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Research Infrastructure
imPact Assessment paTHwayS

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Abstract: This report contains findings emerging from a total of 34 interviews with policy makers, funding agencies and independent experts engaged with the topic of research infrastructures and assessment of their impacts. Interviews were aimed at collecting evidence and insights on the existing practices of socio-economic impact assessment of RIs, information gaps, currently used methodologies, main challenges as well as the perceptions on the need for a common IA model. Findings from these interviews provide one of the input points for the development of a conceptual framework for the IA model (Deliverable 3.2).

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Document revision history

Date	Version	Author/Editor/Contributor	Summary of main changes
07.03.2018	0.1	Gelsomina Catalano (CSIL)	A first draft of the interviews guidelines and a preliminary list of interviewees are circulated amongst the RI-PATHS partners.
08.03.2018-11.04.2018	0.1	Elina Griniece, Alasdair Reid, Jelena Angelis (EFIS), Ildiko Ipolyi (ESF), Ildiko Ipolyi (Fraunhofer ISI), Silvia Vignetti (CSIL)	Revisions to the interview guidelines (e.g. suggesting to add a common text to introduce the project and better clarify some questions) along with comments on interviews allocation (e.g. suggesting alternative contacts and/or adding additional contacts to the list).
16.04.2018	0.2	Gelsomina Catalano (CSIL)	The final version of the interviews guidelines is circulated amongst partners.
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8.10.2018	11	Gelsomina Catalano (CSIL)	Update the list of interviewees

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List of abbreviations used in this document

Abbreviation	Meaning
CFI	Canada Foundation for Innovation
EC	European Commission
ESI funds	European structural and investment funds
EU	European Union
IA	Impact assessment
KPI	Key performance indicator
OECD	Organisation for Economic Co-operation and Development
RI	Research Infrastructure
STFC	Science and Technology Facilities Council
SWG	Strategic Working Group
UK	United Kingdom

Executive summary

This report includes findings emerging from interviews with stakeholders, such as policy makers, funding agencies and independent experts, engaged with the topic of research infrastructures and assessment of their impacts. These interviews were carried out as part of the activities planned under Work Package 3 of the RI-PATHS project, specifically Task 3.3 – Identification of needs, with the objective to map existing needs for and challenges in carrying out socio-economic impact assessment (IA) of research infrastructures (RIs).

Overall, 34 semi-structured interviews were carried out (either face-to-face or by phone) between April and September 2018 comprising the following four categories of stakeholders: i) international and EU organisations (OECD, European Commission, European Investment Bank and the European Space Agency), ii) national and regional government/funding agencies from 11 EU Member States and 4 third countries (Canada, South Africa, South Korea and USA), iii) EU and global umbrella organisations and network, iv) academic, think tanks and independent experts. Specifically, these interviews covered insights into current practices in socio-economic impact assessment and perceptions on the need and relevance of having a common model for impact assessment. RI managers were not included in the list of interviewees as they were specifically targeted by an online survey that was run in parallel.

The evidence collected from the interviews conveys the following main findings:

1. While the primary driver of RI assessment before funding decision is the assessment of the scientific case (i.e. the scientific merit), interviewees recognise the **increasing role of socio-economic considerations** for decisions on the investment in RIs. However, there are no strictly defined requirements from policy makers and funding agencies regarding IA of RIs (i.e. when to perform it, which methodologies/which impacts to look at). **For the purpose of reporting and accountability the predominant request is to track a defined number of key performance indicators (KPIs)**.

2. **Only in few countries there is evidence of a systematic approach to IA or RIs.** These **approaches** are frequently tailored to the following procedures: i) submission of a request for funding or proposal for a roadmap (in particular the ESFRI roadmap); ii) the application for funding from European structural and investment funds for major projects (operations where eligible costs are higher than €50m). Amongst the reviewed countries, **the most systematic approach to IA of RIs is applied in the United Kingdom**.

3. **There is an overall understanding on the range of the most relevant impacts RIs are likely to have on the society and the economy. Impacts related to the scientific activities of RIs are perceived as a core ingredient of the model.** These refer both to 'direct' scientific impacts (e.g. publications, patents, etc.) as well as by-products of the scientific activity (e.g. technological spillovers on firms, new start-ups, etc.)**.** Regardless of the stakeholder category, interviewees are aware that beyond scientific impact RIs contribute to human capital development, technological development and innovation, cultural outreach and competitiveness of the local economy. However, interviewees have a different understanding in the way they describe and define these impacts.

4. In addition to the mentioned impact areas, **a range of other impacts is also mentioned by some stakeholders**. These are, for example, impact on national and European regulations, impact on national and European funding decisions, impact on the formulation of international/diplomatic relationships, impact on the quality of life, impact on general public (e.g. public interest in science), etc.

5. **Different methodologies and approaches of impact assessment are used by RIs themselves and their funding agencies**. In most cases these are the result of individual ad-hoc or piloting exercises. Only in few cases they reflect the methodological frameworks of established guidelines (e.g. UK) and/or legislative framework (e.g. ESI funds regulation).

6. Despite the encouragement and even pressure from policy makers towards the quantification of impacts, there is a wide consensus among the interviewees about the inherent difficulties in purely quantitative approaches and their usability issues. **In most cases, a combination of quantitative and qualitative methodologies is applied.**

7. There is a widespread acknowledgement that **having a common model for assessing impacts would be useful** for a number of reasons which go beyond the most common rationale of supporting funding decisions. A common model could help creating sensible benchmarks for reasonable expectations on RI impacts, support prioritisation and help RI management in maximisation of impact in the future, etc.

8. **Flexibility is the most frequently named must-have ingredient of the model.** Interviewees recognise that the IA model cannot be too prescriptive. It should be viewed as common guidelines rather than a golden straightjacket for measurement as uniform impact assessment procedures are judged neither easy to develop nor to apply for RIs. The model should allow flexibility in its adoption (types of impacts, methodologies of assessment) and enable tailoring of the guidelines to the specificities of RIs.

9. **The definition of impact indicators is also a relevant must-have of the model.** The type of relevant socio-economic impacts to be included in an assessment should reflect the needs from the different perspectives of policy makers, funding agencies and RIs managers.

10. **While a common model is welcomed, some important challenges are perceived for its implementation in practice**. **Strategic and policy challenges concern those factors which relate to the mission and governance of RI.** In particular i) the interpretation of the socio-economic results should be consistent with the RI ultimate mission); ii) the assessment exercise requires coordination and common perspectives between stakeholders (e.g. in data gathering, tracking, etc.); iii) the definition of the time span for IA should be long enough to capture possible materialisation of impacts regardless of the point-in-time of the assessment; iv) reliability of the impact assessment should be ensured through an appropriate methodological framework.

11. **Practical and methodological challenges are faced during the identification and quantification of possible impacts.** They mostly relate to the need of dedicated

resources for carrying out impact assessment (e.g. for data collection) and the difficulty to measure certain impacts (because of e.g. intangible nature of impacts, difficulties in data gathering, difficulties in establishing causal links, uncertainty in the estimation of future trends, etc.).

These results well combine with the evidence from the survey and the literature review and, all together, provide a good input point to the development of a common IA model.

1. Introduction

1.1 Objective of this report

The scope of this deliverable is to present the main findings from interviews with stakeholders such as policy makers, funding agencies and independent experts, engaged with the topic of research infrastructures and assessment of their impacts. The interviews aimed at collecting primary evidence on the existing practices of socio-economic impact assessment (IA) of research infrastructures (RIs), information gaps, methodologies in use, main challenges faced as well as perceptions on the need for a common model for IA of RIs. A total of 34 interviews were carried out (see Annex 2 for the full list) in the period from April 2018 until September 2018.

Interview notes were drafted and further validated with the interviewees. In order to guarantee the confidentiality of the interviewees, the full content of the interview notes is not publicly available, thus only selected anonymous quotes are reported to support the main messages. Key information and messages were processed and then summarised in this deliverable which is organised as follow:

- Section 1 provides details on the adopted interview strategy;
- Section 2 summarises the existing national practices in socio-economic impact assessment of RIs, as well as methodologies and typologies of impacts currently in use;
- Section 3 reports on the perceived needs of having a common model for socio-economic IA of RIs;
- Section 4 illustrates the must-have ingredients of this model as perceived by the interviewees;
- Section 5 identifies the main challenges in relation to the adoption of a common a model;
- Section 6 concludes and summarises the main outcomes.

