

CENTRE FOR INDUSTRIAL STUDIES



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Thinking how to define and measure impacts of RIs

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STAY TUNED TO THE
FUTURE.

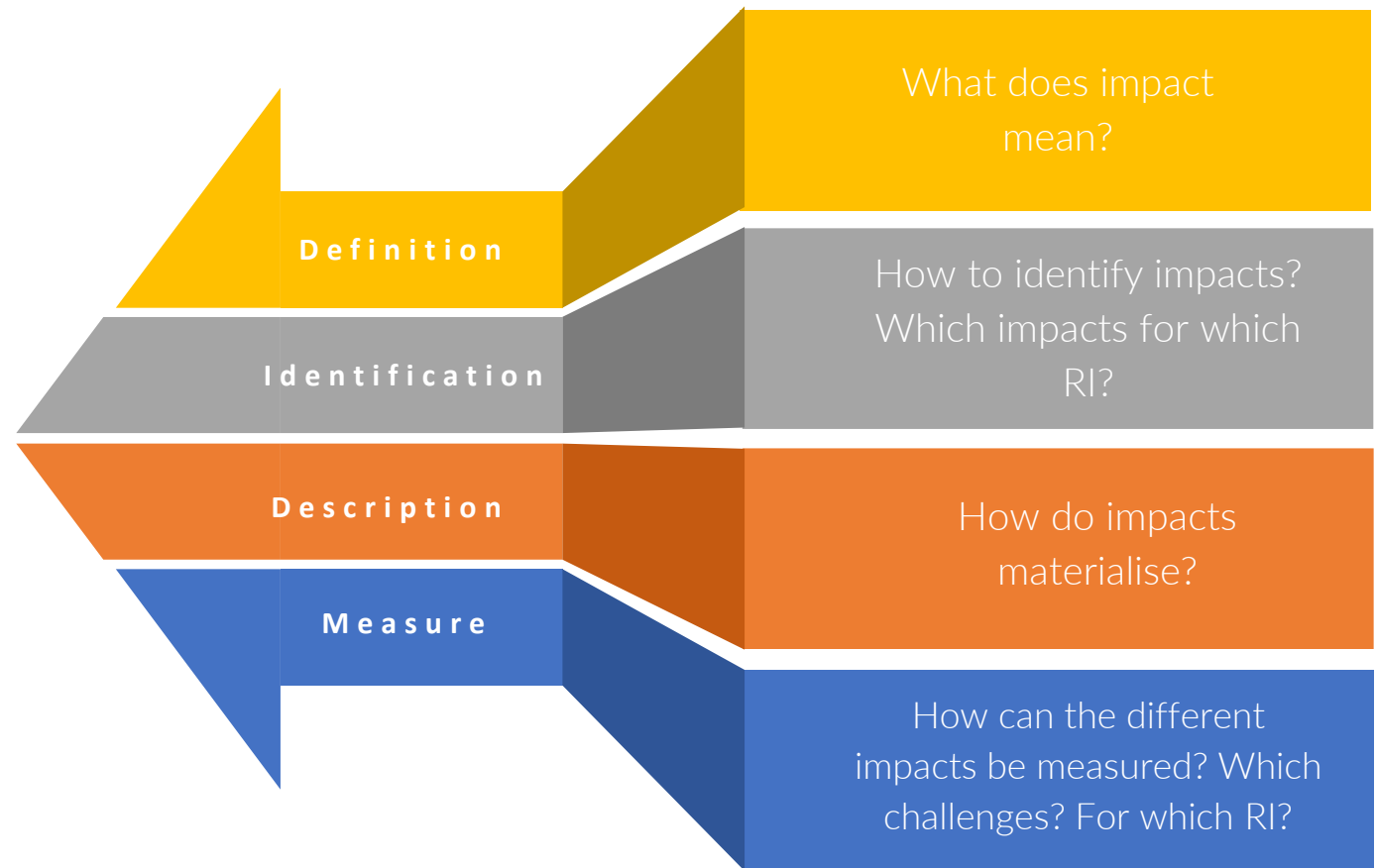
IMPACT OF RESEARCH
INFRASTRUCTURES 2.0

16 SEPTEMBER 2021

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STRATEGIC WORKING
GROUP

Introduction

- Research infrastructures (RIs) generates impacts [beyond the science](#).
- They enable the access to new knowledge which may find applications in different sectors and affect several domains ([economy, society and politics](#)).
- [Measuring RIs impacts](#) - not only for research but for the society at large - is increasingly demanded.



