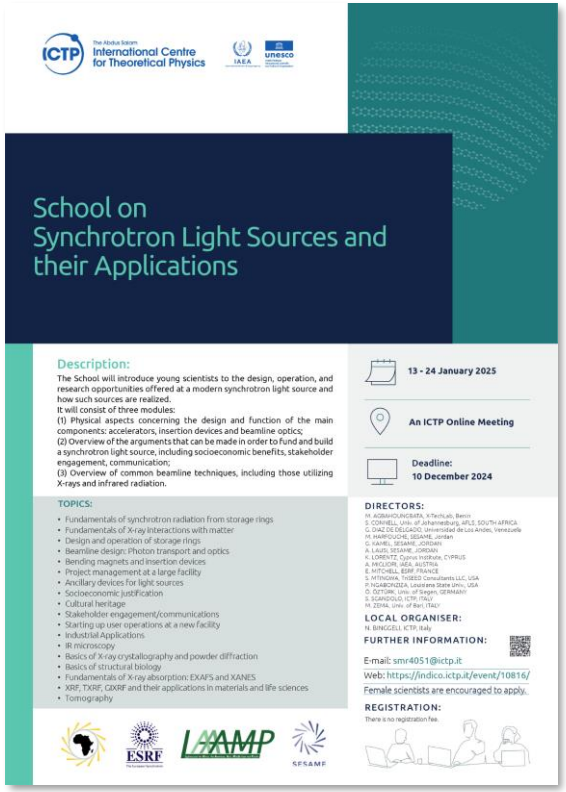
Impacts – why, what and how

An overview of the socioeconomics at large-scale Research Infrastructures



Frank Lehner, DESY

Talk at School on Synchrotron Light Sources and their Applications, 13 – 24 January 2025
ICTP

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

ICTP The Abdus Salam International Centre for Theoretical Physics

DESY.

About me

Profile

- (Particle) Physicist by training at DESY, FNAL and CERN

  > 20 years experience in research management and in political communication / advocacy

- Work at research center DESY in Germany
  - National lab in Germany, ~2800 employees
  - Design, build and operate large-scale research infrastructures in particle / astroparticle physics, photon science, lasers/plasma and data science
- Future project: PETRA IV – the ultimate 4D x-ray microscope
  - impact study finished
  - successful campaigning phase, political advocacy
- engaged also at SESAME since 2011
  - OPEN SESAME, BEATS, HESEB, SUNSTONE

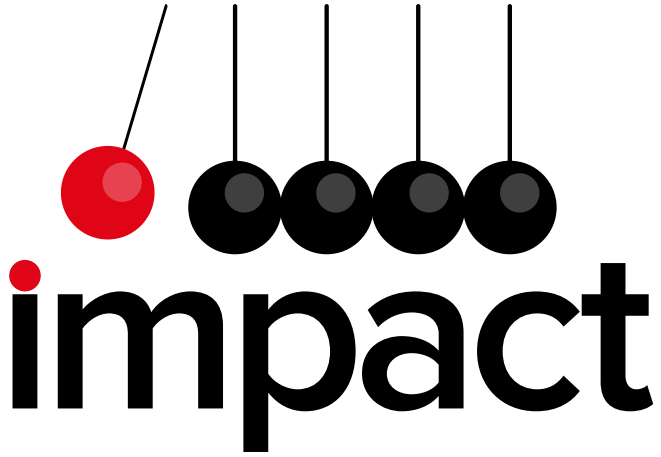
Campus in Hamburg

SCRF cavities

Introduction

Table of Content

- A look back in history
- Why excellent science is key, but not enough today
- Basics in socioeconomics & impacts
  - What is input-output-outcome-impact?
  - „If we can‘t measure it yet, we can at least tell the story!“
- The various impact areas and examples
- The need for impact assessment in different settings
- Q & A‘s



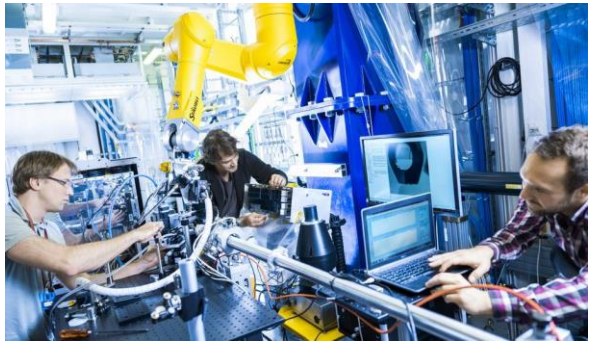
An early Scientist
(and early research infrastructure)

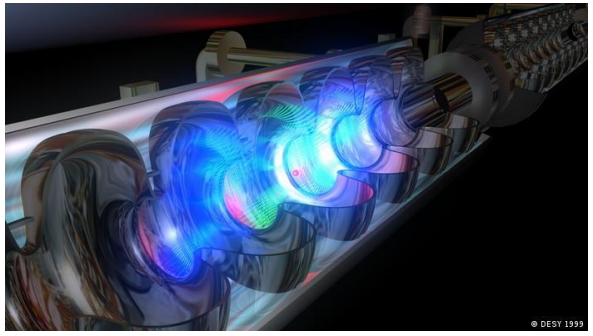
- Tycho Brahe (1546-1601)
- Danish astronomer with its own observatory on the island Hven (called Uraniborg)
- Most famous for his accurate and comprehensive observations
- Stakeholder dimension = 1
  - one decision-maker (= King of Denmark)
  - one funding agency (= King of Denmark)
  - one customer (= King of Denmark)
  - communication to on person (= King of Denmark)
  - Justification of investment: ~easy (?)

King Frederick II

  - (however: new King Christian IV forced Tycho Brahe to leave Denmark!)

Scientists today





- Scientists at DESY/European XFEL observe x-ray lasing (May 2017)
- Stakeholder dimension: high (multi-national project)
- Justification of investment (1,5bn€): complex

Justications for large-scale Research Infrastructures RIs

Expectations & Arguments have changed over time

Research Infrastructures need major **long-term investments**

top-down agendas related to national security and national ambitions:

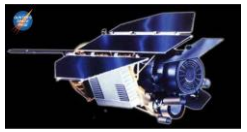
e.g. U.S. Manhattan Project, the French Nuclear Program, the Apollo Program

also big labs, e.g. CERN

„Big science“

„S&T driven“

Scientific benefits
Curiosity-driven
Diffusion of Technology



„Grand challenges“

“grand societal challenges“:

- climate crisis
- health
- aging society
- SDGs

also industrial requirements must be addressed

NOW:

- **“Technology Sovereignty”**
- **“Economic Competitiveness**

(Tycho Brahe) ← 1940s/50s/60s | 1970s/80s/90s | 2000/2010+ → **Time**

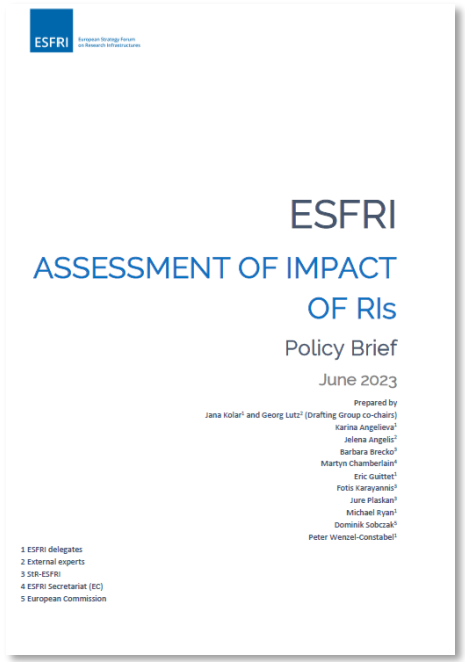
The changing rules

Importance of socio-economic impacts

- Political goals are aligned with “societal challenges”, SDGs, sustainable transformation, digitalization, technology sovereignty etc.
- “Rules of the game” are changing:
  - Excellent science is still a key, but not enough …
  - Governments & funding agencies are requesting more and more proof of evidences of returns for (large) science investments
  - Narratives on “success stories” nice, but less and less going….in times of financial restrictions….
  - Have to proof impacts and need to evolve to quantifying/documenting evidences wherever possible

Socio-economic impacts:

- Measure social, environmental, economic and financial impacts of a investment in a quantitative (monetary unit) or qualitative way.
- An important part of policy-making processes (ESFRI policy brief 2023)



ESFRI Policy Brief 2023
https://zenodo.org/records/8091633

Socio-economic Impacts

What we know

- Science has profound impact on economy
- Well documented relation beween R&D expenses and GDP growth
- Study „G7 Large Research Infrastructures. Synergies and impact on science and society”
- TEHA Think Tank, Italy, October 2024