1.2 Interview strategy

The interviews were specifically targeted to collect information and opinions from policy makers, academics, representatives of thematic networks and independent experts which are (or have been in the past) involved in planning, funding and assessing RIs. To this end, the following four categories of stakeholders were identified[1]:

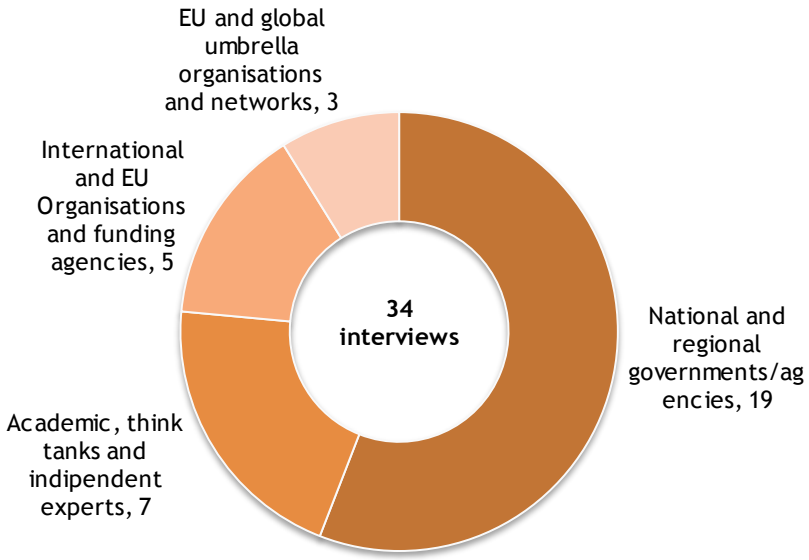
I. International and EU organisations
II. EU and global umbrella organisations and networks
III. National and regional governments/funding agencies
IV. Academics, think tanks and independent experts.

The selection of the interviewees started with the identification of a number of relevant institutions and experts representing these four categories. The initial list was fine-tuned on an ongoing basis[2] and built on specific rationales. More details on the motivation guiding the selection of each interviewee are provided in Annex 2. Overall, the broad target group allowed a rather comprehensive representation of different perspectives, contexts and roles.

[1] RIs were asked to respond to an online survey (results are presented in the Annex of Deliverable 3.2) and for this reason they were not included in the interview list.

[2] Some interviewees were suggested during planned interviews and/or while attending RIs related conferences and workshops.

Figure 1: Breakdown of interviewees by categories



Source: Authors

An important feature characterising the interview strategy is the semi-structured approach. While common guiding questions were provided, interviewers were encouraged to have a flexible approach on the subjects keeping an open discussion with the interviewees and tailoring the questionnaire (enclosed in Annex 1) according to the category and expertise of the interviewee. As a starting point, interviewees were asked to present their institutional affiliation and their position within the organisation. This first question allowed to tailor the questionnaire according to whether the interviewee's institution carries out or requires a systematic socio-economic impact assessment of RIs[3].

If the interviewee's institution had a consolidated previous experience with impact assessment, a set of questions concerning the features of their impact assessment were asked. The objective of these questions was twofold. On the one hand, they aimed at defining the type of RIs assessed, the strategic framework (drivers, interpretation of outcomes, lessons learnt) and the frequency of the assessment. On the other hand, interviewees were asked to describe the methodology used and the type of effects considered during their assessment. By answering these questions, the interviewee provided an overview of her/his experience with socio-economic IA of RIs. This allowed comparative analysis between the current experiences highlighting possible best practices and common challenges. In the case where interviewee's institution had no previous experience with socio-economic IA of RIs, further questions were asked on their knowledge and perception of this topic.

Regardless of their experience with socio-economic IA, interviewees were asked to explain their opinion on the need for a common model to carry out impacts assessment as well as to indicate the 'must-have' ingredients (mostly in terms of typologies of impacts, indicators and timing of the assessment) to be included in this model. Finally, interviewees were asked to consider more practical aspects related to the implementation of this model, such as difficulties in assessing impacts or actions to undertake in order to ensure a robust impact analysis.

[3] This question was not applicable in the case of the interviewees affiliated to a think tank.

In total, 15 interviews were carried out face-to-face. Where this was not possible, interviews were conducted over the phone (20). At the end of each interview, the interviewer drafted a brief note including the main topics and messages of the discussion. This note was sent to the interviewee for validation. As a result, potential misunderstandings were corrected ensuring that the information is accurately reported.

2. Impact assessment: practices in use

Interviews covered insights into current practices of socio-economic IA of RIs in 11 EU Member States, namely, Belgium, Czech Republic, France, Germany, Hungary, Ireland, Slovenia, Spain, Sweden, the Netherlands and the United Kingdom, and four third countries – Canada, South Africa, South Korea and the USA. Additionally, views from an international organisation (OECD), European institutions (including European Commission, European Investment Bank and European Space Agency), the European Strategy Forum on Research Infrastructures (ESFRI) as well as expert experiences stemming from the work with individual RIs have been considered in this synthesis.

1.3 Impact assessment requirements

While generally the primary driver of RI assessment before the funding decision is the assessment of the scientific case (i.e. the scientific merit, usually assessed through a peer review exercise), interviewees recognise that considerations related to socio-economic impact are gaining momentum in the recent years as a necessary complementary element of RI performance.

In most of the reviewed countries, **there are no defined requirements by policy makers and funders regarding the impact assessment of research infrastructures** (i.e. when and how to perform it, which methodologies/which impacts to look at), and the current treatment of RI impacts remains rather unstructured. In terms of reporting and accountability, the predominant requests from policy-makers and funding agencies for operating RIs include **tracking a defined number of key performance indicators (KPIs)**. While RIs are being encouraged to tackle impact assessment, the evidence collected shows that there are no specific requirements to systematically carry out in-depth studies on long-term impacts. Only in few cases - mostly at the EU level (see the discussion below) - this occurs.

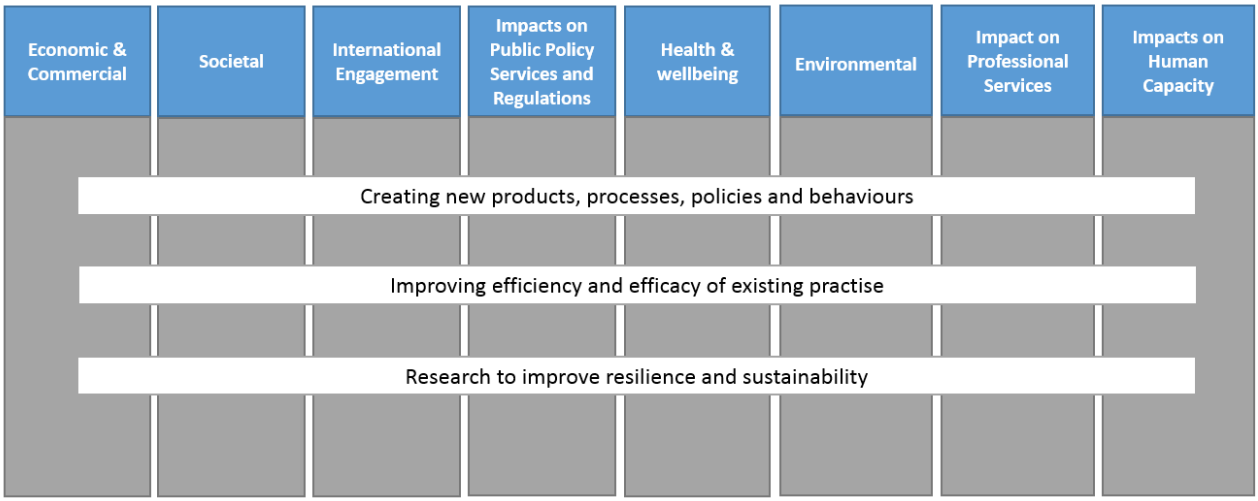
The most systematic approach to impact assessment of research infrastructures at the national level (among the countries covered by the interviews) is applied in the United Kingdom. The UK Science and Technology Facilities Council (STFC) has been pioneering in this regard. The Council has developed an impact framework and evaluation strategy distinguishing among three impacts areas - research, innovation and skills. Indicators used during the assessment fit in within these three areas (e.g. technological development, human capital formation, knowledge output, etc.). Accountability is certainly the main rationale for carrying out impact assessment in this country but not the only one. Quoting an interviewee, "*every time when signing an investment case, the government wants to have a business case*", however "*impact assessments are also important for the advocacy future funding, i.e. to see what RIs are doing and if they are actually doing what they've promised at the funding stage*". A large amount of assessments is increasingly carried out also at an ex-post phase. Annual impact assessment reports are done internally by the STFC, but these reports do not drive future investment, they are simply meant as a summary to policy makers and the general public.

However, beyond this internal impact assessment exercise, large evaluations are usually outsourced to external consultants to provide an external validation.

In other EU countries the impact assessment practices appear to be less methodical.

For instance, in **Ireland RI assessments are also carried out on an annual basis, but the approach is much less prescriptive**. RI managers are invited to select one or more dimensions (see Figure *1*) to develop an impact statement, which tend to be descriptive self-declarations. Longitudinal reporting is considered very important and researchers are encouraged to track publications, report on industry engagement, etc. There is an obligation to report for up to 10 years after the funding award.