What does impact mean?

A **comprehensive** definition of impact is needed

‘Impact refers to an **intended** or **unintended** effect generated by RIs’ activities and outputs over its lifecycle’

[OECD, 2019]

Impact is any long-term effect, whether intended, unintended, **positive**, **negative**, direct or indirect produced by the intervention. In other words, it is the ultimate changes produced in the society by means of a given action or investment decision.

Horizon 2020 RIPaths project, <https://ri-paths.eu/>

How to identify impacts of different RIs?

Each RI

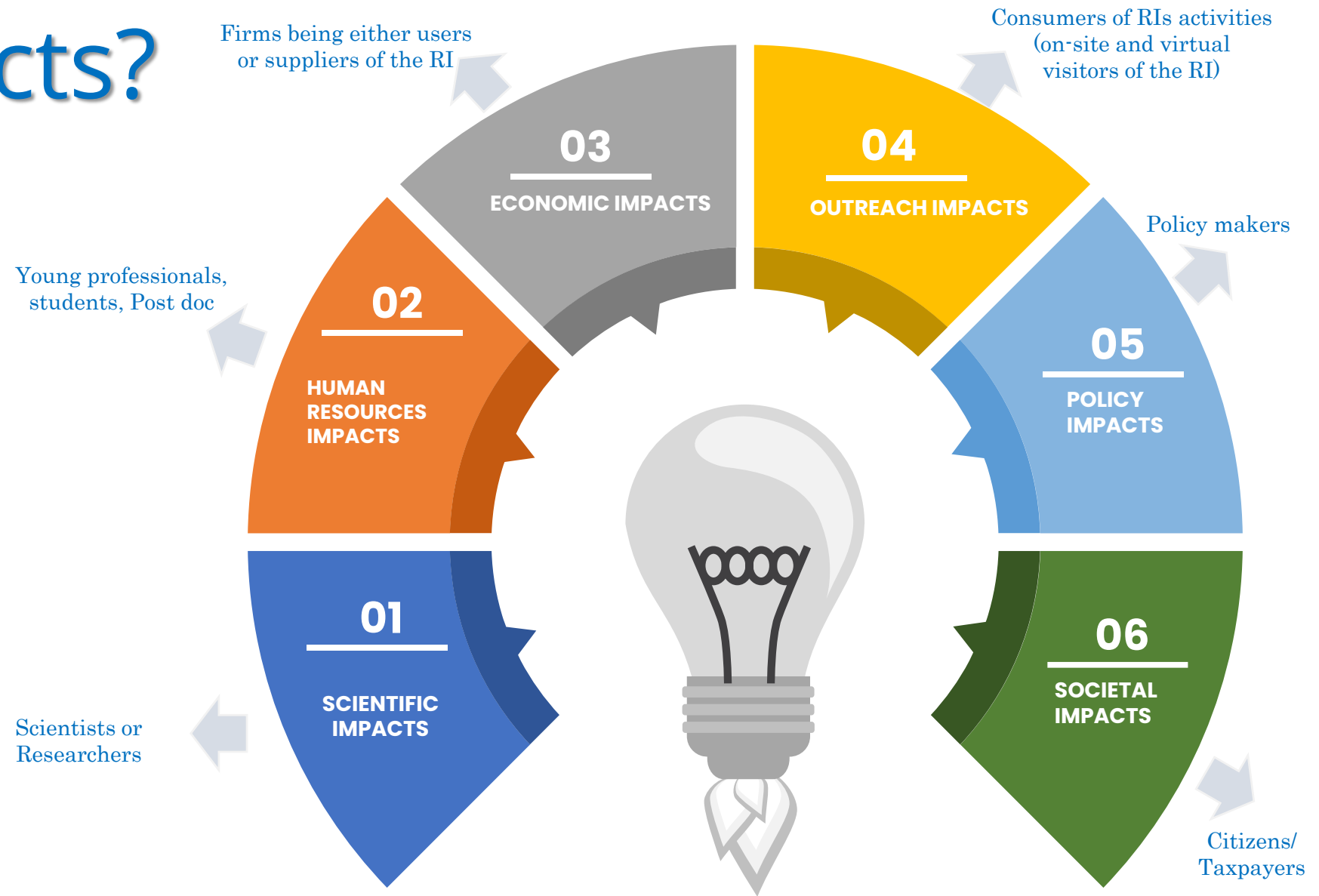
- ❑ has its own **mission** and **objectives**
- ❑ performs specific **activities** in relation to a specific discipline
- ❑ entails interactions with different type of **stakeholders**.