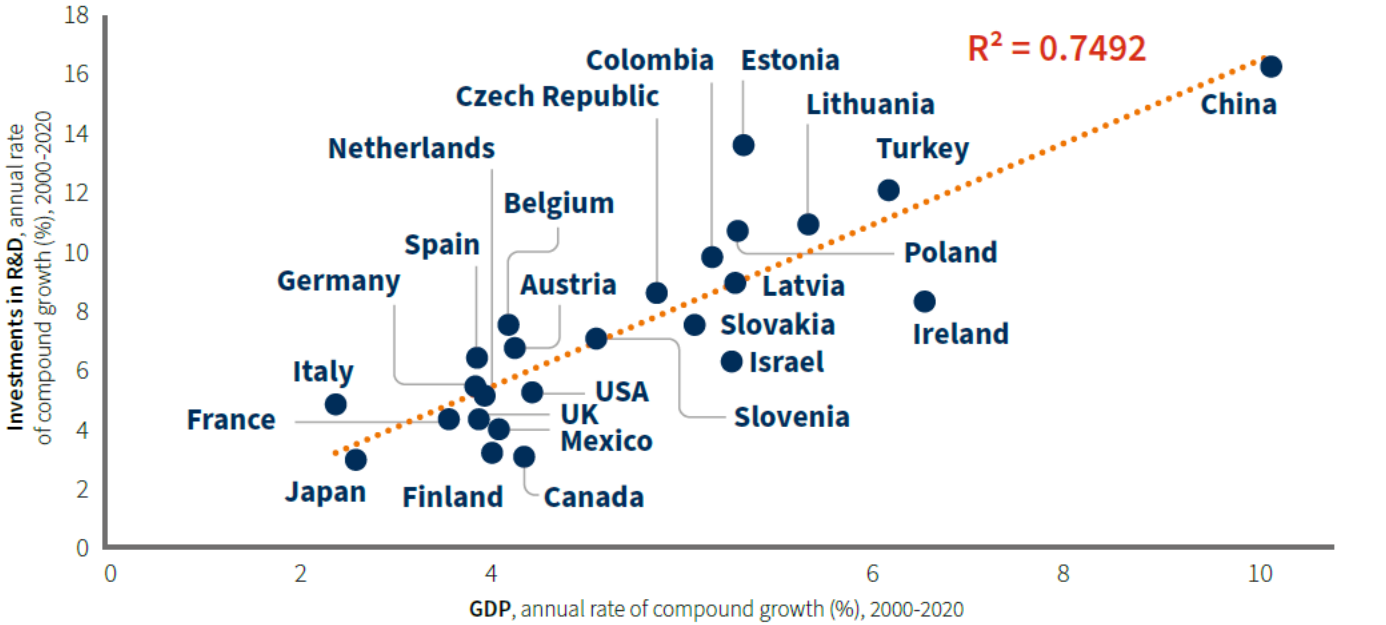


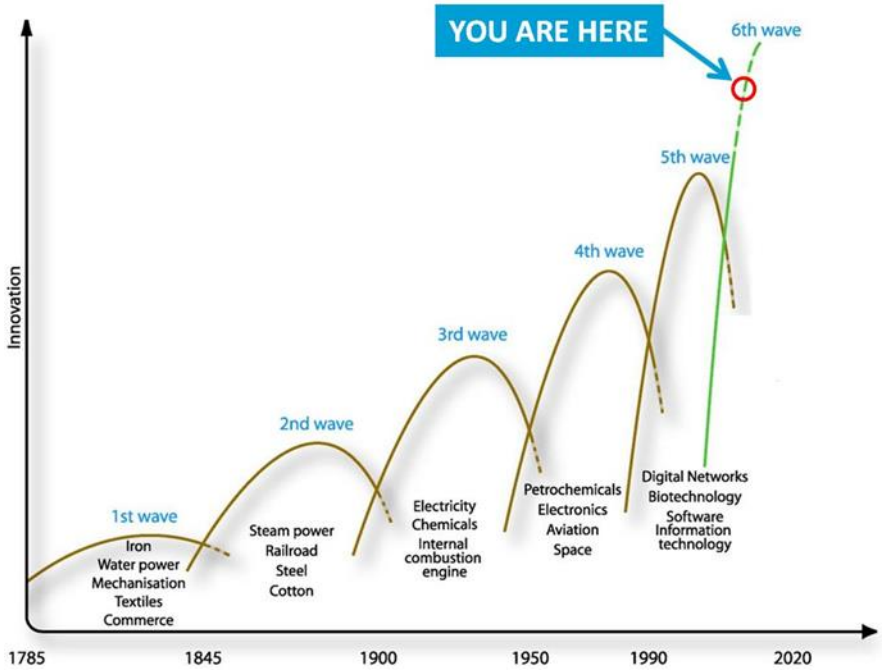
FIGURE 8. Relationship between R&D expenditure and GDP growth in 22 world economies.
Source: TEHA Group elaboration on OECD data, 2024

https://www.ambrosetti.eu/en/innotech-hub/g7-large-research-infrastructures/

Socio-economic Impacts

What we know

- Science has profound impact on society
- Socio-economic impacts of the public research sector has been documented extensively
  - Increasing the stock of useful knowledge
  - Training skilled graduates
  - Creating new scientific instrumentation and methodologies
  - Forming networks and stimulating social interaction
  - Increasing the capacity for scientific and technological problem-solving
  - Creating new firms/Spin-offs
  - Direct technology stimulus for product development
- There is a vast literature on that, a classical one is:
- *Salter, A. J., & Martin, B. R. (2001). The economic benefits of publicly funded basic research: a critical review. Research policy, 30(3), 509-532. (cited in ~800 other articles)*



Major Innovation cycles
Joseph Schumpeter (1883-1950)
"business cycles operate under long waves of innovation"

A vast amount of literature and studies

PETRA III/ IV socio-economic study

Published recently

- Authors: Fraunhofer Institute for Systems and Innovation Research ISI
- ex-post analysis of PETRA III, ~12 years of operation of 3rd generation hard x-ray SR-source
- Ex-ante analysis of PETRA IV, 4th generation ultimate low emittance SR-source
- Needed it for politics => it is in German

https://www.isi.fraunhofer.de/de/competence-center/innovations-wissensoekonomie/projekte/Impact-DESY.html

Socio-Economic Impacts

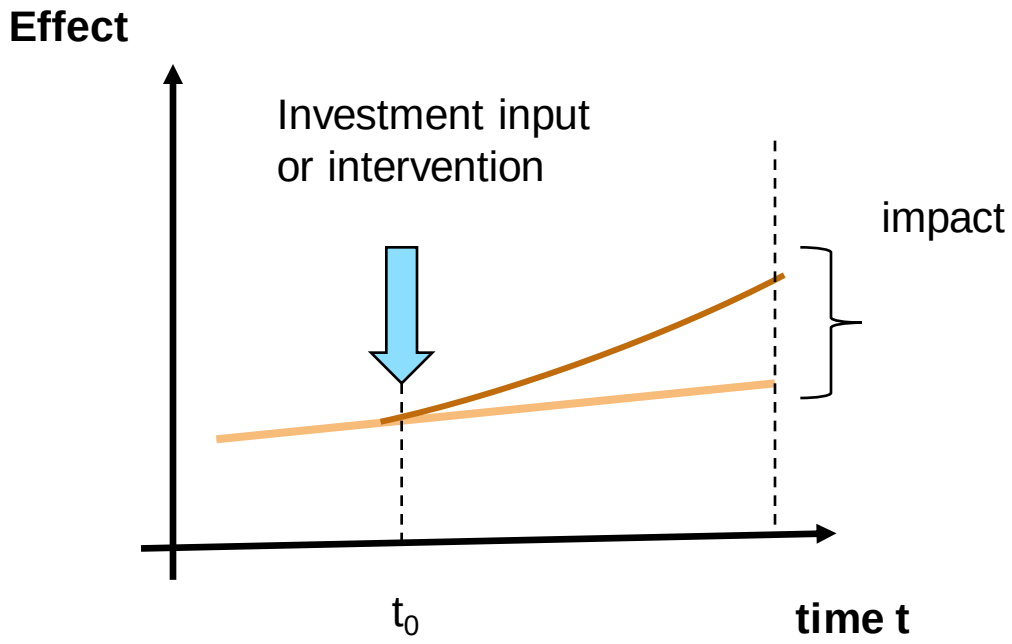
Basic understanding

> *"An impact evaluation provides information about the impacts produced by an intervention - positive and negative, intended and unintended, direct and indirect. This means that an impact evaluation must establish what has been the cause of observed changes (in this case 'impacts')."*
> ESFRI – Long-Term Sustainability Working Group, 2017

In principle measurement of an impact needs to measure the world **with and without** (investment) input / intervention

Challenges:

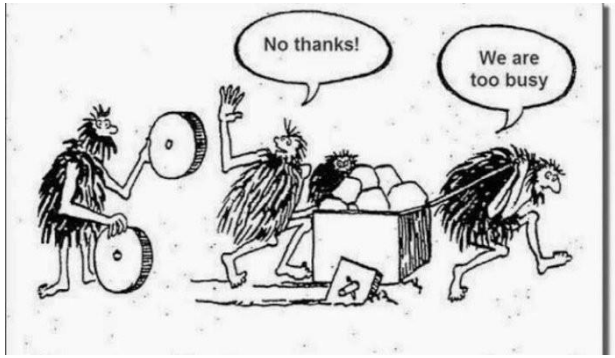
- Causality: What is the relationship between inputs, outputs and impacts? Is there a direct or unidirectional relationship? Is there a non-linearity?
- Attribution: What portion of the effect should be attributed to the initial input and not to other inputs?
- Definition of appropriate indicators / proxys?
- Time scale: At what time should we measure the impacts?
  - Ex-ante vs. ex-post evaluation:
    - Ex-ante: forecast, justification for investment decisions, difficulty to predict
    - Ex-post**:** reporting and accountability, search for improvements, is all information available?



Socio-Economic Impacts

Basic understanding

- **Excellence and high quality scientific results** remain the most important strategic goal of all RIs.
- But RIs have **socio-economic impact** – and this is much **broader** and has **many dimensions** with financial, economical, educational and societal ramifications.
- Impacts studies have task to **assess these effects** – exact design and approach depends on the purpose which stakeholders to address
  - E.g. RI management wishing to monitor the impact of their facility or
  - external stakeholders interested in evaluating RI impact for a variety of objectives
- Methods: need to develop standardized methodologial tools & guidelines to be adapted to each particular objective. Need conceptualization of all types/dimensions of impacts