Figure 1: Impact categories in Irish approach to IA of RIs



Source: Science Foundation Ireland

While French authorities are interested and have inquired RIs on the national roadmaps about their approach to impact assessment, it is not yet a mandatory requirement. In **France, RIs may be subjected to a socio-economic impact assessment at specific stages of their lifecycle**, for instance, in case of new implementation and major upgrades, but not during their operational phase.

In **Germany impact assessments for operating RIs are not yet requested**. Regular reporting is required only on the use of the facilities and outreach activities. RIs are encouraged to conduct more in-depth impact assessments, where appropriate, to be able to demonstrate their positive impact on science and society. More stringent rule is that governing bodies of large RIs are asked to take care much more about innovation aspects that relates closely to one specific area of socio-economic impact. Thorough procedures are put in place only for evaluating RI concept proposals in the framework of the national RI roadmap. The evaluation procedure includes also aspects of socio-economic impact that are appraised before a funding decision.

In **Spain impact assessment is not a formal requirement**, yet studies are being carried out on a case by case basis without a unified methodology. Socio-economic arguments are occasionally used for securing funding decisions.

No systematic impact assessment is carried out also by the central authorities of the Czech Republic, despite the perceived need for such exercises. There have been several attempts to develop this topic specifically in relation to RIs which are funded by the European structural and investment funds (ESI funds) and for which specific assessment requirements apply in the case of major project operations. Also, interim evaluations contain certain elements of an impact assessment. RIs are requested to fill out a formalised self-assessment report to the responsible ministry on an annual basis. In addition, there are two site visits envisaged by an international team for peer review where the panel looks beyond the formalised outputs (e.g. papers, patents, etc.) into broader impacts (e.g. on the career of the students involved, on collaboration with industries, etc.).

In **Sweden, socio-economic impact assessment is carried out on a semi-regular basis**, thus meaning every time that a RI applies for funding. More specifically, where grants are provided through a re-application process (i.e. not on an open-ended basis, but every 2-8 years a new application is submitted), socio-economic impact is assessed either at the RI project application or at the re-application stage. In each proposal, a section on socio-economic impact has to be filled in. As there are no detailed guidelines from the Swedish Research Council on neither how to account for nor how to evaluate the socio-economic impact of RIs, the evaluation grades are judged as rather arbitrary. Moreover, results of these exercises are not used in a structured manner by policy makers. The influence of this evaluation on the decision-making process is indeed limited.

Slovenia and Belgium do not have a national practice for impact assessment of RIs, but ad-hoc impact studies have been done for joining large international RIs like CERN and BBMRI-ERIC. **In the Netherlands,** systematic impact assessments are not carried out but many aspects related to the assessment of impacts are required to RIs in their application for funding. **Practices in Hungary remain more KPI-driven**, despite the acknowledgement of the need for more comprehensive approach to socio-economic impact assessment.

Outside Europe, the approaches to IA of RI of **Canada, South Korea, South Africa and the USA** have been looked at in more detail. The **Canada Foundation for Innovation** (CFI) does not require a systematic impact assessment from the funded RIs. Similarly, as in other EU countries, all funded RI projects are requested to fill out an annual form with defined KPIs. These quantitative values are supplemented by document review, cases studies and interviews done by CFI. The Foundation also undertakes thematic impact assessment projects, for example, in specific areas of research, like agriculture, medical imaging, on specific target groups like trainees, or early career researchers, or clusters of awards. These assessment help CFI to identify and demonstrate where and how funding had led to specific outcomes.

In **South Korea** RI assessment is a requirement and it is focusing on the performance of the facility. Impact assessments are performed, but they vary in the applied methodologies. The primary focus is put on collaboration with industry. Each RI has its individual KPIs that are specifically assigned. These indicators are submitted through an online system to the agency responsible for investment in research for all Korean RIs organisation which - on the basis of an algorithm - calculates RIs rankings. This sensitive information is not communicated to RIs but used just for policy planning. Currently a facility-based evaluation is piloted that is planned to become an annual exercise.

South Africa places great attention to socio-economic impact assessment as a practice which can contribute with its results to the development of the country (e.g. helping understanding the consequences of investments and/or prioritising investments which can have positive return on country and its economy). RIs are assessed for their potential to deliver socio-economic benefits in the area where it is located. For instance, a recent study has been carried out to investigate the socio-economic impacts of the South African component of the SKA Phase 1 development. Long-term effects are assessed by external consultants as part of the feasibility study phase. Monitoring and short-term evaluation are instead done internally. The Department of Science and Technology have a systematic data-collection regarding RIs and is currently interested in developing a model able to quantify the return on investment (taking into account the costs and benefits) of research infrastructure.

The US National Institute of Health (NIH) did not provide evidence on systematic socio-economic IA of internal research projects and activities. Some aspects are taken into account during the selection of research project to be financed. For instance, environmental implications, possible risks to human and animal health are considered before awarding research grants.

More systematic requirements of socio-economic impacts assessment of RIs requested at EU level.

The first example is provided by **ESFRI** which includes the socio-economic impact assessment amongst the key information to be submitted along the proposal for being included in the ESFRI Roadmap. Results from this assessment are taken into account by the Strategic Working Group (SWG) for the evaluation of the scientific case along with other dimensions (such as scientific excellence, pan-European relevance and e-needs)[4].

A further example is provided by **the European Commission DG Regional and Urban Policy** which requires the submission of a quantitative assessment of impacts in the framework of funding application for major projects (operations which eligible costs are higher than €50m, Art 100-103 of EC Reg. 1303/2013). DG Communications Networks, Content and Technology is mainly looking at traceability of e-infrastructure usage and their scientific impact. More concrete requirements and guidelines for scoping socio-economic impact are not yet developed. |

The **European Investment Bank** (EIB) also carries out systematic impact assessments studies in relation to both grant and loan decisions for projects in the area of research, innovation and technological development. In these cases, the assessment of the net contribution of the project to the wellbeing of society as well as the EU objectives is among the information basis backing the financing decision.

Socio-economic impact assessments are also carried out by European Space Agency (ESA). One study is typically scoped with a time-frame of about 6-12 months. Since 2014, it has created a dedicated function to coordinate and harmonise the socio-economic impact assessment capabilities existing across the agency.

[4] ESFRI (2016), Public Roadmap 2018 Guide. For details, see:
http://www.esfri.eu/sites/default/files/docs/ESFRI_Roadmap_2018_Public_Guide_f.pdf

1.4 Methodologies applied for socio-economic impact assessment of RIs

Regardless the specific requirements, different methodological approaches are used for the socio-economic IA of RIs. In most cases, they are the result of individual or piloting exercises. Only in few cases, impact assessments are embedded in established guidelines and/or legislative framework.

In the UK, the government published evaluation guidelines: The Green Book[5] (last edition in 2018) provides guidance on how to appraise and evaluate policies, projects and programmes; and **The Magenta Book**[6] (last edition in 2011) provides guidance on what to consider when designing an evaluation. These guidelines rely on mixed methodologies although insisting on the quantification of impacts mostly through CBA. By quoting interviewees, the "*UK Government pushes for some kind of cost-benefit analysis (…) From the policymakers' perspective this exercise is nice as it tries to put the numbers towards the impact. The UK government has incorporated this approach in its evaluation framework. The framework basically says that it is difficult to use CBA but please try*". In practice, where it is difficult to put numbers qualitative methodologies are used as a complement.

Further examples come from the **EU institutional context.** CBA is currently officially adopted to assess major infrastructure projects - including those in the RDI sector - funded by the European structural and investment funds.[7] Since 2000, a significant number of RIs in the EU received funding also based on the results of a CBA proving they were providing net socio-economic impacts to the society. Main principles of the CBA are enshrined in the secondary EU legislation[8] while non-legislative guidance documents are also provided[9]. In the last edition of the CBA Guide a customised CBA framework to assess the socio-economic impacts of RI has been developed, with the support of the EIB Institute.[10]

The 2016, ESFRI roadmap also recognised the contribution of CBA in providing robust evidence on the assessment of socio-economic impacts of RIs. Moreover, the H2020 Work Programme 2018-2020 as well as the *Questionnaire for submission of proposals* to the ESFRI Roadmap 2018[11] now explicitly indicates the CBA as a basis for the Preparatory Phase of new ESFRI projects.

A boost for the development of specific methodologies in Czech Republic were given by the need to submit applications for funding of RIs through the ESIF in a moment when specific CBA guidelines for RIs were not yet available. Methodologies for the impact assessment of RIs have been specifically developed in Czech Republic. These are mostly focused on capturing the qualitative aspects of RIs.

Several examples of piloting studies were mentioned during the interviews. An example was found in **Canada**. The first (and only so far) return-on-investment type study was conducted in Canada in 2013 with the help of an external contractor.