[Elaboration on the basis of different sources : Florio et al 2016, Florio 2019, ESFRI 2019, Griniecc et al 2020]

Which impacts?

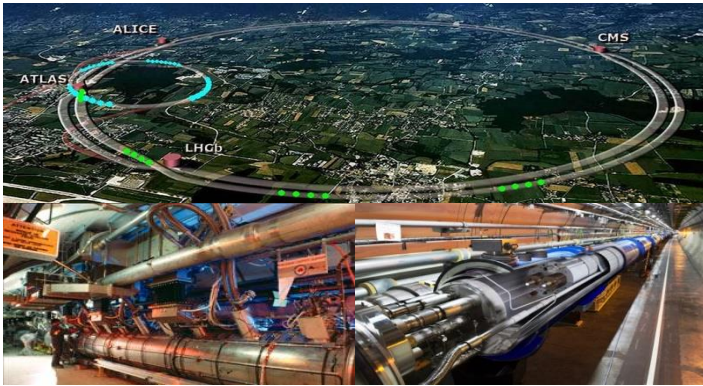
Six impact areas are likely to be affected by a RI in the pursuing of its missions.



[Elaboration on the basis of different sources: Florio et al 2016, Florio 2019, ESFRI 2019, Grinieca et al 2020]

Which impacts? For which RI?

EVIDENCE FROM SOCIO-ECONOMIC IMPACT ASSESSMENTS



The Large Hadron Collider

A physical single-sited RI operating in the field of physics

[Florio, Forte and Sirtori 2016]



CNAO - The National Hadrontherapy Center for Cancer Treatment

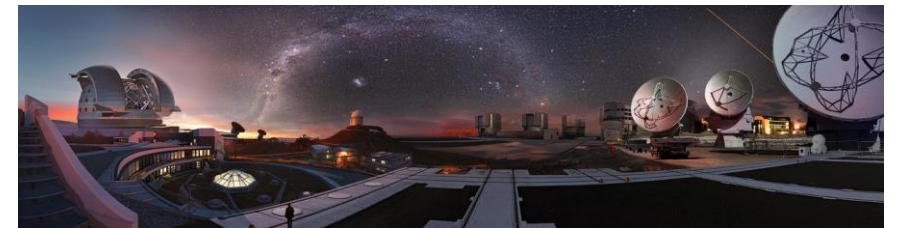
A physical single-sited research RI specialised in hadrontherapy

[Battistoni et al 2016]



A virtual distributed RI operating in the field of heritage science

[CSIL 2019]