Socio-Economic Impacts

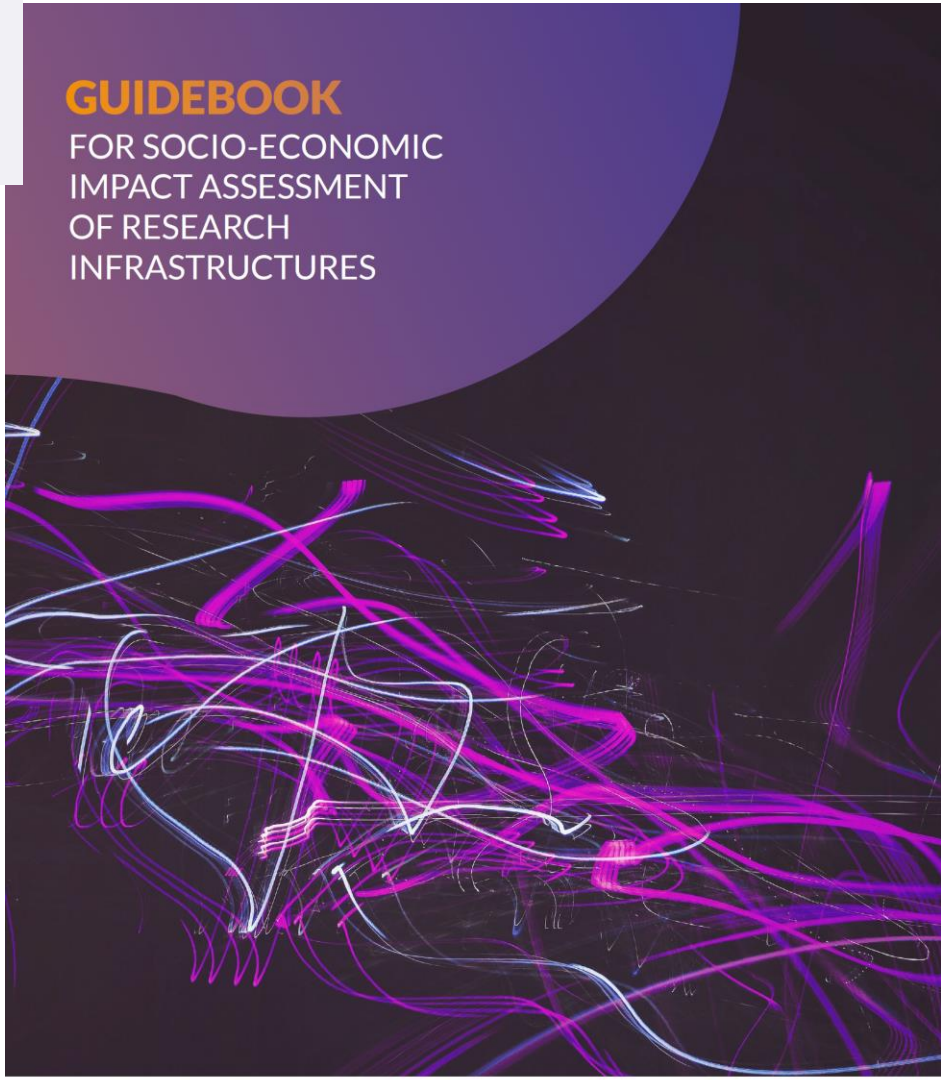
RI-PATHS Project

- H2020 Project RI-Paths: „Charting Impact Pathways of Investment in Research Infrastructures”

https://ri-paths-tool.eu/en

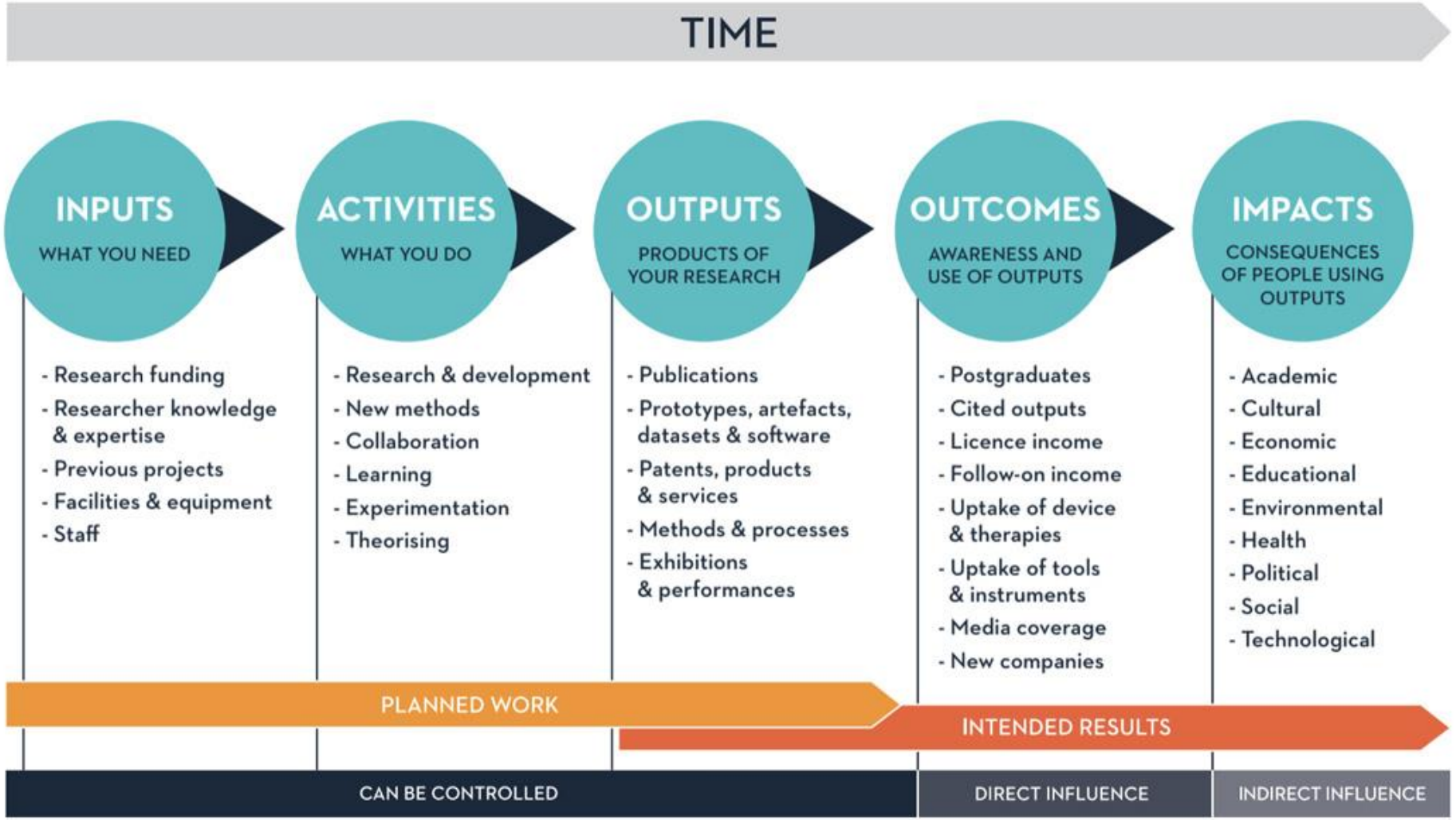
- Partners:
  - Lead: European Future Innovation System (EFIS) Center
  - RIs: CERN, ALBA, DESY
- Project duration: 2018-2020
- developed a conceptual framework on socio-economic impact of RIs
- **Pathways to impacts**

Interactive Impact Assessment Toolkit



The Model: from activities to outputs, outcomes & impacts

The five different stages on the pathway to impact



Outcomes: People becoming aware of, and using, these products. They generally occur in the short- to medium-term.

Impacts: Changes in society that result from outputs and outcomes. Typically, impacts occur in the longer-term.

Source: https://www.ucd.ie/impacttoolkit/plan/impactjourney/

Socio-Economic Impacts

Indicators

- Indicators capture the activity and output of a RI and can be used as estimators of the impact
- Useful indicators need to be
  - easy to measure or easy to collect, user-friendly
  - reliable and meaningful
  - Comparable data should ideally be collected over several years in a consistent manner in order to compare progress over time
- Quantitative versus Qualitative Indicators
- Economic impacts indicators are practical and selected from among commonly recognised indicators (induced turnover, innovation, start-ups, direct and indirect employment, etc.).
- Social/societal impact indicators are more difficult to design and to interpret and require more in-depth validation or coupling with narratives.

A Practical Guide: Assessment of Socio-Economic Impacts of Research Infrastructures

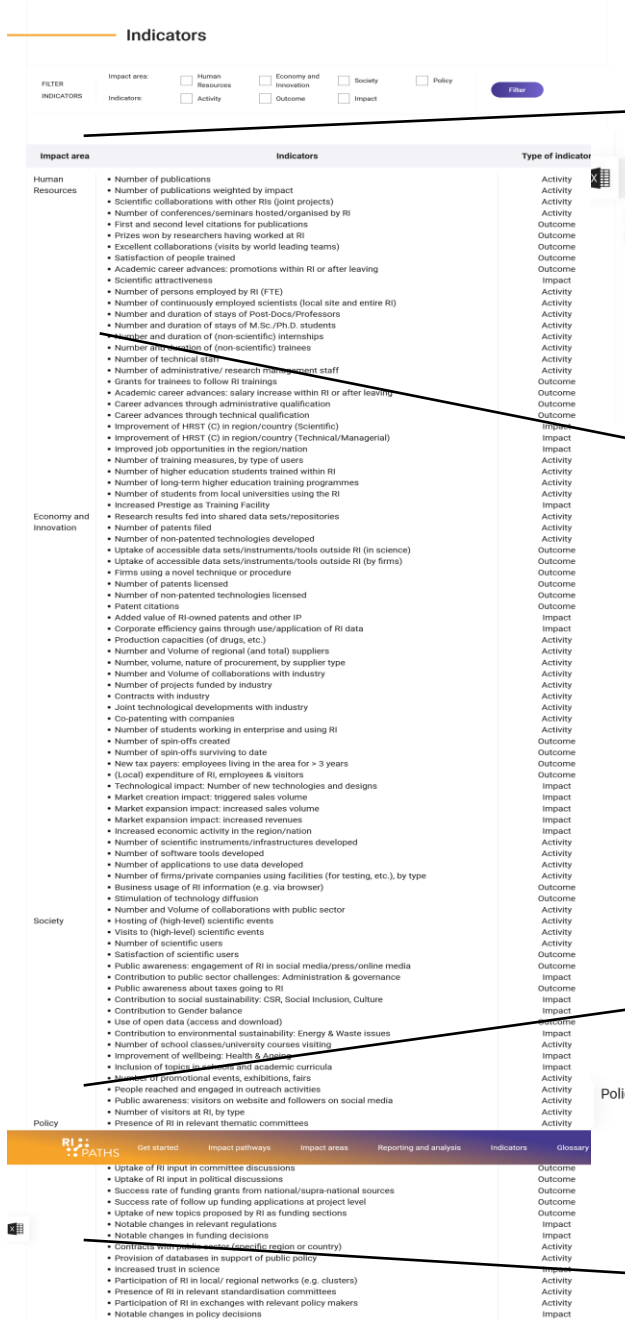
Indicator	Data needed	Phase
Patents	Number of patents granted Number of international patents granted Number of co-patents with companies	Operation
Innovations co-developed with businesses	Number of innovations by business partners to which the RI has contributed	Operation
Joint technology development projects between the RI and businesses	Number of joint technology development projects between the RI and businesses Prototypes of new products and services developed jointly with businesses	Operation
Collaborative projects with business partners	Number of collaborative projects in which businesses are directly involved	Operation
Students working for businesses	Number of students working for businesses and using the RI	Operation
R&D projects commissioned by companies	Number of projects funded by companies Size and type of "client base"	Operation
Scaling up and commercial development of prototypes	Number of technology prototypes and industrial designs co-developed by the RI and sent to the production stage by business partners	Operation
Long-term sustainability of start-ups and spin-offs	Number of start-ups and spin-offs created with support from RI services that remained operational/continued to grow for at least 5-10 years	Operation
Commercialisation of research results	Number of feasibility or market studies for private investment and application of technologies Actual investment in the application of new technologies by business (tracked over time; 5-10 years)	Operation
Procurement contracts signed for the development and upgrading of research equipment	Number and type of procurement contracts for the development of new instruments	Operation