[5] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent
[6] https://www.gov.uk/government/publications/the-magenta-book
[7] Art. 100-103 of Regulation (EU) No 1303/2013
[8] Implementing Regulation N. 207/2015
[9] European Commission (2014), Guide to Cost-Benefit Analysis of Investment Projects.
[10] Some references include: Florio, M., and Sirtori, E. (2016). Social benefits and costs of large-scale research infrastructures. Technological Forecasting and Social Change, 112, 65-78; Florio, M. Forte, S. and Sirtori (2016). Forecasting the socio-economic impact of the Large Hadron Collider: A cost–benefit analysis to 2025 and beyond, Technological Forecasting and Social Change, 112, 38-53.
[11] Available at: http://www.esfri.eu/sites/default/files/u4/ESFRI_Roadmap_2018_Proposal_Submission_Questionnaire_Public.pdf

Another interesting approach applied to the impact assessment of RIs has been found in the **United States.** An expert consortium that convenes a core group of nearly 20 social and earth scientists around the United States is working on new and existing methods in the science of the **value of information (VOI)**, an approach that is widely used in finance, engineering, information technology, risk assessment and management, and other business and scientific domains. In the case of space activities, a broad range of methodologies are applied depending on the activities, the type of impact to be measured, as well as the perspective of measurement (ex-post or ex-ante). **Strategic foresight (technology foresight or participatory)** are generally used to support or complement specific elements of ex-ante assessments.

In most cases, a **combination of quantitative and qualitative methodologies is applied**. Societal impacts are frequently approached through case studies. Data is occasionally complemented with expert interviews to define hypothesis, explain a specific context or evolution in a specific technical domain, validate assumptions, etc.

Policy makers seems to be more open to quantitative approaches since this would facilitate benchmarking and prioritisation of investments, an important objective of socio-economic impact assessment in their perspective, as pointed also below. Despite the encouragement and even pressure from policy makers towards the quantification of impacts (e.g. by means of CBA), **there is evidence amongst the interviewees pointing towards the inherent difficulties in purely quantitative approaches and usability issues**. To quote some interviewees:

- "*A good approach to evaluation of RIs is to focus on quantitative measure of impacts. Depending on the case, this information can be combined with qualitative assessments provided by means of panel's opinions (e.g. ranking based on assessment of scientific community), storytelling approach. Qualitative information should help in describing what are the key successful elements of RIs in achieving certain impacts*".

- *"There are also challenges linked to individual methodologies. For example, in CBA you meant to capture all the costs that contribute to RI. It's not always easy. Also setting a scope and parameters for the assessment. In our case, it is because many players involved in making investments and we might not feel confident in the data. CBA might sound easy, but it isn't as straight-forward*".

- *"The CBA hardly depicts and analyses the mechanics and logics behind the socio-economic impact of a research infrastructure*".

- "The CBA was certainly providing some level of justification for the investment, but in a way that was disconnected from the reality of the investment as the list of indicators suggested in the guidelines of the Managing Authorities were typically relating to outputs that are hardly predictable."

1.5 Types of impacts assessed

The impact areas that currently are either measured or looked at in more general manner in the reviewed national and international RI impact assessment practices cover the following impact areas:

- Scientific impacts and theoretical knowledge output
- Direct job creation and employment effects
- Multiplier effects through the income generated by employment
- Standardised procurement at local/national businesses, especially SMEs
- Technological development and transfer (e.g. licensing)
- Spin-offs and commercialisation
- Spill-overs through collaboration with industry/use of facilities
- Innovation impacts from qualified procurement
- Impacts on quality of life (culture, general attractiveness) and tourism
- Attracting foreign researchers and engineers
- Formal and tacit skills formation
- Training of technical staff
- Training of Master and PhD students
- Contribution to external curricula
- Impact on professional services
- Impact on national and European public policies and regulations
- Impact on national and European funding decisions
- Impact on formulation of international/diplomatic relationships
- Impacts on general public (e.g. outreach and science literacy, public interest for science)
- Environmental impacts

3. The need for a common IA model

There is a widespread acknowledgement that it is important for a region and a country to know something about the impact that a hosted research infrastructure may have on their territory. Generally, interviewees recognise that a common model for the socio-economic impact of research infrastructures would be useful, both for assessing the performance of existing RIs as well as for taking decision on financing new ones. Beyond its relevance for supporting funding decisions, interviewees point to a number of other reasons which make a common model desirable. Among these are:

- A systematic evaluation tool that can be consistently applied to all RIs. If assessment is carried out regularly and according to a consistent methodology, performance over time could be well evaluated.
- Clear guidelines, solid methodology and easiness of use for impact measurement would incentive more RI stakeholders to apply the model in practice.
- A more uniform model would enable quantifying the social return on investment (through the estimation of social cost and benefits) in order to prioritise investment and support long-term planning. It will also be helpful for a comparative evaluation of different RIs.
- A common model for the measurement of impacts could help to create sensible benchmarks by eliciting realistic expectations of what specific RIs can deliver. Quoting one interviewee, "*an important task of a theoretical model would be to match specific types of RIs against a specific set of expectations about reasonably achievable impacts*".
- It would increase the awareness of both RI management and other stakeholders, in particular policy makers and funders, about the underlying impact pathways and value and/or impact chains. Or as one interviewee put it, "*measuring impacts is important but making them larger and higher is the challenge*", thus first of all "*an impact assessment has to be useful for the RIs themselves as well as the other stakeholders*".
- Common guidelines would allow to develop also more standardised description of the content for RI impact strategy. They can serve as a basis for RI stakeholder analysis that shows the processes how impacts are created, diffused, and how they eventually could be maximised in the future.
- Common approach would enable learning among agencies on IA of RIs that has an inherent value.

Only one interviewee was of an opinion that "*more structured procedures for socio-economic impact assessment are generally not considered desirable*" since they are perceived to be problematic in fitting well with the specificities of RIs (e.g. fields of activities, etc.).

Asked about the main mechanisms of how to incentive the adoption of a common IA model, interviewees name clear funding agency requirements at the proposal stage to include ex-ante socio-economic impact assessments (like ESFRI is currently doing), requirements from policy makers to adopt such practices and the use of persuasion power of influencers in the RI community. One interviewee cautioned about the obstacles in political acceptance of certain unified schemes suggesting that careful explanatory work should precede any top-down requirements (see Section 5 for more details).

4. The must-have ingredients

As mentioned in Section 1.2, one of the key objectives of the interviews was to identify those features which are perceived as the key ingredients that a common model for IA of RIs should have. Interviewees were given the opportunity to describe their preferred ingredients of the impact assessment model. They were asked to provide their opinion on the typology of impacts, structure of the model and other features. Overall, there was a general agreement on the following key findings.

1. The common model should be flexible and guide the assessment

As reported in Section 3, there is a wide consensus on the strategic usefulness of having a common model for the assessment of RIs impacts. However, when asked about the design of the model, the majority of the interviewees point out that one 'must-have ingredient' should be **flexibility**. According to the interviewees, this can be achieved as follows:

- Firstly, several interviewees expressed their concern about having a 'one-size-fits-all' model. They stressed that impacts are inherently linked to RI specific features (e.g. nature, domain, objectives, etc.) and introducing a unique set of impacts to be assessed may be a major limitation for its adoption in practice. Instead, a **modular approach is welcome** allowing to tailor the assessment according to the RIs types and defining features.

- Secondly, the **common model should not be too prescriptive but rather be viewed as guidelines**. There is a common understanding that having a systematic impact assessment is good, but this should not become too burdensome for RI management, especially when considering the underlying difficulties in identifying (and eventually measuring) possible impacts.

While ensuring the flexibility of the model in its implementation, one should not jeopardise one of the rationales of having a common model, which is to allow benchmarking and comparability of RIs. There is evidence pointing towards **finding a balance between these two perceived needs**. On the one hand, the model should lay down a common framework for the type of impacts which are relevant to be assessed – reflecting the real information needs for policy makers and RI managers – and guide on the assessment of these impacts (e.g. providing a common methodological approach). On the other hand, flexibility should be allowed to tailor the model to the specificities of RIs by focusing on those impacts which are more relevant according to the activities of a specific RI and applying the methodological approach for which data and information are actually available.

2. Impacts related to the scientific activities of RIs are perceived as the core ingredient of the model

There is a long-lasting and wide-spread practice amongst national and international funding agencies in prioritising scientific excellence amongst other criteria in support of financing decisions. Quoting one interviewee from a national funding agency, "*if a research project/infrastructure does not meet scientific excellence requirements, it is unlikely to be funded*". Another interviewee confirmed that the assessment of the scientific case is the driver of funding decision. This well-established priority for scientific excellence is reflected in an

overall preference for including science-related impacts in the model since the key objective of RI is to deliver new scientific knowledge.

When coming to purely scientific impact, there is a divergence in understanding what they represent and how they can be measured. Some funding agencies pointed out that the *value of publications* can be a good proxy for assessing scientific impact. Indeed, many RIs and funding agencies monitor the number and the ranking of scientific publications (sometimes using software such as Research-Fish). *The value of the new patents* filed thanks to the research carried out in the RI is mentioned as another 'direct' scientific impact.