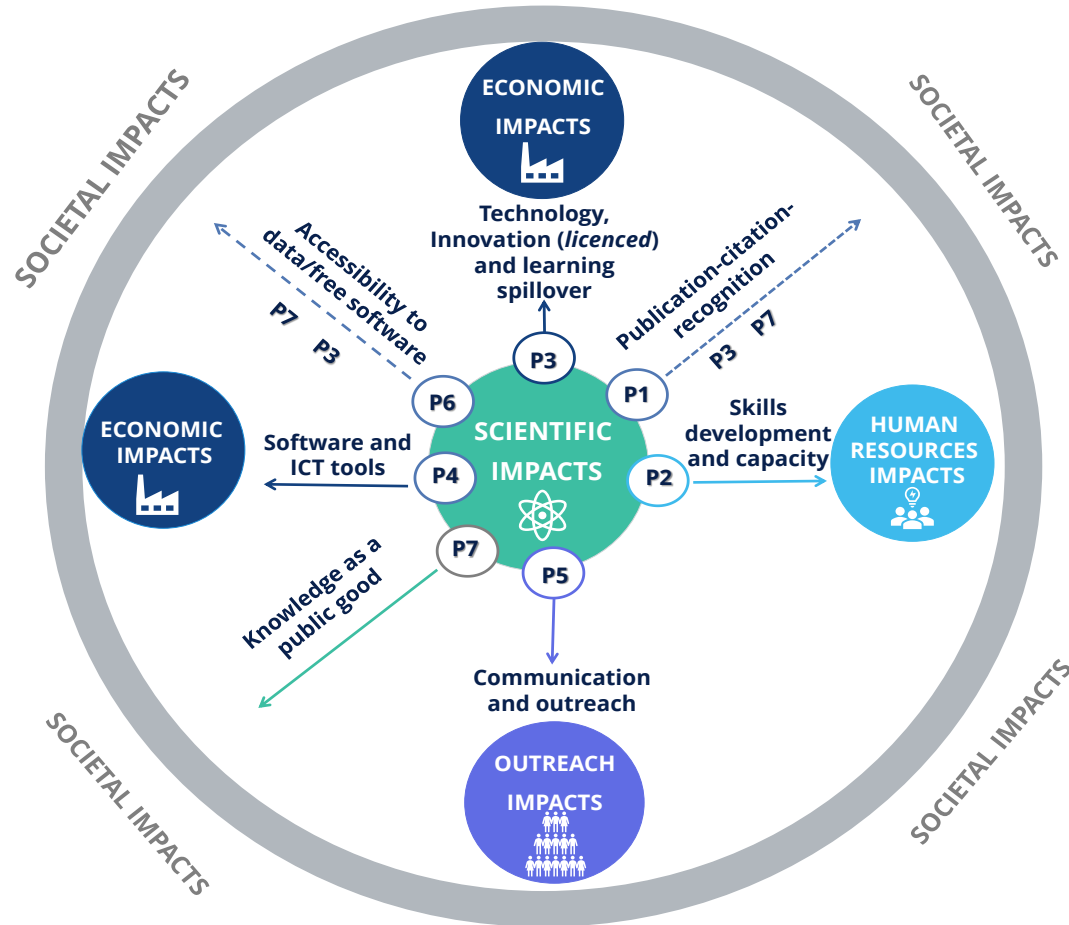


European Southern Observatory

A physical distributed RI operating in the field of astronomy

[ESO, 2021]

How do impacts materialise?



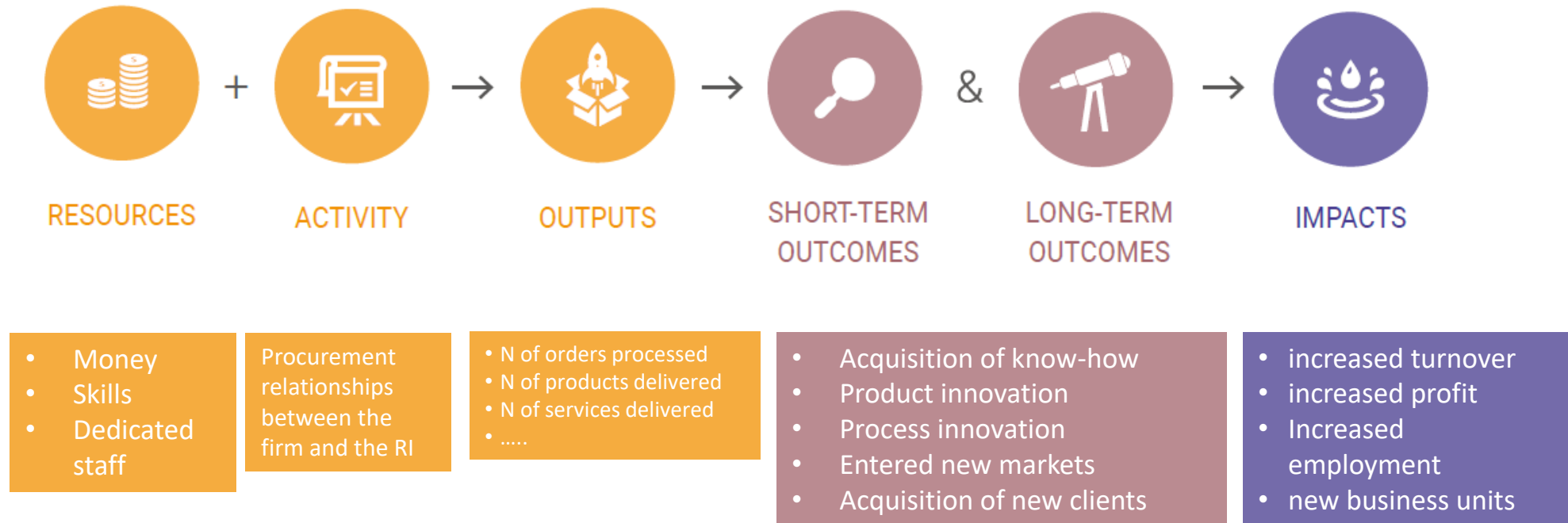
- The spreading of effects to its related stakeholders can be described by means of **impact pathways**.
- Each pathway represents the **chain of events** according to which RI's research-related activities might generate effects on its stakeholders' ecosystem.
- Impact pathways are **usually non-linear and often very complex**. They can be interconnected, thus meaning that one pathway may allow to the generation of different one

