European Commission

Stakeholder Workshop

LONG-TERM SUSTAINABILITY of Research Infrastructures

– Exploring RI's full potential –

Brussels, 25 November 2016

Report

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Research and Innovation

Contents

INTRODUCTION

Background

Following the discussions that took place in 2014 in the frame of the an informal EU Competitiveness Council which acknowledged long-term sustainability (LTS) of Research Infrastructures being one of the main dimensions to be dealt with at European and national level, in December 2015 the European Commission launched a targeted consultation to capture the main trends and the measures to address such challenge.
The Competitiveness Council conclusions of 27 May 2016 then invited the Commission to prepare together with ESFRI and relevant stakeholders a targeted action plan on Research Infrastructure LTS.

The Sustainability of Research Infrastructures debate is centred around a number of pre-conditions identified by the mentioned consultation[1], which include funding and governance aspects of RI, socio-economic impact as well as the management and exploitation of data and the innovation potential of RI. All the relevant stakeholders will have the opportunity to state their position, as these pre-conditions clearly call for a multi-stakeholder approach.

This Stakeholders workshop focused on a specific set of pre-conditions, which were considered more complex challenges to tackle: Innovation, Data, Skills, Governance and International Outreach.

Objective

The objective of the workshop was to present and discuss with experts and stakeholders the main challenges identified in the online consultation on Research Infrastructures LTS and to collect suggestions and comments that could contribute to the development of a dedicated Action Plan. More than 170 persons coming from Member States, funding Agencies, stakeholder Organisations and Research Infrastructures, belonging to all the different scientific dimensions, attended the event.

[1]EC Stakeholder Consultation Report available at:
https://ec.europa.eu/research/infrastructures/pdf/lts_report_062016_final.pdf

Such a multi-stakeholder debate allowed for a constructive discussion as well as the identification of a coherent and strategic framework for future developments and potential multi-level actions from different actors.

Format

The workshop was conducted across 5 sessions each dedicated to one of the focus preconditions: innovation potential, data, skills, governance & funding, international outreach of RI.

Each session had its own moderator, rapporteur and a number of panelists which were asked to set the basis for the discussion by presenting in a few minutes their view or that of their Organisation to the specific precondition being discussed.

PROGRAMME

9h30 - Welcome Address & Setting the Scene - Strategic Approach on RI Long term sustainability
Antonio Di Giulio, Head of Unit Research Infrastructures, DG RTD, B4 **Jan Hrusak**, Czech Academy of Sciences, ESFRI LTS WG Chair
10h00-11h00 Unlocking the Innovation potential of RI
Moderator: Annika Thies, EARTO representative (Helmholtz Association Brussels Office) Jo De Boeck, IMEC, Senior Vice President & Chief Technology Officer Markus Nordberg, CERN, Head of Resources Development, IdeaSquare Lars Börjesson, European Spallation Source ERIC, Chair of Council Teresa Ponce Leão, Portuguese National Laboratory of Energy and Geology (LNEG), President Tomas Mocek, HiLASE - New lasers for industry and research, Project coordinator *Rapporteur: EC/ESFRI*
11h00 Coffee-break
11h30-12h30 Ensuring Data preservation and exploitation
***Moderator: Juan Biccaregui**, EOSC Pilot coordinator, STFC* **Caj Södergård**, HLEG on 'European Open Science Cloud' member **Werner Kutsch**, ENVRI+, Coordinator **Tiziana Ferrari**, EGI, Technical Director **Peter Wittenburg**, Research Data Alliance, Technical Advisory Board *Rapporteur: EC/ESFRI*
12h30-13h30 Lunch

13h30-14h30 Up-skilling & mobility in RI

***Moderator: Markus Pasterk**, RI Train Coordinator/ BBMRI ERIC*

Jana Kolar, CERIC ERIC, Executive Director

Silke Schumacher, EMBL, Director for International Affairs

Ullrich Pietsch, European Synchrotron and FEL User Organisation (ESUO), Chair

Tim de Zeeuw, ESO, Director-General, EIROforum Chair * presentation delivered by Silke Schumacher

Rapporteur: EC/ESFRI

14h30 – 15h45 Governance & funding innovative mechanisms

***Moderator: Michael Ryan**, Science Europe WG on Research Infrastructures, Chair*

Martin Muller, Swisscore, INROAD Project Coordinator

Carlo Rizzuto, ELI, Director General

Richard Tuffs, ERRIN, Director

Antonella Calvia-Gotz, European Investment Bank

Axel Börsch-Supan, SHARE Coordinator

Rapporteur: EC/ESFRI

15h45- 16h00 – Coffee-break

16h00-17h00 International Outreach of RI

***Moderator: Giorgio Rossi**, GSO Italian Delegate*

Sylvie Pouliquen, EURO-ARGO, Program Manager

Martin Sandhop, CREMLIN Coordinator

Jean Louis Romette, European Virus Archive Global, Coordinator

Charlotte Warakaulle, CERN, Director of International Relations

Rapporteur: EC/ESFRI

17h00 Q&A with the audience

17h20 - Wrap-up and next steps – Philippe Froissard, Deputy-Head of Unit Research Infrastructures, DG RTD, B4