ResInfra@DR project c/o Centre for Social Innovation
Linke Wienzeile 246, A-1150 Wien
institute@zsi.at

Socio-Economic Impacts

Indicators

RI-PATHS provides a set of indicators for all four impact dimensions



Impact area	Indicators	Type of indicator
Human Resources	• Number of publications	Activity
	• Number of publications weighted by impact	Activity
	• Scientific collaborations with other RIs (joint projects)	Activity
	• Number of conferences/seminars hosted/organised by RI	Activity
	• First and second level citations for publications	Outcome
	• Prizes won by researchers having worked at RI	Outcome
	• Excellent collaborations (visits by world leading teams)	Outcome
	• Satisfaction of people trained	Outcome
	• Academic career advances: promotions within RI or after leaving	Outcome
	• Scientific attractiveness	Impact
	• Number of persons employed by RI (FTE)	Activity
Policy	• Public awareness: visitors on website and followers on social media	Activity
	• Number of visitors at RI, by type	Activity
	• Presence of RI in relevant thematic committees	Activity
	• Presence of RI in relevant committees that define scientific norms	Activity
	• Provision of expert advice in public policy	Activity
	• Provision of empirical data in support of public policy	Activity
	• Uptake of RI input in committee discussions	Outcome
	• Uptake of RI input in political discussions	Outcome
	• Success rate of funding grants from national/supra-national sources	Outcome
	• Success rate of follow up funding applications at project level	Outcome
	• Uptake of new topics proposed by RI as funding sections	Outcome

Socio-Economic Impacts

The four areas of impacts (from RI-PATHS Guidelines)

Impact on Human Resources 1

- Research jobs and career development
- Skills development for non-scientific staff and users
- Relationship capital and international collaboration
- Better working conditions
- Wider effects of concentrating new competences

Impact on Economy and Innovation 2

- Business and industry
- Labour market and productivity
- Technology transfer and innovation
- Impact on local and regional economy

https://ri-paths-tool.eu/en

Impact on Society 3

- New solutions, technologies, open access data and software for societal use
- Knowledge benefits for society in different domains
- Public awareness and engagement
- Cultural impact
- Social inclusion
- Environmental impact

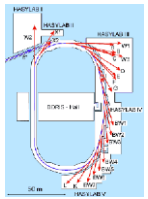
Impact on Policy 4

- Policy, regulations and standards
- Science diplomacy
- Co-funding and sustainability
- Ethics and trust in science

Socio-Economic Impacts

Human Resources

1

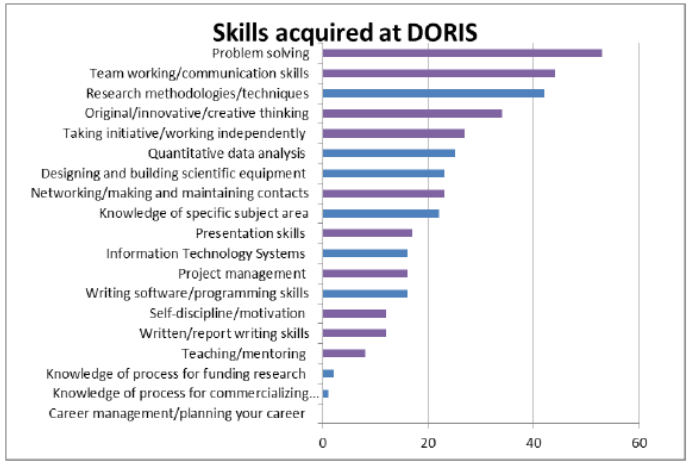


DORIS study (unpublished)

- "Human Capital"
- Effects on the career development of scientific, technical and non-scientific personnel
- RIs as "magnets" for best researchers
- Key questions:
  - How did the interaction with RI change and enhance new competences and skills?
  - What were the effects on capacity building through training and learning at RIs?
- Crucial: cooperation with research-performing and higher-education institutions/universities

Impact of PhD-Students

- Between 1973 and 2014, about 1200 students completed their PhD on a topic related to DORIS.
- To visualise the career paths of doctoral degree recipients and to analyse the acquirement and transfer of skills into other sectors of employment, a survey among former DORIS graduate students was conducted.
- About half of them could be contacted via e-mail, and 144 participated in the survey.
- Results prove outstanding value of education at large-scale research facilities. **Skill set gained at DORIS goes far beyond scientific expertise.**



22% started career in private sector (mainly in IT and healthcare)

10% became entrepreneurs

Only five years after graduation, 55% of DORIS PhD students were responsible for their own budget and 45% led their own staff.

Vast majority of respondents have full-time permanent contracts

76% of the respondents would today again pursue a PhD at a facility such as DORIS

Seite 14

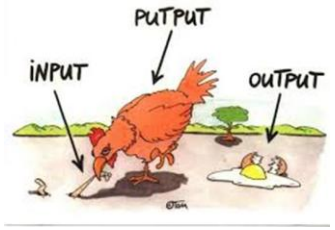
DORIS was a SR source at DESY in operation from 1974-2013 – pioneering facility

Socio-Economic Impacts

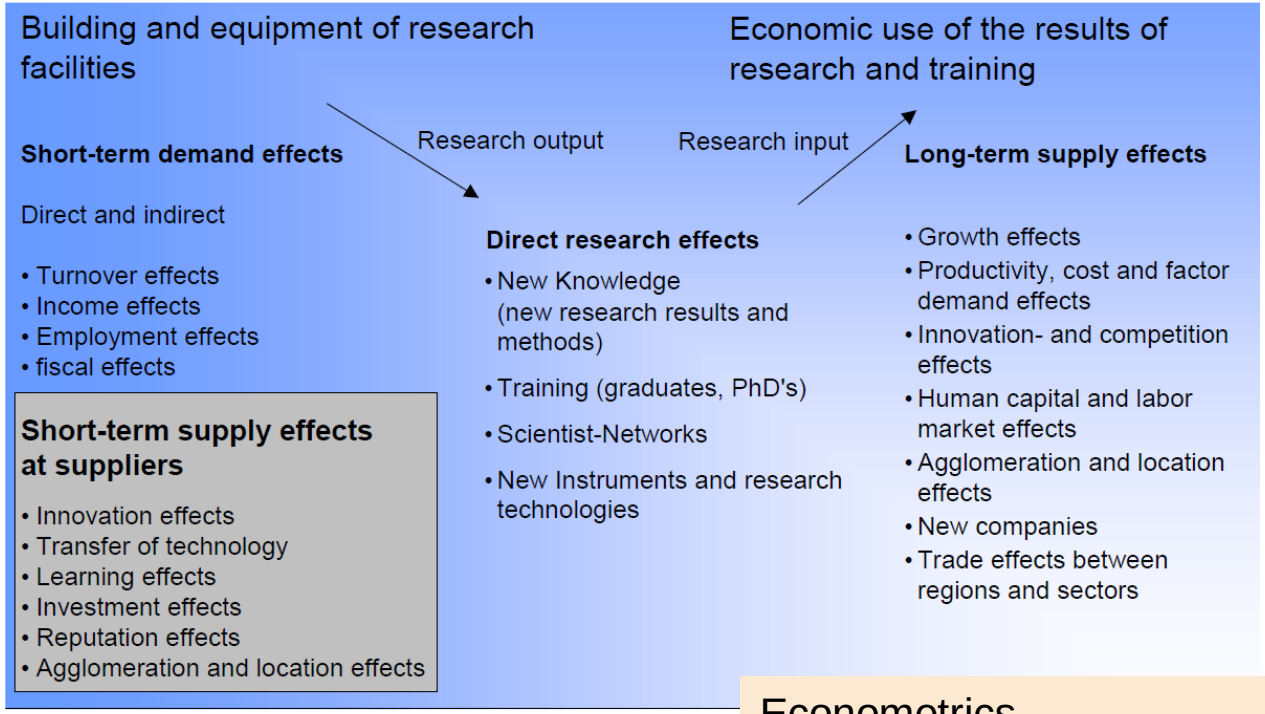
Economy and Innovation

2

- All monetary and fiscal effects induced through demand and supply effects of RIs on the economy
- Commonly used are Input-output (I/O) analysis
  - a form of macroeconomic analysis based on the interdependencies between different economic sectors or industries
  - Investigation of the economic “chain reaction” of further spending, production, income and employment of the initial budget
- How much $ is generated in economy if 1$ is invested in science?



W. Pfähler, Economic effects of Basic Research



Ex-ante, ex-post
Input-Output studies

Econometrics
Long-term ex-post studies
Case studies

Socio-Economic Impacts

Some I/O Examples

PETRA III 2010-2022

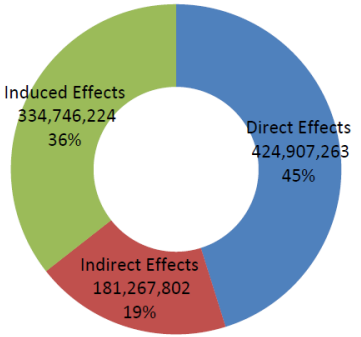
- Initial invest & 12 years operation: 815M€
- Generates total of up to 2,25 bn€

PETRA III

TRIUMF

- TRIUMF expenditures totaled $622.4 million over the last ten years
- Generates ~1 bn $ total GDP distributed among British Columbia (80%) and the rest of Canada (20%).

TRIUMF



https://www.triumf.ca/sites/default/files/HAL-ReturnOnInvestmentStudy-May-2013.pdf

Argonne National Lab FY 2010

- ~700M$ Economic Output

Argonne

Argonne Economic Impact in Illinois in FY 2010*

	Economic Output (millions)	Household Earnings (millions)	Employment
Argonne Expenditure Economic Impact	$689.2	$211.5	4,875
Contractor and Visitor Economic Impact	$7.7	$2.2	77
Total Economic Impact	$696.9	$213.7	4,952

Source: Anderson Economic Group, LLC

*As each dollar spent by Argonne enters the economy, it supports additional business activity, jobs, and payroll. The numbers in this table reflect these multipliers.