Besides these impacts, most of the interviewees also pointed out that RIs are likely to generate impacts which are often described as by-products of the scientific research. In most of the cases, they comprise *innovation and technological spill-overs on firms* and the possible creation of *new start-ups*. Indeed, many interviewees agreed to the fact that RIs are extremely likely to shift part of their knowledge to industrial use. This is particularly evident in some scientific fields, such as the aerospace, characterised by significant R&D spending. Interestingly, a national funding agency recommends assessing possible impacts on RI's 'scientific reputation' in terms of networking and collaborations.

It is interesting to note that also several independent experts agreed that science-related impacts should be included in the model. One academic included the value of publications in his assessment of RIs even though this impact had been discussed only from a qualitative stand-point. Another academic expert pointed out that scientific impact should be included but it is not exhaustive for an overall assessment of RIs. Even though to a lesser extent, also academic and independent experts, in addition to policy makers and funding agencies, consider scientific and science-related impacts as relevant.

3. The types of relevant socio-economic impacts to be included in the model change according to stakeholders' perspective

Most of the interviewees acknowledge that RIs are likely to generate impacts which go beyond science. The assessment of these impacts is perceived as relevant by the majority of interviewees, regardless of the category they belong to. Their perspective may be different when it comes to the list of impacts to be assessed since it can be influenced by current practices or interests.

The following impacts have been mentioned by interviewees from funding agencies and national and regional governments:

- *Impacts on firms*. It refers to the economic returns arising from the involvement of private firms in the RIs' construction and operation. This is likely to boost the demand of highly specialised goods which would not have a market otherwise. The challenge of supplying goods and services to RI may bring economic return to the firm but also act as driver for enhancing economic competitiveness of the region.
- *Impacts on the labour market.* RIs may create employment for skilled and unskilled labour. Most of the interviewees agreed on the fact that employment impacts shall be included, especially in terms of new possibility for researchers and scientists.
- *Impacts on tourism and related economic activities.* Some interviewees recognise the potential of RIs to act as a touristic attraction point of a region/country and therefore

impact the tourism flows and consequently the economic activities of the area concerned.

- A government agency stated that – like all infrastructures – also *RIs shall be assessed for their impact on the so-called triple challenges*. In other words, at least for developing countries, the IA model for RIs may include considerations how research infrastructure can contribute towards the reduction of poverty, unemployment and inequality.

Interviewees point out that the *geography of impacts is something that should be tracked*. They recognise that assessing the socio-economic impact for a region or a country is worth even in the case funds are allocated to a RI which is located elsewhere. As illustrated by an interviewee, it is interesting to assess the return to the national economy of participating in international RIs and ESFRI/ERIC projects. Similarly, another interviewee pointed out that that the geographic dimension is also relevant for understanding tax impacts. For instance, council taxes may be used to support RI facilities having an international users' pool.

A number of interviewees also consider it is worth measuring impacts on the wider community. This perspective is more prevalent amongst independent experts as well as think-thank organisations. The following impacts are mentioned:

- *Educational impacts and human capital effects.* This type of impact is inherently wide-spread as RIs often host international students and researchers. As claimed by one interviewee, any additional students or researchers using a RI brings a benefit to the wider society. Interviewees from a national funding agency running its own PhD programme in partnership with several RIs in the country confirmed that there is indeed a human capital effects on PhD students from using cutting-edge RIs. While this impact is widely recognised, many interviewees express their concern over its quantification.
- *Value of information*. This type of impact is mentioned by an independent think-tank. In economics, value of information (VOI) is intended as "*the gain that results from making better decisions that are based on additional information in the presence of uncertainty*". This impact may, for instance, concern policy makers that need to make decisions on the basis of research results. There is evidence of VOI estimation by using information from earth observation. VOI concerns not only scientific themes but also information available to the general public (such as maps, whether forecasts…).[12]
- *Impacts on the community through social media*. This is referred to be a good proxy to estimate the public relevance of a RI.

[12] The consortium (which name is kept confidential) is developing a model to assess Earth Observation science from the point of view of Value of Information. In general, VOI is likely to be large when 'there is a lot at stake', i.e. when different actions may lead to opposite outcomes (good versus bad) under different states of the word, the VOI is higher[12]. Another generally valid consideration is that prior beliefs lead individuals/decision makers to choose actions with much worse outcomes that what one would choose under perfect information. At the same time, it can be stated that observations strongly influence prior beliefs.

5. Challenges

After having discussed the potential benefits of a common model to assess the impacts of RIs, interviewees were asked to identify the most important challenges for its practical implementation. Broadly speaking, the nature of these challenges is twofold:

- **Strategic and policy challenges** which might hamper the integration of the impact assessment in the mission and governance of RIs.
- **Practical and methodological challenges** which RIs may face during the identification and measurement of possible impacts.

Starting with the **strategic and policy challenges**, several interviewees have pointed out the following issues:

***a*. The interpretation of the impact assessment of RIs should be in line with their core mission**

There are some concerns about the possible use of the socio-economic impact assessment. One representative of a national funding agency claims that socio-economic impacts should not be the only criterion for funding basic research. Another interviewee highlighted the risk of creating perverse incentives. Indeed, if scientific research is measured and valued in terms of socio-economic impacts, researchers may be influenced at aiming to reach best evaluation score rather than increasing scientific excellence. A funding agency outside Europe warned that an open evaluation may create undesirable competition amongst RIs. As one interviewee coined it, "*another big challenge: there is a real desire to compare the data, assessments, infrastructures*." Against all these concerns, there is a consensus that it is important to find a suitable strategic dimension for the interpretation of results. Several interviewees pointed out that – together with the scientific considerations – the results of the socio-economic IA can have an important role for planning and financing purposes (i.e. they are perceived as more comprehensive than cost-effectiveness analysis), provided that it is based on rigorous criteria and credible methods reflecting RI core mission (i.e. supporting high quality scientific research).

***b*. A common model for the socio-economic IA of RIs requires coordination and common perspectives between stakeholders which are not currently in place**

Funding agencies generally take a national/regional perspective on the topic of IA of RIs. As one interviewee summarised it: "*The perception of RIs is not yet converging in Europe. In some countries RIs are still considered as toys for researchers. Other countries have already developed an approach where they really consider RIs as strategic investments similarly to e.g. railroads*". Also, the status of RIs is differs across countries. For example, in the Czech Republic RIs are well-defined in the public research funding, but they are not legal entities. RIs still have the status of a project (i.e. based on grant funding scheme with a clear beginning and a clear end) that complicates the adoption of long-term strategic decisions.

The diversity of perspectives come into play also when assessing the impact of distributed RIs or international RIs (e.g. CERN) as it demands coordination between a large group of stakeholders and is perceived as very challenging. However, if impact assessment is carried out following a sound common methodology, it may eventually boost cooperation strengthening the scientific community. Even though it is perceived as a challenge, the introduction of a common system is

perceived as a good opportunity to find a common ground. Quoting one interviewee, "*we need to think collectively. It's challenging as there is a competition for resources. The more we can share the info, the more we can be transparent and open, the more we can improve. It's the whole shift towards better tracking of certain things and making sure the data tracked is the most useful.*"

***c*. The time dimension requires a careful consideration**

While any impact assessment exercise shall have a predefined and finite time horizon, visible outputs (e.g. the diffusion of scientific knowledge created using RI) may materialise in an indefinite future. Addressing the time dimension may be a major challenge. Many RIs are engaged in fundamental research activities which are not likely to produce visible results in the short term. For instance, in the aerospace industry, products market develops so rapidly and unpredictably that any long-term forecast is unlikely to be accurate.

This challenge can be faced whatever is the 'point-in-time' of the assessment, i.e. both for the assessment carried out before an RI is constructed (ex-ante), during its operation (in itinere) or even after the main operational phase (ex-post). In all these cases the perspective of the assessment should be long enough to capture the possible materialisation of impacts. Impacts with indefinite timeframe may be discussed from a qualitative standpoint as many interviewees warned that excessive quantification can be counterproductive.

***d*. Appropriate methodological framework is necessary for the reliability of an impact assessment**

Many interviewees acknowledged that the IA of RIs is an ambitious task. Histories of various case studies show that many reports have clearly too optimistic estimates of impacts. A well-defined model can be a good solution to have realistic and comparable results. The model should define a clear scope for application and appropriate methodological toolbox so that the evaluator can have reliable guidelines. Such a model would prevent conceptual weaknesses and possible exaggerations. This means that a more uniform approach is applied by taking into consideration the specific features of RIs.

As part of the guidance and methodological framework, the model should help RIs defining their impact strategy and have a clear understanding of the actual meaning of an impact. As one interviewee suggested this could be achieved by "*categorisation of all types of interactions RIs can have with their stakeholders and an analysis of how impact gets disseminated and maximised within the context of those interactions*". This strategy should not be only a list of indicators or associated to communication strategy. It should include a stakeholder analysis and how the RIs impact on them.

Moving to the **practical and methodological challenges**, the most significant concerns are listed below.