Source: Elaboration on the basis of Future Circular Collider Innovation Study (forthcoming)

Legend: P1 - Publication-citation-recognition, P2 - Skills development and capacity, P3 - Technology, innovation and learning spillover, P4 - Software and ICT tools development, P5 - Communication and outreach, P6 - Accessibility to curated and edited data P7 - Knowledge as a public good

How do impacts materialise?

Focus on public procurement of RIs: logic of the impact pathway

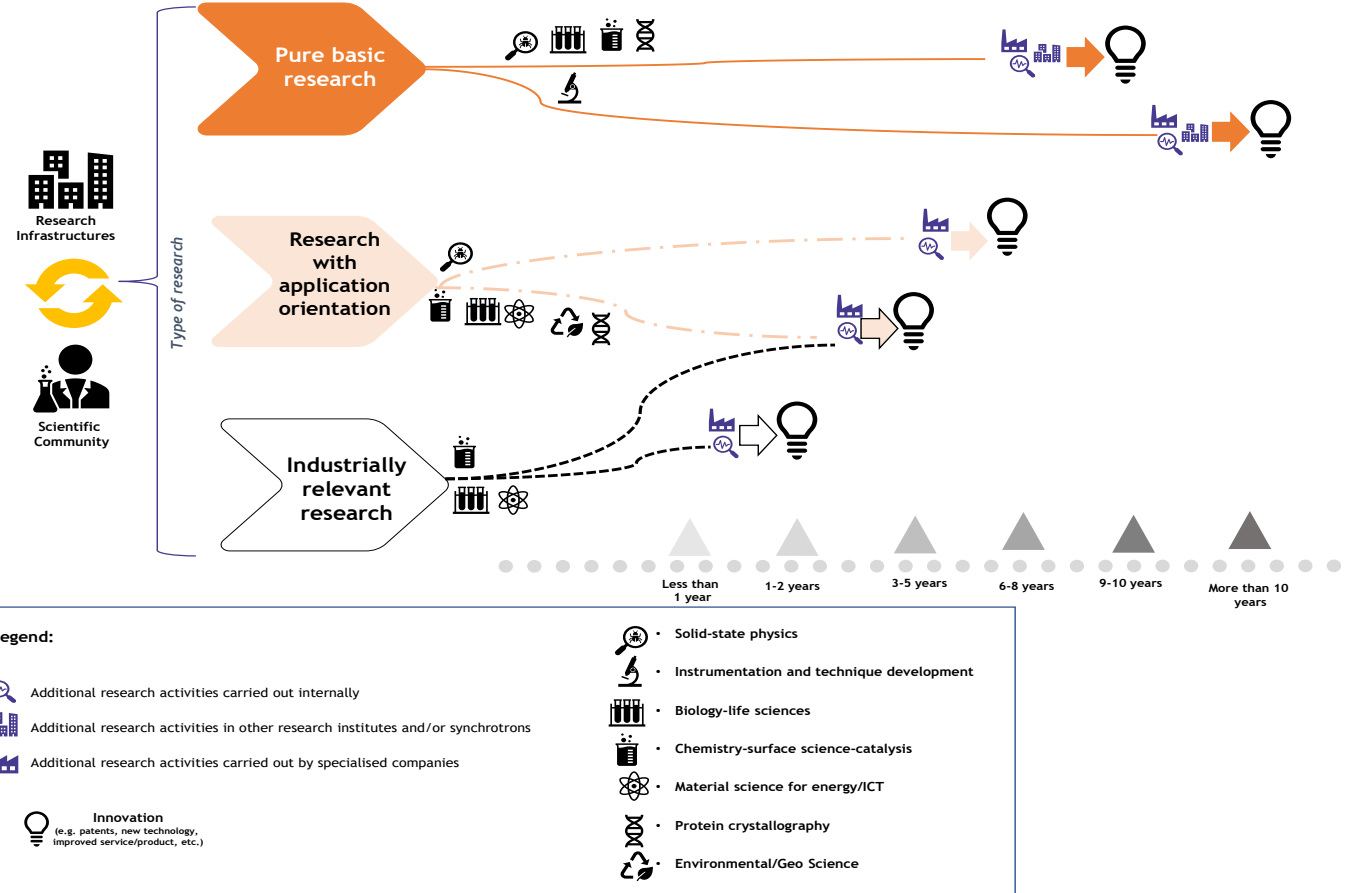
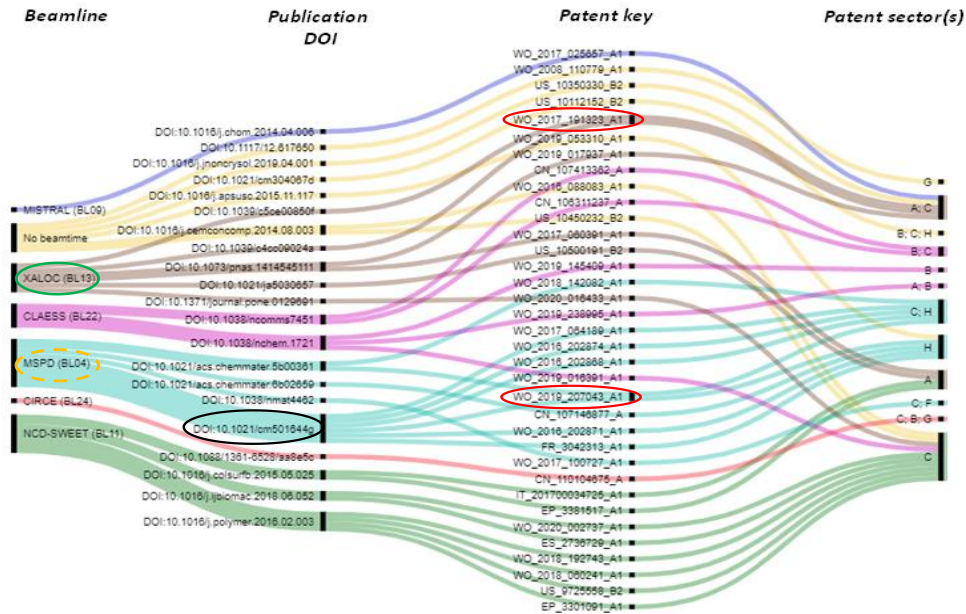