G7 Study / look at impacts of 57 RIs in G7 countries:

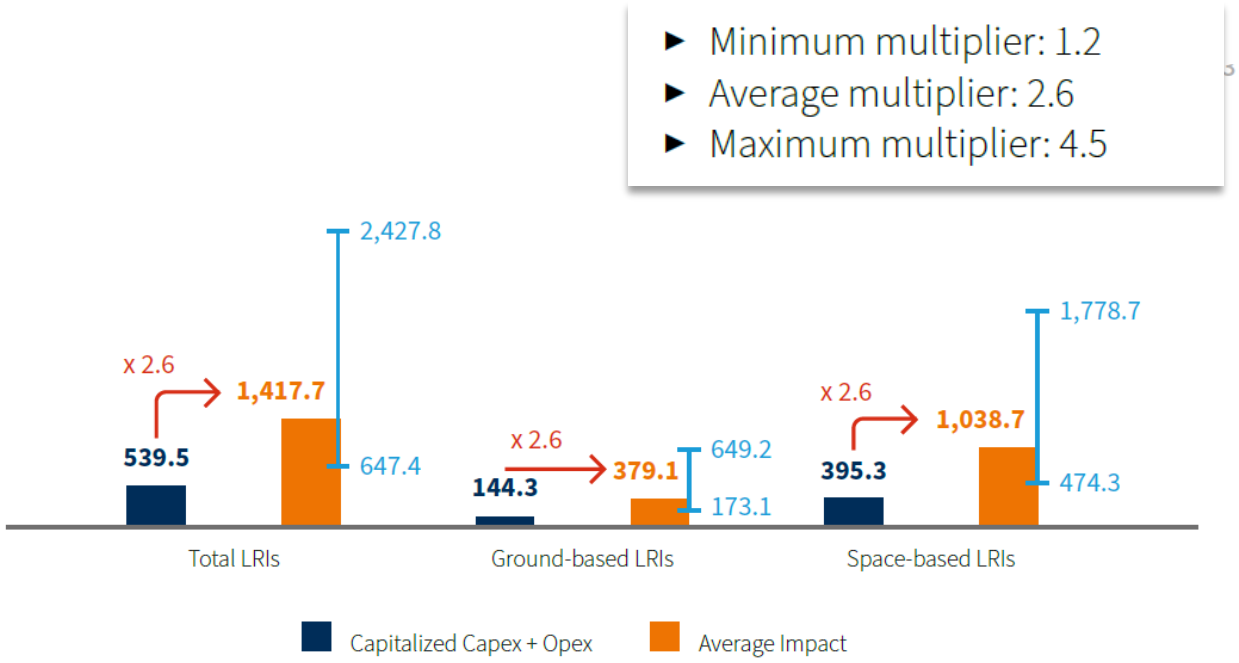
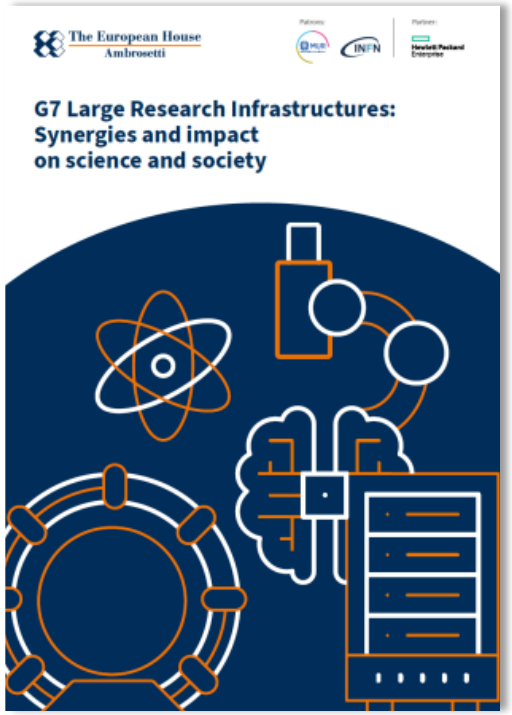
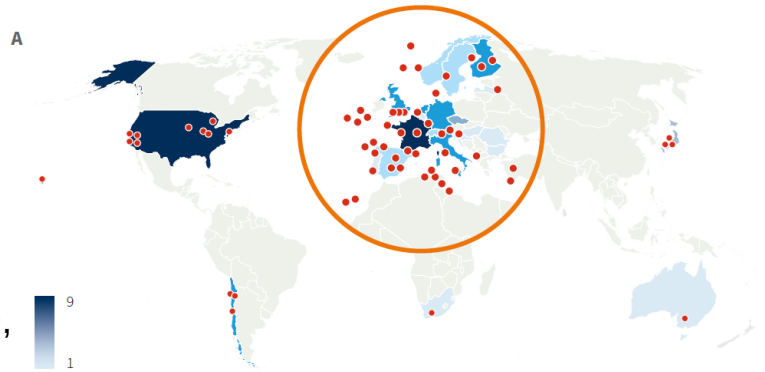


Figure 15. LRIs' actualized Capex and Opex (histograms) and estimated range of economic impact (candlestick) (billion USD).

Source: TEHA Group elaboration on proprietary methodologies, 2024





Analyze 57 RIs in G7 countries

The total capital & operational costs invested in **the 57 identified RIs totaled 539.5 billion USD**,

with the estimated economic impact ranging from **647.4 billion USD to 2.4 trillion USD**, based on various output multipliers derived from literature

Socio-Economic Impacts

Diamond Lightsource study

- Recent (2021): Diamond lightsource study
- "(…) so far (2007-2020) had a **cumulative monetized impact of *at least*** £1.8 **billion**, based on the evidence captured at this relatively early stage of the facility's operations".
- "(…) compares very favourably with the £1.2 billion investment in the facility (…)".

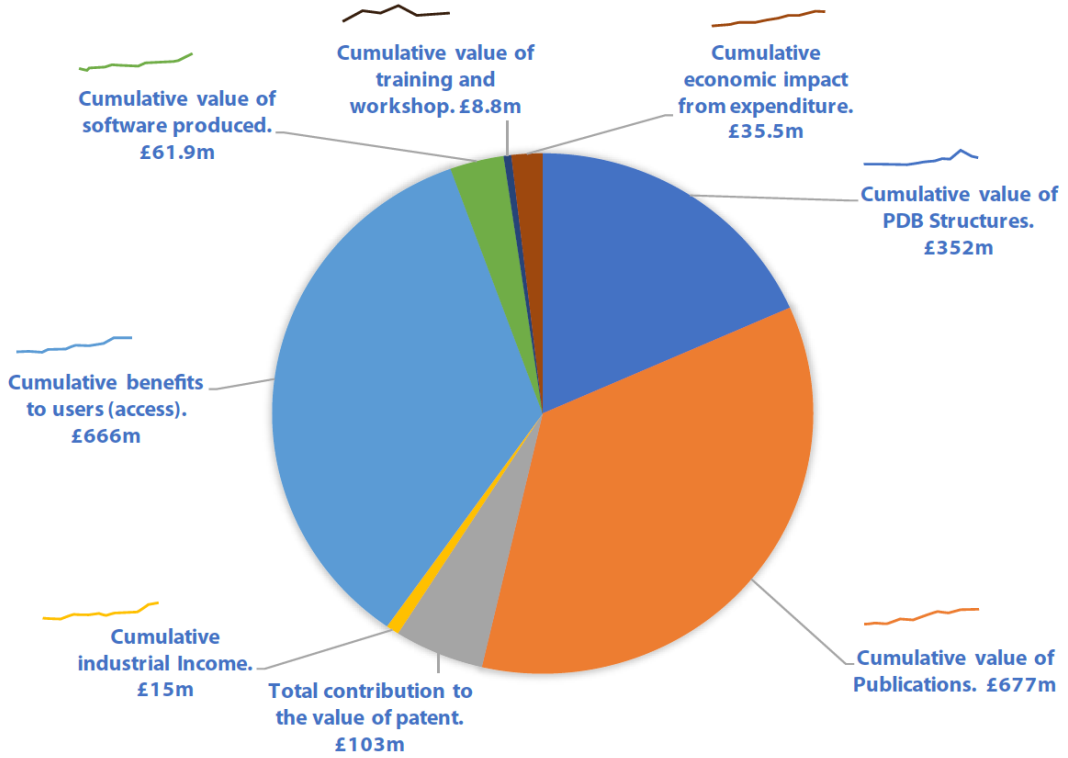


Figure 21: Break down of impact areas mapped as part of this report with trend data (where available) showing the steady growth over time.

Challenge: monetize various impact areas

Socio-Economic Impacts

Impacts to Society

3

- Refers to the effects on society as a whole and how well societal challenges are addressed
  - Contributions to solving “Grand societal challenges”
  - Direct: through research contribution (sustainability, health, climate, biodiversity, mobility)
  - Indirect: through new knowledge leading to innovation and with benefits for society in different domains
- Communication, Public awareness, outreach and engagement
- Social/cultural inclusion, diversity
- Environmental impact

PETRA III

Publication output of PETRA III classified according to SDG

Using web of science/Clarivate

WoS/clarivate:
Category-to-category mapping where Sustainable Development Goals are mapped to sets of related Micro Citation Topics. The first mapping to Micro Citation Topic was in January 2022.