***a*. Impact assessment may require dedicated resources**

It is recognised that an effective impact assessment is data-intensive, and stakeholders are aware that socio-economic impact assessment is likely to require data and information which are beyond the current reporting duty of RIs (i.e. standard KPIs). As one interviewee concluded,

"*defining the decision context is not always a straightforward task and the challenge of carrying out an impact assessment is generally underestimated*".

Given the importance of the impact assessment, some interviewees argued that additional resources shall be provided to RIs for carrying out this task. These additional resources should allow RIs to develop consistent and harmonised methodologies for impact assessment and data generation. As described by a funding agency, the risk is that the data-collection draws resources away from the RI primary task, namely scientific research. One interviewee stated that additional resources are not likely to be significant (i.e. there is no need for a new position 'RIs impact assessment officer') and evaluation can be outsourced. However, it appeared that there is the general feeling that the current RIs' budget is not sufficient to finance extra-tasks including impact assessment.

***b*. Some impacts are difficult to measure**

There is a wide consensus amongst interviewees about the challenging task of measuring certain impacts. This can be related to the following main reasons:

- **The intangible nature of certain impacts** makes the impact measurement very challenging. An example pointed out by one interviewee is "*how to measure impacts on the quality of life*".

- **Difficulties to establish causality in impact chains.** It refers to the challenge of relating a certain impact to the activity of an RI. Technology spill-overs is mentioned as an example in this regard. The measurement of such impact implies tracking unpredictable patterns of transmission and use of scientific results. In some cases it can be tricky attributing a given technological spill-over to a single RI as it is mostly impossible to trace back its origin.

- **Difficulties to gather relevant data (e.g. on counterfactual).** For certain impacts, it may be challenging to gather relevant data for their measurement. An example mentioned by interviewees is impact on human capital. While recognised as an essential ingredient of the IA of RIs, interviewees found that in practice it is very difficult to grasp the real added value of RIs in this regard, since it would require to define a suitable counterfactual scenario, tracking people's career, etc.

- **Uncertainty and related risks in estimating future trends.** Interviewees notes that it is challenging to carry out an accurate foresight exercise. In Germany, this has been done through a Delphi method which has allowed to develop a common cost estimation and risk evaluation. In other countries, such as the US, uncertainly quantification has been tested with structured expert judgement and risk portfolio management.

- **Capacity building and technical assistance is needed for RIs**. The measurement of certain impacts may require some time and skills to make the methodology applicable in practice. An interviewee from an international funding agency warned that methodologies beyond monetisation - such as "*non-use value, existence value, value of knowledge, development and valuation of skills and knowledge, value and impact of inspiration*" - are not commonly used and known amongst RIs so they may require more

time to be introduced. Several interviewees said that is preferable to go for a narrative description rather than an unrealistic quantification of some impacts.

6. Conclusions

While recognising the role of the socio-economic IA, interviews confirm that there is limited evidence of systematic implementation of this practice. Only in few cases, there are defined requirements regarding the IA of RIs (e.g. when and how to perform it). Certain impacts of RIs are recognised to be relevant and already assessed to some extent, through different methodologies.

The idea of having a common model is welcomed and supported by the majority of interviewees. The perceived need for such a model goes beyond the common rationale of supporting funding decisions. Among other considerations, the IA model could help creating sensible benchmarks for reasonable expectations on RI impacts and support RI management in maximisation of impact in the future. When discussing the design of the model, it is perceived as a common framework guiding the assessment of impacts while ensuring flexibility in its implementation to reflect the specificities of RIs.

Findings from these interviews – the perceived needs, the must-have ingredients of the model and the main challenges faced for its implementation – will be used for drafting an initial heuristics for the model (Deliverable 3.2) and in further discussions with RI stakeholders (through participatory workshops convened under Work Package 4 tasks). RI stakeholder reactions, elaborations and substantiation of the messages expressed in this report will be taken up in the work on the development of a common impact assessment model.

Annex 1: Semi-structured questionnaire

Ask about the nature and role of the institution the interviewee represents and its relationship with RIs.

1. Does your institution carry out/require a systematic socio-economic impact assessment of RIs? *(start from asking this question only if applicable to the stakeholders interviewed (e.g. not applicable for category IV), otherwise start from Question N.2)*

***If the answer is YES**, focus on the following questions:*

- Which RIs do you assess (e.g. type, scientific domain, type of service provided etc.)?
- What are the main driver(s) to carry out a socio-economic impact assessment (e.g. accountability purpose, financing decision, etc.)?
- Who carries out the socio-economic impact assessment (e.g. there is a dedicated department/division/working group within your institution, external institutions/consultants, etc.)
- Can you describe the methodology used to carry out socio-economic impact assessment of RIs (e.g. GDP/employment multiplier, cost-benefit analysis, qualitative narrative, etc.)?
- Which impacts do you usually assess (e.g. Technological development, Human capital formation, Knowledge output, impacts from procurement, Outreach and Cultural Impacts, other)?
- Which indicators do you use for measuring RIs impacts (if needed, during the interview cite some examples of indicators referring to different impacts assessed)?
- When Is the socio-economic impact assessment of RIs carried out (e.g. ex-ante, in-itinere, ex-post)?
- How often is the socio-economic impact assessment of RIs performed (e.g. on a regular basis, on specific request, etc.)?
- Are the results taken into account to guide decision making for RIs (e.g. funding, setting strategic priorities, roadmap, etc.)?
- Which lessons can be drawn from the implementation of your approach?

If the answer is NO, skip to question N.2

2. Do you think it would be useful? Do you know any example/previous exercises of socio-economic impact assessment of RIs? If yes, in your opinion which positive or negative lessons can be drawn from these exercises?

3. From the perspective of the institution you represent/From your experience (e.g. for Category IV), what is the strategic relevance and the need of having a model for the socio-economic impact assessment of RIs?

4. Focusing on the 'must ingredients' that the Impact Assessment model should have from the perspective of your institution and/or from your previous experience in this field, what do you suggest in terms of:

   - Typologies of impacts to assess
   - Typologies of indicators (cite some examples of indicators to guide the interview)
   - Timing of the assessment

5. Focusing on the design of the model for the socio-economic impact assessment of RIs, in your opinion what are the most difficult impacts to assess and why (e.g. data availability, etc.)? In answering this question, please consider the different typologies of RIs and/or scientific domains, etc.

6. Which actions might be required to the different stakeholders (e.g. RIs, funding agencies, international organisation, umbrella organisation, etc.) to develop and make systematic use of a model for the socio-impact assessment? For instance, in terms of legislative requirements, data collection/monitoring, reporting activities, etc.

Annex 2: List of interviewees

CATEGORY	NAME	AFFILIATION	POSITION	RESPONSIBLE	DATE	Mode	Rationale for Selection
International and EU Organisations and funding agencies	Augusto Burgueño Arjona and Enrique Gomez	European Commission, DG Connect, e-Infrastructure and Science Cloud Unit	Head of the e-Infrastructure and Science Cloud Unit	EFIS	31.05.2018	Phone Call	Mr. Burgueno Arjona is Head of the e-Infrastructure and Science Cloud Unit within DG Connect (EU Commission). This unit specifically deals with the coordination of the European Cloud initiative and its governance, which includes the establishing of funding models. Mr. Enrique Gomez is Programme Officer within this unit and specifically oversees the progress of key e-Infrastructure projects (such as GÉANT, EGI & INDIGO-DataCloud) under EC Horizon 2020 Framework programme.
International and EU Organisations and funding agencies	Witold Willak	European Commission, DG Regional and Urban Policy	Deputy Head of Unit F.1 Competence Centre Closure and Major Projects	CSIL	12.09.2018	Face-to-face	DG Regional and Urban Policy is responsible for the EU Commission's policies on regions and cities. Mr Witold Willak and specifically his unit is responsible for the coordination of major projects, including the appraisal of major projects submitted for ERDF/CF financing. Witold is also in charge of JASPERS initiative, set up together with the European Investment Bank. He was responsible for coordinating all work related to the updated Cost-Benefit Analysis Guide 2014, and before he had been a programme manager responsible for operational programmes and

							projects in Czech Republic and Poland.
International and EU Organisations and funding agencies	Davide Sartori	European Investment Bank JASPERS – Networking and Competence Centre	CBA specialist	CSIL	30.08.2018	Phone Call	JASPERS – Networking and Competence Centre provides capacity building support and advice to EU Member States on horizontal issues, such as cost-benefit analysis, climate change, state aid or environmental issues, relevant to more than one project or more than one country. Davide Sartori is an expert in appraisal of development projects and in financial, economic and risk analysis of infrastructure investments. He is the lead author of the last edition of the EU Guide to Cost-benefit Analysis of Investment Projects. In the last years, he was appointed by several International Financing Institutions to appraise and/or evaluate their projects.
International and EU Organisations and funding agencies	Charlotte Mathieu	European Space Agency	Head of Section for Industrial Policy and Socio-economic Impact	ESF	23.07.2018	Phone Call	ESA's mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. In 2012, a study was commissioned by ESA to design a methodology to evaluate the direct and indirect economic and social benefits of public investments in space. Their experience on socio-economic assessment is valuable for the purpose of this study. They are aware of the need for socio-economic impact assessment for Research Infrastructures.
	Elisabeth Ackerler		Analyst Socio-Economic Studies				