**The graph on the top is from the RI-PATHS Guidebook for Socio-economic Impact Assessment of Research Infrastructures. Deliverable D5.4 <https://ri-paths.eu/deliverable/>*

How do impacts materialise?

THE PATHWAYS FROM EXPERIMENTS
TO INNOVATION IMPACTS:

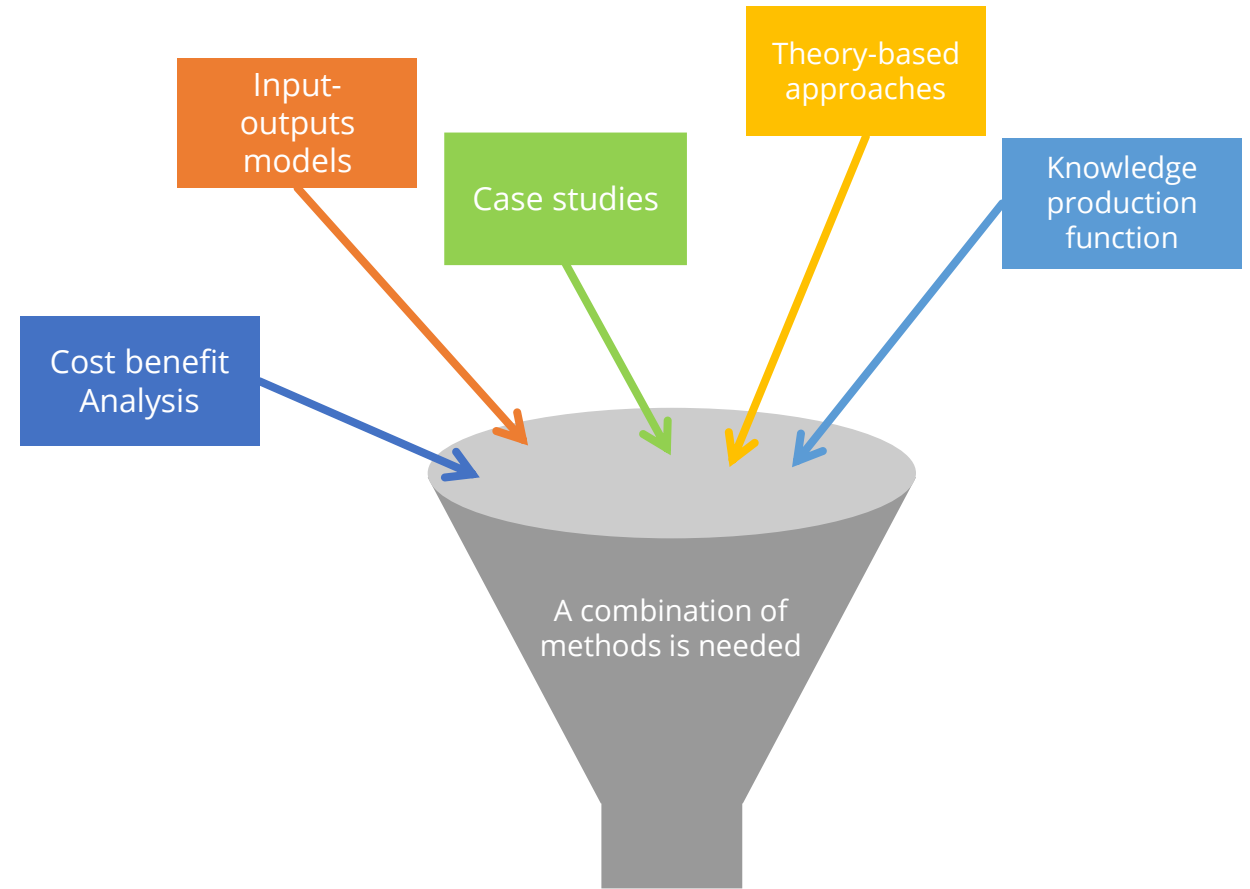
EVIDENCE FROM ALBA SYNCHROTRON LIGHT FACILITY



Innovation pathways arising from the use of beamlines by the scientific community

How can the different impacts be measured?

- A variety of methods are used in socio-economic impact assessment of RIs depending on the *scope of the analysis*, the *type of impacts* that are assessed and the *target users*.
- The methods range from *quantitative approaches*, such as macroeconomic modelling or cost-benefit analysis, to more *qualitative approaches* like narratives and case studies.
- None of existing methods, in their formulation, provides a comprehensive and satisfactory measurement of RI's impacts.



[Giffoni, F. and Vignetti, S., 2019, Griniece et al 2020]

Which challenges? for which RIs and for which impacts?

❑ Data availability or relevance of available data

Data collection from RIs is often bound to scientific and technological impacts (e.g. number of publication, citations, number of procurement contracts, etc.) while it should be strongly tailored to all the impacts generated by the RI.

❑ Mobilise dedicated, costly methods, such as interviews, surveys, case studies

E.g. for assessing innovation impacts.

❑ The time frame according to which the different impacts materialise

Some impacts (e.g. technological impacts in physical RIs) can materialise even before the construction of the RI while some others (e.g. education impacts), take some years of operations to start being observable. A proper assessment of RI's impacts should rely on a long-term perspective, looking at the entire lifecycle of the facility.

How to define and measure RI's impacts?

Keeping in mind

The **peculiarity** of a research infrastructure and its surrounding ecosystem should be taken into account when measuring impacts.

1

A **users' approach** can be used to the identification of the specific impacts associated to a research infrastructure.

2

For each group of direct or indirect user, a corresponding **impact area** can be identified. In turn, for each impact area, a **pathway** can be traced to describe the way according to which the research infrastructure generates impacts

3

The methods should be tailored the *scope of the analysis, the type of impacts* that is assessed and the *target users*. A **smart and rigorous combination of methods** could be actually needed to provide a comprehensive assessment of all the potential RI's impacts and explain the way they may materialise

4

The overall exercise should be guided by a **comprehensive definition of impact**, which entails both negative and positive changes in the society.

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Any questions?

THANK YOU

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