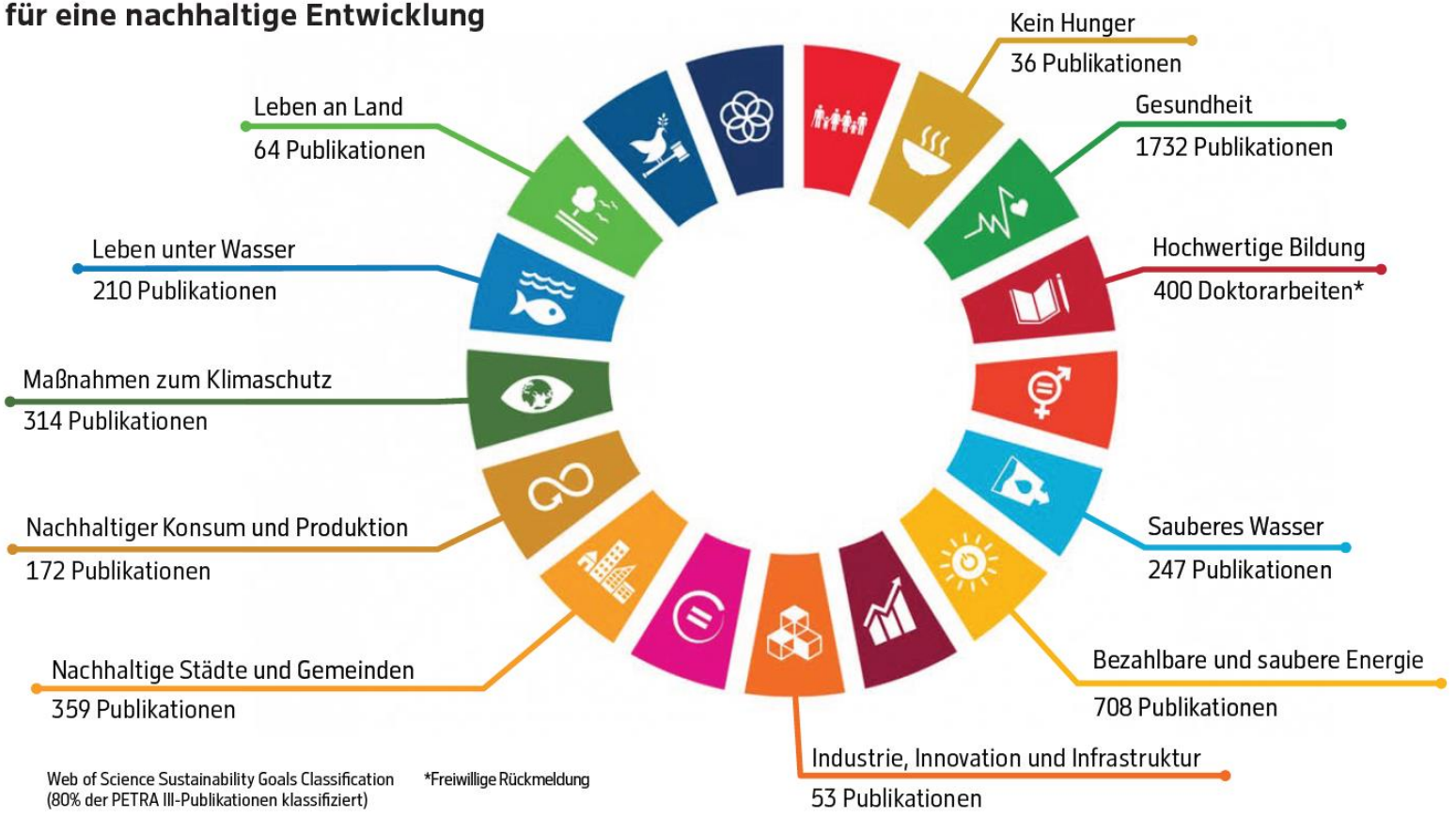
Research for more Sustainability

Eine bessere und nachhaltigere Zukunft ist das Ziel der meisten Wissenschaftlerinnen und Wissenschaftler, die ihre Experimente an PETRA III durchführen.

80 %

der PETRA III-Publikationen leisten einen direkten Beitrag zu **gesellschaftlich relevanten Themen**

PETRA III-Beitrag zu den UN-Zielen für eine nachhaltige Entwicklung

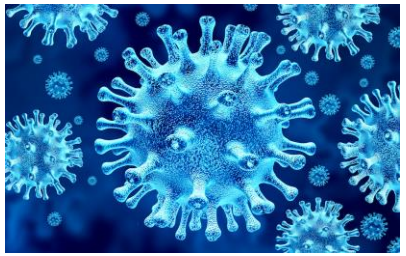


Web of Science Sustainability Goals Classification (80% der PETRA III-Publikationen klassifiziert)

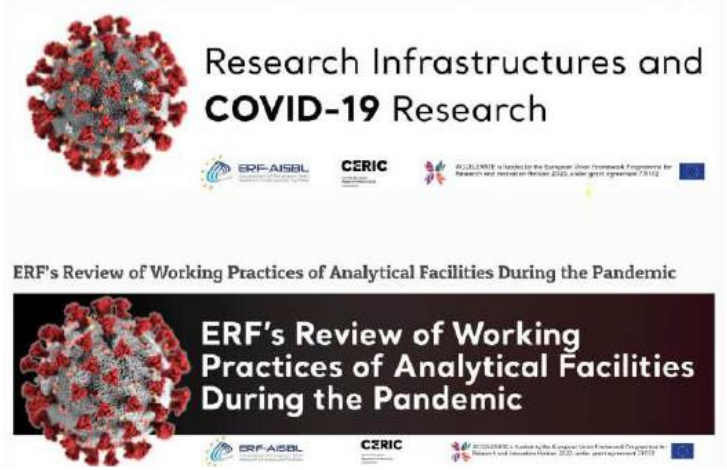
*Freiwillige Rückmeldung

Impacts to Society

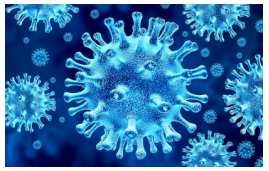
Response to pandemics and impact on fighting COVID-19



- SR labs decided quickly to open dedicated **fast track access mode for beamtime** from the very first moment, compatible with each country's pandemic conditions
- Good exchange among the labs - sharing experiences, best practice and solutions



Socio-Economic Impacts



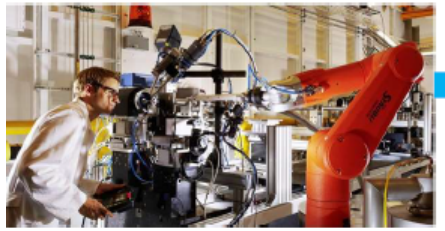
DESY's role in the scientific response to the Covid-19 pandemic

Corona Research

Drug search

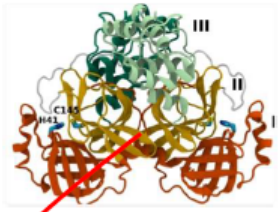
more than 100 scientists involved

Science March 2021



robot screens 1 sample/3min

The most comprehensive x-ray search for an agent that inhibits the reproduction of the virus in human cell

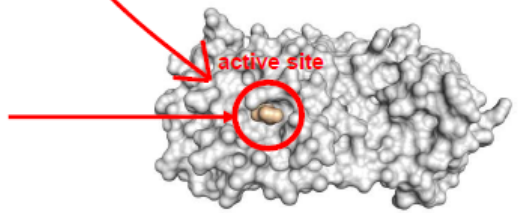


SARS COV-2 Main Protease (M^{pro})
=
knife cutting RNA into pieces for assembly of daugther viruses within human cell

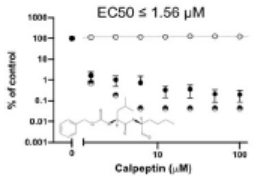
Find molecule which blocks knife !!

7000 molecules co-crystallized with M^{pro}
check by high resolution X-ray crystallography binding at critical site of M^{pro}

Several hits (around 40) for binding on active site



Antiviral tests:	4-5 highly efficient
hereof antitoxic:	2 remaining



Calpeptin and Pelitinib in preclinical study

CORONAVIRUS

X-ray screening identifies active site and allosteric inhibitors of SARS-CoV-2 main protease

Sebastian Günther[1*†], Patrick Y. A. Reinke[1†], Yaiza Fernández-García[2], Julia Lieske[1], Thomas J. Lane[1], Helen M. Ginn[3], Faisal H. M. Koua[1], Christiane Ehrt[4], Wiebke Ewert[1], Dominik Oberthuer[1], Oleksandr Yefanov[1], Susanne Meier[5,6], Kristina Lorenzen[7], Boris Krichel[8], Janine-Denise Kopicki[8], Luca Gelisio[1], Wolfgang Brehm[1], Ilona Dunkel[9], Brandon Seychell[10], Henry Gieseler[5,6], Brenna Norton-Baker[11,12], Beatriz Escudero-Pérez[2], Martin Domaracky[1], Sofiane Saouane[13], Alexandra Tolstikova[1], Thomas A. White[1], Anna Hänle[1], Michael Groessler[1], Holger Fleckenstein[1], Fabian Trost[1], Marina Galchenkova[1], Yaroslav Gevorkov[1,14], Chufeng Li[1], Salah Awel[1], Ariana Peck[15], Miriam Barthelmess[1], Frank Schlünzen[1], P. Lourdu Xavier[1,11], Nadine Werner[16], Hina Andaleeb[16], Najeeb Ullah[16], Sven Falke[16], Vasundara Srinivasan[16], Bruno Alves França[16], Martin Schwinzer[16], Hévila Brognaro[16], Cromarte Rogers[5,6], Diogo Melo[5,6], Joanna J. Zaitseva-Doyle[5,6], Juraj Knoska[1], Gisel E. Peña-Murillo[1], Aida Rahmani Mashhour[1], Vincent Hennicke[1], Pontus Fischer[1], Johanna Hakanpää[13], Jan Meyer[13], Philip Gribbon[17], Bernhard Ellinger[17], Maria Kuzikov[17], Markus Wolf[17], Andrea R. Beccari[18], Gleb Bourenkov[19], David von Stetten[19], Guillaume Pompidor[19], Isabel Bento[19], Saravanan Panneerselvam[19], Ivars Karpics[19], Thomas R. Schneider[19], Maria Marta Garcia-Alai[19], Stephan Niebling[19], Christian Günther[19], Christina Schmidt[7], Robin Schubert[7], Huijong Han[7], Juliane Boger[20], Diana C. F. Monteiro[21], Linlin Zhang[20,22], Xinyuanyuan Sun[20,22], Jonathan Pletzer-Zelgert[4], Jan Wollenhaupt[23], Christian G. Feiler[23], Manfred S. Weiss[23], Eike-Christian Schulz[11], Pedram Mehrabi[11], Katarina Karničar[24,25], Aleksandra Usenik[24,25], Jure Loboda[24], Henning Tidow[5,26], Ashwin Chari[27], Rolf Hilgenfeld[20,22], Charlotte Uetrecht[8], Russell Cox[28], Andrea Zaliani[17], Tobias Beck[5,10], Matthias Rarey[4], Stephan Günther[2], Dusan Turk[24,25], Winfried Hinrichs[16,29], Henry N. Chapman[1,5,30], Arwen R. Pearson[5,6], Christian Betzel[5,16], Alke Meents[1*]

The coronavirus disease (COVID-19) caused by SARS-CoV-2 is creating tremendous human suffering. To date, no effective drug is available to directly treat the disease. In a search for a drug against COVID-19, we have performed a high-throughput x-ray crystallographic screen of two repurposing drug libraries against the SARS-CoV-2 main protease (M^{pro}), which is essential for viral replication. In contrast to commonly applied x-ray fragment screening experiments with molecules of low complexity, our screen tested already-approved drugs and drugs in clinical trials. From the three-dimensional protein structures, we identified 37 compounds that bind to M^{pro}. In subsequent cell-based viral reduction assays, one peptidomimetic and six nonpeptidic compounds showed antiviral activity at nontoxic concentrations. We identified two allosteric binding sites representing attractive targets for drug development against SARS-CoV-2.