International and EU Organisations and funding agencies	Frederic Sgard	OECD	Project administrator at the Global Science Forum of the Organisation for Economic Co-operation and Development (OECD)	ESF	12.07.2018	Face-to-face	The objective of the Global Science Forum (GSF) is to support countries to improve their science policies and share in the benefits of international collaboration. GSF provides a venue for consultations and mutual learning among senior science policy officials of OECD member countries. It carries out analytical work on high-priority science policy issues. Fredric Sgard has been involved in many of the Forum's projects on research infrastructures, such as the 2013 report on international distributed RIs. His current portfolio includes activities on the sustainability of Research Infrastructures and on their socio-economic impact, on effective operation of competitive funding systems, and on the creation of an international clinical research initiative for global health
National and regional governments/ agencies	Laurent Ghys	BELGIUM BELSPO (Belgian Federal Science Policy Office)	Responsible for the CIS-Infra	EFIS	29.05.2018	Face-to-face	The Belgian Federal Science Policy Office is the federal government body responsible for research policy in Belgium. It designs and implements research programmes and networks and manages the participation of Belgium in European and international organisations. BELSPO supervises Belgian federal scientific organisations. Within BELSPO, Laurent is responsible for the CIS-Infra / H2020 which is a 'concertation' committee involving the Belgian authorities (federal, regional and language community representatives).

National and regional governments/ agencies	Jan Hrusak	CZECH REPUBLIC Ministry of Education, Youth and sports - Council for large research infrastructure	Member and Advisors of the Council (since 2007) ESFRI Vice Chair (and elected Chair from January 2019)	EFIS	23.05.2018	Phone Call	The Council for large RIs is an advisory body at the Ministry of Education, Youth and sports (MEYS), who itself is the authority for research in Czech Republic. The Council advises MEYS on road mapping and implementation issues of large research infrastructures including their evaluation and funding.
National and regional governments/ agencies	Stephanie Lecocq	FRANCE Centre national de la recherche scientifique (CNRS),	Project Officer for Research Infrastructures and European Affairs	ESF	26.06.2018	Phone Call	CNRS is the largest governmental research organisation in France (under the responsibility of the French Ministry of Education and Research) and the largest fundamental science agency in Europe. The organization's annual budget represents a quarter of French public spending on research. Its budget relies on various sources: Government and public funding; CNRS-generated income, primarily from industrial and EU research contracts and royalties on patents, licenses, and services provided.
National and regional governments/ agencies	Christian Renner	GERMANY Deutsche Forschungsgemeinschaft	Programme Manager	Fraunhofer ISI	4.06.2018	Phone Call	The Deutsche Forschungsgemeinschaft is a German research funding organization. The DFG supports research in science, engineering, and the humanities through a variety of grant programmes, prizes and by funding infrastructure. Christian Renner is programme director for medical imaging and medical physics at the German Research Foundation (Deutschen Forschungsgemeinschaft, DFG). Since 2007 he works both in the unit for scientific instrumentation and in the unit for

							research funding in medicine, with medical technology as a cross-cutting theme.
National and regional governments/ agencies	Gerd Ruecker	GERMANY DLR Project Management Agency	Senior Science Officer	ESF	19.07.2018	Phone Call	Gerd Ruecker is a senior scientific officer at the German Aerospace Agency (DLR) Project Management Agency (PT) with the focus of his activities in science, innovation and development policy. Beyond the responsibilities covered at DLR, Gerard was also selected for his high level understanding of the state-of-the-art of evaluation mechanism of research infrastructures at European scale, his personal interest on this issue and and for the experience gained from the InRoad project.
National and regional governments/ agencies	Peter Wenzel-Constabel	GERMANY German Federal Ministry of Education and Research	Responsible for the National Roadmap Process for Research Infrastructures	Fraunhofer ISI	4.07.2108	Phone Call	The Roadmap Process was initiated in 2011 as a three-year pilot process and was fully established in 2015. The main goal is to implement a transparent, objective and consistent approach for evaluating concept proposals for new research infrastructures (RIs) that leads to prioritise RI concepts and helps to prepare funding decisions.
National and regional governments/ agencies	Lajos Balint	HUNGARY National Information Infrastructure Development Institute	Special Advisor and former director of International Relations	ESF	25.06.2018	Face-to-face	Special Advisor for (Former Director of) International Relations at the National Information Infrastructure Development Institute in Budapest, Vice President of the Hungarian Academic and Research Networking Association, and part time Invited Lecturer at the Pannon University in Veszprem (Faculty of Information Technology). Member of e-IRG (e-Infrastructures Reflection Group), Treasurer of TERENA (Trans-European Research and

							Education Networking Association), member of the NREN-PC (Policy Committee of the National Research and Education Networks),
National and regional governments/ agencies	Damhnait Gleeson	IRELAND Science Foundation	Scientific Programme Manager	EFIS	26.07.2018	Phone call	Damhnait Gleeson is the Scientific Programme Manager at Science Foundation Ireland, which runs an annual funding programme for Research Infrastructures which provides awards ranging from 100k to several million euro.
National and regional governments/ agencies	Tomaz Boh	SLOVENIA Ministry of Education, Science and Sport	Head of the Science Division in the Science Directorate	CSIL	22.03.2018	Face-to-face	Tomaž Boh has been head of the Science Division in the Science Directorate of the line ministry since 2009. Before that he was employed for two years in the Slovenian Research Agency where he was responsible for making analyses in the area of scientific policy; he was monitoring indicators of research and development policy and carrying out a number of other important tasks. In 2006 and 2007, he was advisor to the director at the Information Sciences Institute in Maribor.
National and regional governments/ agencies	Jesus Marcos de Luca	SPAIN National Research Council (CSIC)	Vice-president of the Scientific Department	CSIL	27.04.2018	Face-to-face	The Spanish National Research Council (Consejo Superior de Investigaciones Científicas -CSIC) is a government agency for basic and applied scientific research. It is the largest public research organization in Spain, with presence in all the Autonomous Communities through 126 centers and 145 associated units. CSIC overviews the financing process of the the majority of Spanish RIs. Jesus Marco de Luca is vice-president of the scientific department. In addition, he is a well-known physics with research experience

							at CERN. He combines the perspective of both a funding agency and an academic expert.
National and regional governments/ agencies	Francesc Subirada	SPAIN Catalan Government	Chief Director of Research Department	CSIL	25.04.2018	Face-to-face	The Generalitat Catalana (Autonomous Goverment of Catalonia) funds several Ris in the region (amongst those ALBA and Supercomputer centre). Their criterion for funding are different from the Spanish one. Francesc Subirada has previously been director of the Supercomputer Centre in Barcelona.
	Maria Daban		Head of International Relations				
National and regional governments/ agencies	Magnus Friberg	SWEDEN Swedish Research Council	Geophysicist - Infrastructures for Climate, Environment and Energy	EFIS	15.05.2018	Face-to-face	The Swedish Research Council has a leading role in developing Swedish research of the highest scientific quality, thereby contributing to the development of society. Besides research funding, the agency advises the government on research-related issues and participates actively in the discussions to create understanding of the long-term benefits of research. The Department of Research Infrastructures is specifically responsible for the funding of research infrastructures of national interest, which includes both national and international research infrastructures.
	Niklas Ottosson		Molecular physicist - Infrastructures for High Energy Physics, Material Science and Energy				
National and regional governments/ agencies	Kas Maessen	THE NETHERLANDS Organisation for Scientific Research (NWO) -	HEAD of the Operational Processes & Quality in the Science Domain	ESF	9.07.2018	Phone Call	Apart from dealing with large-scale infrastructure investment, Dr. Maessen's remit also includes procedures and quality, free competition (the possibility of applying for research grants for investigations outside the sectors defined by the Science division as coming into consideration for funding), the Science division's Talent programmes, the financing of this field, performance indicators