Main outcomes of the Sessions

SESSION 1 – UNLOCKING THE INNOVATION POTENTIAL OF RESEARCH INFRASTRUCTURES

While the main focus of Research Infrastructures is to achieve excellence in science, their potential to foster innovation is clearly recognised and should be better explored. Opportunities provided by the development of RI components and services should be better exploited to push the limits of existing technology.

The main purpose of this session was to gather stakeholders' views on how Research Infrastructures could better contribute to the innovation process and to eventually identify measures that could result, if needed, in a stronger involvement of Industry in the RI activities. As a general theme, the different panelists highlighted the crucial role of Industry as a **supplier, user and co-developer** in the life cycle of Research Infrastructures, stressing their main function as exploiters of the RI innovation potential.

One of the main bottlenecks that prevent optimizing the relations between RI and Industry is the different scope, purpose and, often, language of the two communities. In such context, the **role of intermediaries** between RI, academics and industry was highlighted as a way to unlock the output of RI in a more innovation driven-approach. This role could be played by universities, small consultancy companies, Technology Transfer Organisations (TTOs) or other similar entities. More in detail, academia could have a positive impact in the way researchers communicate with industry, by aligning curricula with industrial needs and also focusing research communities to fill the industrial gaps and challenges.

Such reasoning led to emphasise a need to appropriately involve Universities in the Long term sustainability discussion, namely in the innovation and skills development dimensions. The discussions also stressed the requirement for RI to balance their work between their focus on the local ecosystem and their aim to a global impact since a sustainable RI requires both approaches.

The **implementation of technological roadmaps** on key-technological components and the encouragement of academics recruitment in industry were identified as 2 efficient ways to foster a closer interaction between the 2 different communities.

Long term commitment funding is perceived as an *a priori* requirement for innovation since securing basic funding at national level allows for ambitious development targets. The discussions highlighted that, possibly, the EC could play a role in this context by providing an **appropriate framework for a long term reliable funding** stream at a national level.

Scientific excellence and innovation potential are not mutually exclusive. There is a need to identify **key performance indicators** that would be effectively able to capture and measure any impact and correlation between such dimensions. This is recognised as a challenging objective since such impact is not immediately visible and mainly of indirect nature. Such KPIs would need to be well defined and closely monitored. Easy key performance indicators such as publications, real figures, and type of services should be also selected whenever appropriate. However impact should not be exclusively based in classical measurements (e.g. references in publications), and both local and international impacts need to be duly taken into account.

The participants indicated that dedicated initiatives to raise RI' visibility among the different communities need to be further enhanced. **Innovation pilots** could represent a possible instrument to develop a closer relationship with industry and to increase visibility. Incentive/ reward mechanisms could be also further explored to promote closer interactions between European Technology Platforms (ETPs) and innovative EU programs.

Among the different measures identified to better implement the RI communication strategy are:

- Adopt of a communication strategy that bring industrial players to RI sites;
- plan innovative procurements in an attractive manner for industry,
- project an image of a talent producer – RIs as capacity builders,
- attract different types of users and do not only target the consolidated user community,
- improve/ adapt Access policies to foster new partnerships' development,
- stimulate a mindset change to direct users to interact with industry,
- build confidence / trust relations with different types of user communities.

RI' long-life cycles call for a strategic focus on the way they interact with industrial players – who usually need to have a quick result/solution to a problem. RI should target big and challenging projects, but also build smaller scale relationships – to build an RI reputation in a local and regional context.

With regards to the **skills** that RI staff needs to have to efficiently attract industry**,** many stakeholders indicated that coaching of managers in business skills should be one of the targets. Specific programs for industrial students and teaming and twinning projects at EU level could also play a role in skills development.

Regarding the exploration of new ways of using **co-innovation methods**, there was a general agreement that new mechanisms need to be identified going beyond the traditional modes of funding Technology Transfer, including the design of new financial instruments.

Finally, the participants agreed that concrete measures to tackle the barriers RI face to fully exploit their innovation potential need to be appropriately considered in the overall picture: such as national procurement processes, odd funding innovation methods, lack of clarity in access modes, restricted access policies, limited collaboration in design and coordinated programming, lack of continuity at the national context.