Science 372, 642–646 (2021) 7 May 2021

Socio-Economic Impacts

Impacts to Society- Outreach, public engagement

(e.g. DESY, all pre-Corona):

Visitor Tours:

- 10‘000 visitors per year, 60% school classes

School lab:

- About 8000 pupils per year, schools from Northern Germany

Public Day:

- every two years, 20‘000 guests

„Science on tap“:

- Informal get-together in pubs, talk about science

„Science meets art“

- Art exhibitions at DESY; attracts visitors who normally do not come

STFC impact report 2010/2011

In 2010/11 STFC:

- Attracted 2,500 undergraduates to study physics, inspired by STFC research areas.
- Attracted over 12,000 pupils and 15,000 members of the public to events at STFC sites, a 40% increase over 2 years.
- Invested in 95 national school outreach projects in partnership with the Institute of Physics to encourage students to study STEM subjects, directly engaging with over 900 teachers.
- Provided particle physics master classes at STFC sites for 570 secondary school students.
- Invested in 51 Public Engagement Awards including 4 Science in Society Fellowships. These fellows have reached an audience of 1.4 million members of the public.

Students enjoying a Particle Physics Master class.

Socio-Economic Impacts

Impacts to Society

Citizen Science

- Citizen science projects are collaborative initiatives in which members of the public are invited to engage in the process of scientific research and investigation: asking questions, collecting data, and/or interpreting results
  - Break down barriers to engagement in science
  - Increase scientific knowledge
  - Increase scientific literacy
- inspire, motivate and enhance lives It is a rapidly growing field, particularly within the natural sciences, with over 700 peer-reviewed papers published to date. **There is growing evidence that people want to get actively involved in such contributory science**

Graham Higley & John Tweddle, Natural History Museum London

eu-citizen.science

https://eu-citizen.science/

Online platform for sharing knowledge, tools, training and resources for citizen science.

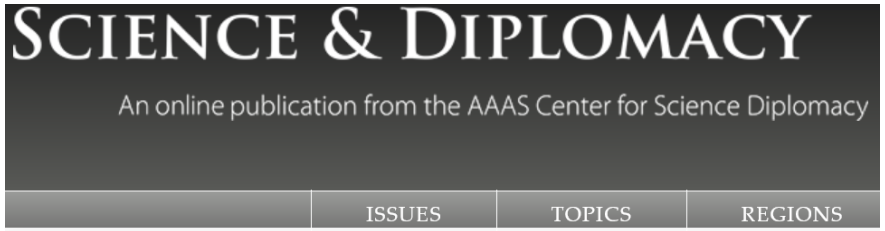
Socio-Economic Impacts

Impact on Policy

4

- Effects and changes in policy-related domains
  - Improving science / policy interface – evidence-based decision making
  - Provide scientific support to public policies
  - Expert advice in support of public policies
  - Production of resources in support of public policies
  - Regulations, standardization
- **Science diplomacy,** trust building
  - building bridges between communities, societies, and nations through scientific cooperation
  - **Examples:**

Amy K. Flatten, Director APS international affairs



PERSPECTIVE

Global Research Infrastructures: A Decade of Science Diplomacy

By Amy K. Flatten - 09/27/2018

In celebration of the tenth anniversary of the AAAS Center for Science Diplomacy, it is valuable to reflect upon common themes of some of the most frequently read articles that have been published in the Center's quarterly journal, *Science & Diplomacy (S&D)*. These pieces discussed the diplomatic impact of global research infrastructures such as the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME), the International Space Station (ISS), the Abdus Salam International Centre for Theoretical Physics (ICTP), and the European Council for Nuclear Research, known as CERN.

http://www.sciencediplomacy.org/editorial/2018/global-research-infrastructures-decade-science-diplomacy

Impact on Policy

Confidence / Trust in Science

- Science matters and has a central role in public debates on policy => e.g. COVID pandemics
- Pandemics highlighted significant challenges around the use and communication of science in policymaking,
- Decreased trust in science will lead to negative consequences and harm society, e.g. in health related issues

Pew Research Center

FOR RELEASE NOVEMBER 14, 2024

Public Trust in Scientists and Views on Their Role in Policymaking

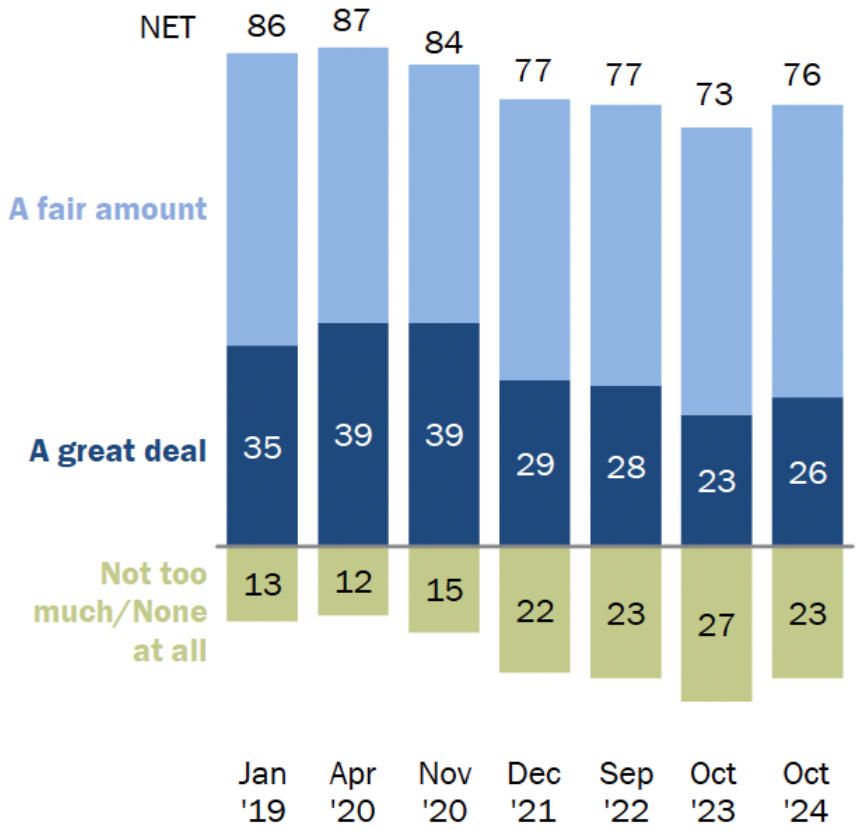
Trust moves slightly higher but remains lower than before the pandemic

BY *Alec Tyson and Brian Kennedy*

https://www.pewresearch.org/wp-content/uploads/sites/20/2024/11/PS_2024.11.14_trust-in-science_REPORT.pdf

Confidence in scientists up slightly but remains lower than before pandemic

% of U.S. adults who have ___ of confidence in scientists to act in the best interests of the public



Note: Respondents who did not give an answer are not shown.
Source: Survey of U.S. adults conducted Oct. 21-27, 2024.
"Public Trust in Scientists and Views on Their Role in Policymaking"

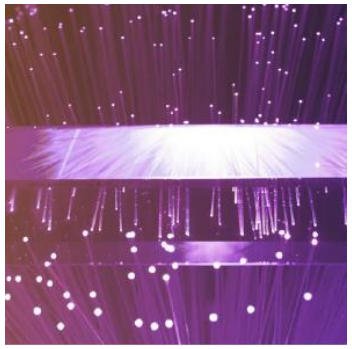
PEW RESEARCH CENTER

Socio-Economic Impacts

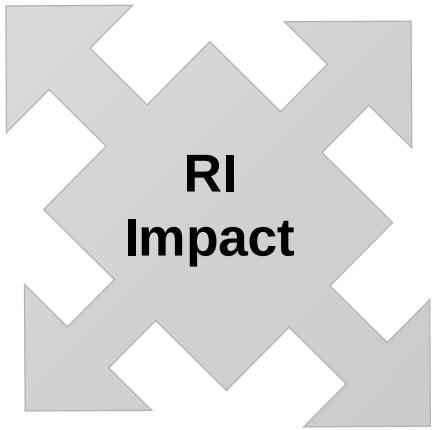
Quick Summary / Take Home

Human Resources

Economy / Innovation



https://ri-paths-tool.eu/en



Society

Policy

Which impact area do you consider as most important?

Take Home Message

Know your Stakeholders

So, what are your stakeholders?

What is for them relevant?

Also helpful is best practice

ERIC Forum Policy Brief

- ERIC Forum of 24 ERICs in Europe
- Share best practice, identifying common grounds and challenges, help build a common framework that could help other ERICs to identify and measure socio-economic impacts
- https://www.eric-forum.eu/2022/05/04/overview-eric-forum-policy-seminar-socio-economic-impact-of-erics/