							and evaluation.
National and regional governments/ agencies	Claire Dougan	UK Science and Technology Facilities Council	HEAD of Impact Evaluation	EFIS	08.06.2018	Phone Call	STFC is one of Europe's largest multidisciplinary research organisations supporting scientists and engineers world-wide. Through research fellowships and grants, it is responsible for funding research in UK universities, in the fields of astronomy, particle physics, nuclear physics and space science. Claire Dougan has 13 years' experience of working for the UK Research Councils and has spent the last 6 years working in impact evaluation, establishing STFC's well-respected impact evaluation framework. She manages a small team to deliver a range of impact studies and annual impact reports, with a particular focus on RI.
National and regional governments/ agencies	Lee Glassbrook	UK Biotechnology and Biological Sciences Research Council	Senior Innovation and Skills Manager	CSIL	24.05.2018	Phone Call	It is a UK Research Council, the largest UK public funder of non-medical bioscience. It predominantly funds scientific research institutes and university research departments in the UK. Lee Glassbrook is Senior Innovation and Skills Manager. Paul Reeves is Senior Evaluation Manager, in charge of overseeing the funding criteria for the selection scientific project to fund by BBRSC.
	Paul Reeves		Senior Evaluation Manager				
National and regional governments/ agencies	Laura Hillier	CANADA Canada Foundation for Innovation (CFI)	Director of Evaluation and outcome Assessment	EFIS	24.05.2018	Phone Call	CFI is an independent not-for-profit organization that invests in state-of-the-art research facilities and equipment in Canada's universities, colleges, research hospitals, and non-profit research institutions. The CFI has established a rigorous, competitive and independent merit-review process that relies

							on experts from across Canada and around the world to ensure that only the very best projects receive funding. Laura Hillier is the Director of Evaluation and Outcome Assessment at the Canada Foundation for Innovation. For the past 3 years she has led a team responsible for the assessment and analysis of the outcomes and impacts of CFI investments in research infrastructure.
National and regional governments/ agencies	Yongjoo Kim	KOREA NFEC, Equipment Policy Team of National Research Facilities and Equipment Center	Senior Project manager	ESF	26.06.2018	Face-to-face	NFEC was established by the Framework Act on Science and Technology to provide systematic support for research F&E for the development of science and technology. NFEC is exclusively responsible for the research facilities and equipment (F&E) of all Korean R&D organizations. In this capacity, NFEC identifies the needs and the domestic and global environmental changes at the time the advancement of research F&E is needed. NFEC puts its best efforts in maximizing R&D productivity by systematically implementing its mandates, such as strategic investment in research F&E, promotion of co-utilization of research F&E, nurturing of technical manpower, and overall operational management.
National and regional governments/ agencies	Daniel Adams	SOUTH AFRICA Department of Science and Technology	Chief Director of Basic Science and Research Infrastructure	CSIL	7.06.2018	Phone Call	The Department for Science and Technology (DTS) is the South African government department responsible for scientific research, including space programmes. In 2007, the Cabinet decided on the need for a consistent assessment of the socio-economic impact of

							policy initiatives, legislation and regulations. Daniel Adams is the Chief Director: Basic Science and Research Infrastructure, at the Department of Science and Technology (DST), South Africa. His duties and responsibilities include monitoring and evaluation of new and emerging research areas as well as the establishment of national research and cyber-infrastructure. Daniel Adams took part in the very detailed ex ante socio-economic impact assessment of the SKA (International distributed RI).
National and regional governments/ agencies	Michael Tartakovsky	USA CIO NIAID Office of Cyber Infrastructure and Computational Biology - National Institutes of Health (United States)	Chief Information Officer and Director of the Office of Cyber Infrastructure and Computational Biology (OCICB) for the National Institute of Allergy and Infectious Diseases	CSIL	14.03.2018	Face-to-face	The National Institutes of Health (NIH) is the steward of medical and behavioural research for the United States. Its mission is science in pursuit of fundamental knowledge about the nature and behaviour of living systems and the application of that knowledge to extend healthy life and reduce the burdens of illness and disability. Michael Tartakovsky is the Chief Information Officer and Director of the Office of Cyber Infrastructure and Computational Biology (OCICB) for the National Institute of Allergy and Infectious Diseases (NIAID), National Institutes of Health (NIH). He provides strategic leadership and technical direction for the modern, secure, high performance infrastructure that supports the NIAID biomedical research mission.

EU and global umbrella organisations and networks	Beatrix Vierkorn-Rudolph	InRoad H2020 Project	Chair of the Advisory Board	EFIS	15.06.2018	Phone Call	InRoad is a Horizon 2020 project going towards better synchronisation of priority settings and evaluation mechanisms for research infrastructures beyond national relevance. In order to obtain a comprehensive picture of national RI policies in Europe, InRoad conducted a broad online-consultation, which targeted the national organisations in charge of national RI roadmapping, to collect information about national Research Infrastructure (RI) policies in EU Member States (EU MS) and Associated Countries to Horizon 2020 (AC). Beatrix Vierkorn-Rudolph serves as a Member of Supervisory Board at Forschungszentrum Jülich GmbH. She worked as Deputy-Director General for Large Research Infrastructure and Basic Research of the Federal Ministry of Education and Research, Germany (BMBF).
EU and global umbrella organisations and networks	Bethany Mabee	Resource for future (RFF)	VALUABLES Consortium Community Manager	CSIL	14.03.2018	Face-to-face	RFF is an independent, non-profit research institution funded in 1952 and based in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. it is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy. RFF - together with the VALUABLES Consortium - is currently developing a methodology to assess impacts of Earth observations.

EU and global umbrella organisations and networks	Caterina Biscari	LEAPS (League of European Accelerator-based Photon Sources)	Vice-Chair	CSIL	24.04.2018	Face-to-face	LEAPS is a strategic consortium initiated by the Directors of the Synchrotron Radiation and Free Electron Laser user facilities in Europe. Its primary goal is to actively and constructively ensure and promote the quality and impact of the fundamental, applied and industrial research carried out at their respective facility to the greater benefit of European science and society. Besides being vice-chair of LEAPS, C. Biscari is also director of the ALBA synchrotron.
Academics, think tanks and independent experts	Dr Claus Habfast	Former official of ESA and ESRF. Now Municipal Councilor at Grenoble City Hall	Communications Officer (ESA) Head of Communications (ESRF)	Fraunhofer ISI	20.06.2018	Phone Call	Dr.Habfast is municipal councillor in Grenoble. He is also vice-chair of research, higher education and facilities of the Grenoble metropolitan council. Before 2014, Dr. Habfast gained in-depth experience through his professional engagement in research infrastructures such as ESRF (head of communication), ESA (various functions) and national research infrastructures such as DESY.
Academics, think tanks and independent experts	Florian Gliksohn	ELI (Extreme Light Infrastructure)	Associate Director - Integrated Organisational Development	EFIS	12.06.2018	Phone Call	ELI (Extreme Light Infrastructure) is a distributed infrastructure with three sites in Czech Republic, Hungary and Romania. ELI is known for being a pioneer of using EU Structural Funds (SF) for building a large-scale research infrastructure. All three sites represent over EUR 800m of investment.

Academics, think tanks and independent experts	John Womersley	European Spallation Source – European Research Infrastructures	Director General	CSIL	11.04.2018	Phone Call	John Womersley has a long-lasting experience with Ris. In particular, he led the UK's membership of the European XFEL, EES; and the SKA telescope. Prof. Womersley had also advised the Department of Energy in the US. For the purpose of this study, it is important to highlight that Prof. Womersley attempted to estimate the financial impact of Fermilab's Tevatron.
Academics, think tanks and independent experts	Jose G. Montalvo	Pompeu Fabra University	Associate Professor	CSIL	24.04.2018	Face-to-face	José G. Montalvo is an associate professor at the University Pompeu Fabra in Barcelona. During his academic research, he particularly focused on CBA and impact assessment of infrastructure and policy interventions. In particular, he carried an ex-ante CBA of the ALBA synchrotron in 2010.
Academics, think tanks and independent experts	Josephine Rekers	Department of Human Geography Lund University	Senior Lecturer	Fraunhofer ISI	8.06.2018	Phone Call	Dr. Josephine Rekers has analysed the effects of important research infrastructures located at Lund. In particular, as a former member of the Pufendorf Institute, an interdisciplinary research center at Lund University, she has conducted several project in 2011 and 2015, which aimed at assessing the societal impacts of the European Spallation Source (ESS) in Lund as well the MAX IV Laboratory in Lund.

Academics, think tanks and independent experts	Laurent Romary	INRIA (Institut national de recherche en informatique et en automatique)	Research Director	Fraunhofer ISI	24.07.2018	Phone Call	Prof. Dr. Romary is Research Director at INRIA and Director General of DARIAH (Digital Research Infrastructure for Arts and Humanities). He has been involved in the definition of the scientific information policy of CNRS (2005-2006), the Max-Planck Digital Library (2006-2008) and Inria (2006-).
Academics, think tanks and independent experts	Milena Žic Fuchs	Lamy Group	Permament Member	CSIL	22.03.2018	Face-to-face	Prof. Milena Žic Fuchs, professor of Linguistics at the University of Zagreb, served as the Croatian Minister of Science and Technology from 1999 to 2000. From 2009 to 2012, she was Chair of the Standing Committee for the Humanities of the European Science Foundation. During her mandate, she investigated policy incentives for Multidisciplinary Research and Digital Humanities. From 2012 to 2013, she was member of the EC Expert Group for ESFRI Roadmap, and is at present member of numerous Science Advisory Boards at European level in the domains of RIs and SSH.