for the exploitation of the results follows a “wave-like” impact model (see Figure 17) to **turn results into tangible impacts for various target groups in a structured way**. Starting with the innermost circle, this project makes the **consortium members** the key knowledge providers for a new research infrastructure. This puts them into a privileged position as **lead organisations for the construction preparation phase**.

The **particle accelerator physics and technology community**, the **experimental physics community and numerous technology and engineering domains** that are needed for the design, implementation and operation of such an RI will use the results of this study as direct input for the technical requirements and designs for the individual systems and subsystems that make up the RI. Through the capacity building and exploitation-oriented dissemination actions outlined earlier, this project will start engaging science and technology partners to develop the enabling technologies for the particle accelerator, the experiment detectors and the technical infrastructures.

Other science communities such as economics and political sciences can use the results as an example for socio-economic impact planning of RIs with long-term sustainability and regional benefit creation in mind.

Several projects face the challenge of **translating research results into value for society and economy**. This project cuts the Gordian knot by aiming at creating innovation along the entire value chain using the “Open Innovation Funnel” and applying Technological Competence Leveraging at intermediary steps (Section 3.2.3).

As one example, companies will be able to profit from the results of the placement and excavation materials management study. These are topics unrelated to the physics and accelerator research, but which are necessary pre-condition for the implementation: “Mining the Future Future^{CC-BY-ND}” will identify if the excavated “molasse soil” can be used in a circular economy as a primary resource and which commercial pathways exist. The need to classify and separate six to seven molasse types and to treat them on-line during the tunneling process will permit leading subsurface engineering companies to develop and market entirely novel, integrated drilling and processing plants underground with significant cost saving potentials for conventional transportation infrastructures.

As another example, CERN, an international organisation, cooperates with the two host states in the areas of transnational environmental impact assessment and resource optimisation for a technical infrastructure project with high potential to catalyse evolutions of national regulatory frameworks and best-practices that can become guidelines. Potential evolutions concern water use, electricity, land, telecommunication, transport and logistics, noise nuisance control, energy-cost-aesthetics optimised architecture, landscaping for nature-inventory protection and ecologic construction, sustainable local economic development and vertical social integration. The