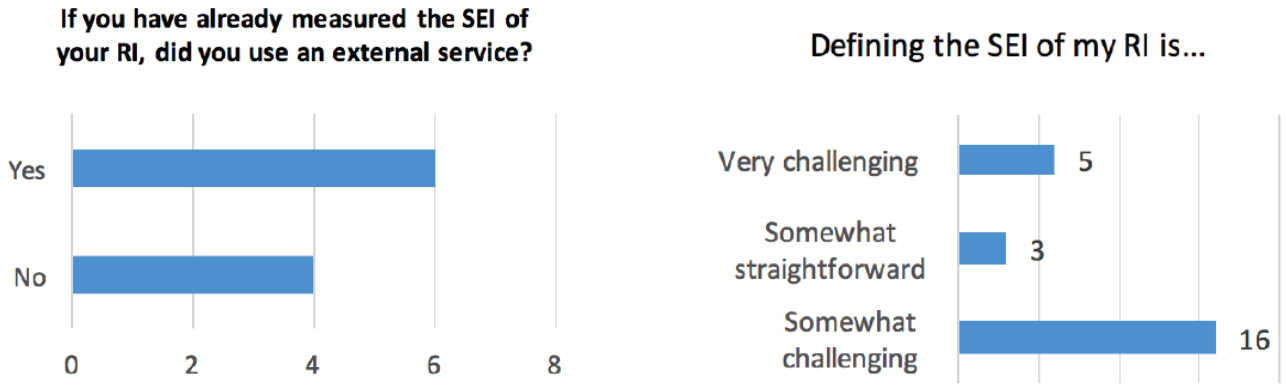
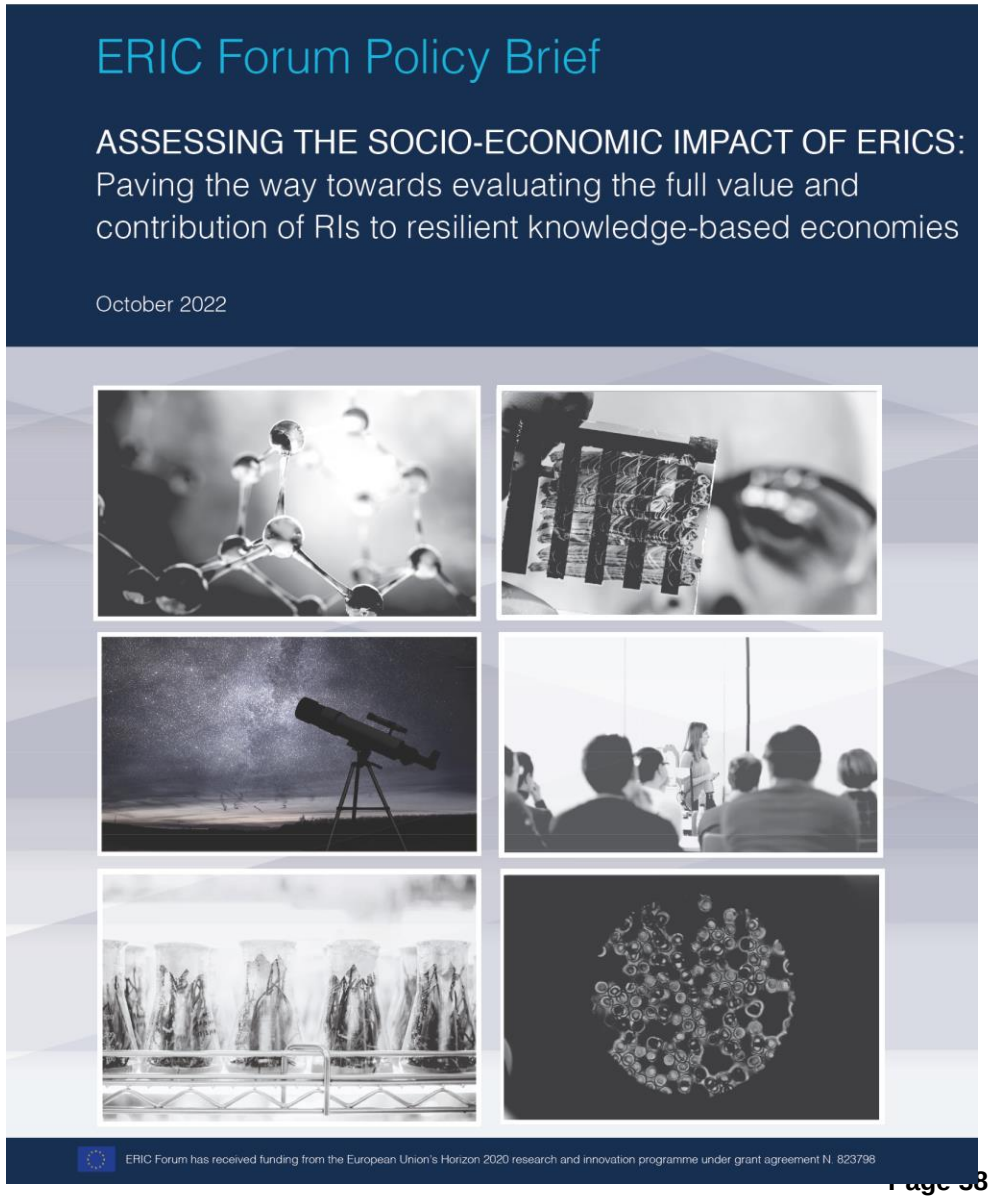


Figure 5. Use of external service

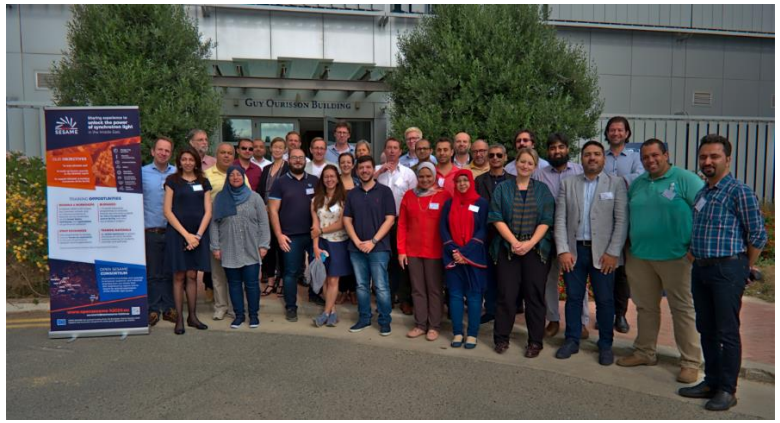


Workshop on SESAME in 2018

Maximizing Socio-economic impacts

The OPEN-SESAME project has received funding from the EU's H2020 framework programme for research and innovation under grant agreement n.730943

- H2020 project „OPEN-SESAME“
- two workshops with young scientists from the SESAME member states



CyI, Cyprus, May 2018

- Formulated a set of recommendations and guidelines that help to assess/report/monitor SESAME-specific impacts

Izmir, Turkey, October 2018

Recommendations[1] on maximizing the socio-economic impact and securing the long-term sustainability of SESAME

Introduction/Background

Within the EU funded OpenSESAME project (www.opensesame-h2020.eu/) a dedicated training and networking programme for young research administrators and managers was carried out to strengthen the role of SESAME as a knowledge institution in the science and innovation system region of the Eastern Mediterranean and Middle East. The programme consisted of two workshop modules attended by 25 participants from SESAME Members. The two workshop modules took place in Nicosia (Cyprus) at the Cyprus Institute in May 2018 and in Izmir (Turkey) in October 2018. The programme included a number of learning sessions run by senior managers and top-level research administrators from well-established research infrastructures and academic institutions. Both modules included case studies, practical sessions and site visits, along with networking and social activities to provide a stimulating learning environment for the participants.

Participants explored and developed a range of key practices, capabilities and skills associated with the effective management of research infrastructures in an international context, including:

- Understanding the role of research infrastructures within the science system and its funding system, their life cycle and long-term sustainability
- Defining and determining socio-economic impacts of research infrastructures to society
- Legal, governance and management structures at research infrastructures
- Formulating policies and guidelines in relation to good scientific practice, access policies, internationalisation, communication strategy, technology transfer, intellectual property and data management issues
- Managing human resources
- Project Management
- Financing and funding opportunities

[1]This paper was written by an editorial team representing the participants of the OPEN SESAME Training and Networking Program for Research Administrators/Managers. Members of the editorial team were: Allayth Aldrabee (JAEC, Jordan), Tha'er Abu Hanieh (SESAME), Ramia Al Bakain (University of Jordan, Jordan), Ahmed Bassalat (An-Najah National University, Palestinian Territories), Mert Bal (Kadir Has University, Turkey), Tayel El-Hasan (Mutah University, Jordan), Salimi Ehsan (IPM, Iran), Ehab Essawy (Helwan University, Egypt), Greta Facile (SESAME), Emine Sökmen (Hitit University, Turkey), Khaqan Shati (PINSTECH, Pakistan), Muhammad Usman (Quaid-i-Azam University, Pakistan), Michalis Yiangou (Cyprus Institute) and others. Contact through ri-training@desy.de

Socio-Economic Impacts

Conclusions

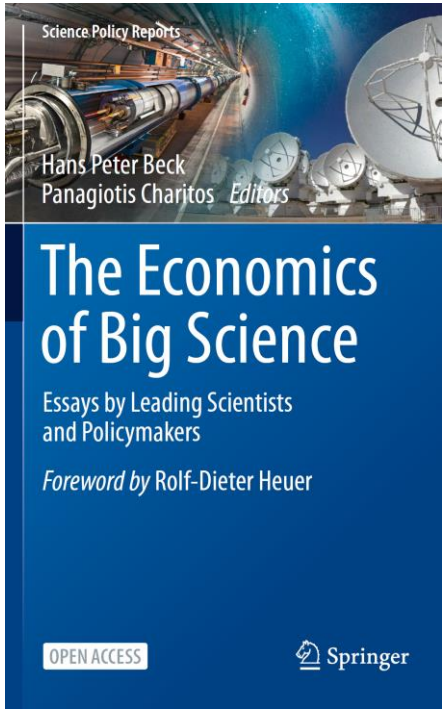
- Research infrastructures (RIs) such as synchrotron radiation labs have a **critical scientific mass** and generate **strong impacts** on science, human and social capital, economy and society
- The **analysis** (and demonstration of) of **socio-economic impacts of RIs is nowadays a must** – although it is challenging, time-consuming and needs a well-defined and clean conceptual framework
- There is a permanent challenge of scarce, incomplete or ill-defined data/metrics. An impact-oriented monitoring needs to be designed and implemented from the beginning with carefully selected, credible and **easy to collect impact indicators**
- The **true nature of research infrastructures and their entire impacts** are **difficult to assess** by quantifiable indicators solely. It needs also the underpinning with **good case studies**.

Literature

- RI-PATHS
  - https://ri-paths-tool.eu/en

- The Economics of Big Science
  - Essays by leading scientists and policymakers
  - Editors: Hans Peter Beck and Panagiotis Charitos
  - Springer 2019, ISBN 978-3-030-52390-9 ISBN 978-3-030-52391-6 (eBook)
  - https://doi.org/10.1007/978-3-030-52391-6

- Technopolis Study on Diamond Lightsource
  - May 2021
  - Econmic imoacts and 28 case-studies from plastic degrading enzymes to new synthetic vaccines



https://www.ukri.org/news/uks-national-synchrotron-generates-impact-worth-1-8-billion/

PETRA III/ IV socio-economic study

Published recently

- Authors: Fraunhofer Institute for Systems and Innovation Research ISI
- ex-post analysis of PETRA III, ~12 years of operation of 3rd generation hard x-ray SR-source
- Ex-ante analysis of PETRA IV, 4th generation ultimate low emittance SR-source

https://www.isi.fraunhofer.de/de/competence-center/innovations-wissensoekonomie/projekte/Impact-DESY.html

Thank you