SESSION 2 – ENSURING DATA PRESERVATION AND EXPLOITATION

Research Infrastructures are often large research data factories. With the increasing size of the generated data sets, - too large to be transferred - and the increasing complexity of data analysis - not affordable by most of the research laboratories - the Research Infrastructures are acquiring by necessity a more active role in the data management domain. This session focused on the identification of concrete measures that could enable Research Infrastructures to effectively perform such role in a more efficient and effective way.

Stakeholders widely agree that the optimisation of data management and exploitation functionalities is a precondition for long-term sustainability. This is directly related to the fact that sustainability of Research Infrastructures highly depends also on their ability to provide data, supporting the full data lifecycle, as well as on their capacity to share data and data related products which are useful for science and for society at large, consequently enabling excellence and innovation. Data is, therefore, perceived as the main driver in a knowledge economy.

Looking at the same issue from an alternative angle, sustainable research infrastructures can represent a solution for ensuring data preservation and exploitation. In this context, since most of the Research Infrastructures are data factories, it was suggested that the Private sector should not only support research on data but be also engaged in the funding of data providers.

While the integration of HPC facilities and communication networks is well advanced in Europe, it is clear that this is not yet the case for the data component. Both data generation and data stewardship as well as data service provision need to be addressed. Research Infrastructures and e- infrastructures are key players in this process. However, the discussions highlighted a **gap between Research Infrastructures and e-infrastructures** concerning the sustainability of service provision.

Participants convened that the **European Open Science Cloud (EOSC)** could help to address this gap and promote a sharing culture between data and service generation and provision, involving both Research Infrastructures and e-infrastructures. The EOSC would make science more efficient and productive, by letting millions of researchers share and analyse research data in a trusted environment, across technologies, disciplines and borders.

Data is a natural mean to break interdisciplinary borders, but for that to happen, there is a need to ensure that formats and standards do not represent an obstacle. Data and products should be re-used in different scientific contexts. However participants indicated that aggregate data across scientific discipline boundaries, bringing together discipline specific knowledge and methodologies, is currently a major challenge to tackle.

The EOSC is not about moving all data in a centralised repository. It should build **on existing Research Infrastructures and e-infrastructures**, keeping, as far as possible, data close to the creators for better curation.

Access to data and services through EOSC must account for the authoritative **role of Research Infrastructures** in generating standardized **quality-controlled data**. Traceability of data and accountability of data providers are key issues to be addressed in order to build a trusted and innovative EOSC. Accountability and traceability are requirements that drive the need to create skills in data management and quality control within the Research Infrastructures.

The EOSC should be structured in shared ICT services and thematic services, coupling data with applications. A **data-driven federated architecture** was identified as the possible way forward, but there is a need to address the related governance, financial and policy issues. The EOSC pilot project, funded by DG RTD, was clearly seen as a way to support this process.

On the respective role of Research Infrastructures and e-infrastructures in this initiative, participants underlined that the role of research infrastructures is crucial in the EOSC governance and that through the clusters' projects infrastructures are already working on interoperability. . However, commonalities in requirements need to be taken into account for optimising the use of resources. Research infrastructures are, indeed, perceived as crucial for a correct data curation but generic e-Infrastructures services could help to better offer data beyond their communities. In addition, e-Infrastructures can better follow ICT technology evolution. There is also an increasing demand for data analysis that can only be answered by sharing resources.

Fragmentation of efforts is clearly perceived as one of the main risks to be avoided - there are currently **too many initiatives in this field**, hundreds of them only in Germany.

To avoid the waste of publicly funded data (80% of research data are not stored in trusted repositories), the discussion highlighted the need to:

- ensure in Europe stable, certified and robust **repositories** and **registries** for data preservation. The relevance of thematic reference repositories towards generic e-Infrastructures was stressed by some participants.
- promote a **change of culture** for data management. To this extent, the adoption of FAIR principles and the use of Data Management Plans must be further fostered.
- train the next generation of **data scientists and data managers.** Half a million of data core experts, either generalists or field specialists, are needed in the next decade, but they should be offered a perspective of a career. To this extent appropriate acknowledgment/reward/impact factor/accreditation systems need to be developed.
- In addition, as 75-80% of data scientists' time goes in Data Management and curation, data stewardship should be, as far as possible, automatised.

In this context, a change of the current mind-set is also needed to break silos. Participants emphasised that data aggregation within a discipline is already a challenge but cross-disciplinary data aggregation is even more difficult as, usually, researchers do not think in a cross-disciplinary way. Additional obstacles are due to fragmentation of the research data landscape, technical problems, lack of incentives and insufficient collaborative frameworks.

Implementing and providing data services requires joint efforts from Research Infrastructures and e-Infrastructures throughout the different phases of the infrastructure lifecycle (for instance from design to implementation). Moreover**, Research Infrastructures should use e-infrastructures services - and not redevelop existing solutions –** particularly in a context of budgetary limitations. Research Infrastructures and e-infrastructures should specialise to avoid duplication and make services more effective. Good e-infrastructures can nurture Research Infrastructures. However, barriers are still perceived for this collaboration, in particular related to the different funding models for Research Infrastructures and e-Infrastructures and to the limited collaborations for designing coordinated provisioning. Solving these issues would contribute to better define and implement the business models of both.

Participants suggested that the launch of specific **studies on best practices on how to integrate Research Infrastructures and e-Infrastructures**, as well as on business models, economic and procurement models for international research, and ICT service provisioning could be a potential follow-up of this workshop.

Finally, the discussion highlighted a broad agreement on the fact that the definition of an Research/e- Infrastructure **common ICT service catalogue**, extending the current e-Infrastructures initiative could work as a potential measure to tackle the data challenge. This could simplify the discoverability of services for customers and users, improve the understanding of their relevance, and help identifying complementarities or gaps. In addition, a shared language for service descriptions should be made available to service providers (Research Infrastructures and e-infrastructures), increasing the visibility of services offered. This would also be relevant for funding agencies, as it would help them to better communicate what they fund and the impact of their funding, and consequently better evaluate RI policy impacts.

SESSION 3 – UP-SKILLING & MOBILITY IN RI

The availability of competent managers and technical staff running the RI is a critical need, which has been widely acknowledged and is directly connected on one side to the existence of dedicated training programmes providing staff the necessary knowledge and skills and, on the other hand to the attractiveness of the RI as a prospective employer. This session of the workshop was specifically dedicated to capturing the stakeholders' views on appropriate measures to tackle with these challenges.

There appears to be abroad consensus on the possible categorization in **three target groups for training actions**, each of which with different needs: **managers, operators, users**. RI managers, in particular, need many different skills and competences, which evolve as the RI ecosystem is developing.

In reference to **existing gaps in the RI staff and management training**, it is recognized that there are still not enough people coming out of universities with the right skills to manage research infrastructures. RI management and general research management have a lot in common, but RI have also a large number of specificities, especially when it comes to design, construction and operation in an international context. Due to this, personnel at RI with a science background often miss specific managerial or administrative skills. As it is important for RI to have managers with a science background, dedicated, **modular training programmes** would be helpful in addressing this gap.

As regards the **training of users**, this role could be covered by the facilities themselves, to adequately cover their specific features. Working together with less experienced users is particularly important to help them take full advantage of the potential of facilities.

The need to establish **a centralized, coordinated training system tailored for RI managers and operators** is a recurrent matter. There are advantages of a standardised curriculum, but different RI also have different needs. Certified career paths for managers also have advantages. However, the different regulatory and legal systems in the various countries might make more difficult to develop a centralized training system for managers and operators in the case of distributed RI. Specialised, non-accredited curricula are also needed, as a broad range of skills needed might not be able to fit in one curriculum, but access to good trainers was mentioned as a possible limitation.

Discussions highlighted that while sector-specific needs are largely mapped by sectorial clusters, nevertheless, a sectorial qualifications programme could be useful in promoting career paths in RI in Europe.

The participants indicated that an RI **staff exchange programme** should be in place to encourage the mobility of RI managers and operators. However, there are difficulties experienced when reinstating in the previous posts and, therefore, the possibility of lowering barriers at the reintegration stage would need to be addressed.

With reference to the challenge of **encouraging cross-border mentoring and tutoring of RI managers and operators**, it was noted that coaching and mentoring for newcomers are very important actions to help develop soft skills and, strengthening such activities at European level, would be highly beneficial.

Another topic under discussion was **how RI can broaden their user communities**. It was observed that access is not equally distributed over the EU and there are differences in the distribution of users among countries hosting and non-hosting an RI. Also, lack of national funds has an impact on community building, therefore there is a need for a sustainable system of access for users, with specific support measures at national and European level.

Finally, the panel addressed **the need to make the RI a more attractive place for managers and scientists** in terms of training, career path, salaries, pension schemes, etc. Developing educated staff and keeping them in RI was recognised as the main challenge. In this context, ensuring a stable working environment and competitive salaries was assessed as particularly important to attract talent and keep managers at RI, unstable funding negatively impacts on career paths and HR development.

SESSION 4 –GOVERNANCE & FUNDING INNOVATIVE MECHANISMS

Many initiatives aimed at structuring the RI ecosystem within the EU have been positively launched over the past years. The ESFRI roadmaps have led to a certain convergence at European level and have also triggered similar exercises in Member States and Associated Countries and the ERIC regulation has provided for a new alternative European solution in terms of legal framework for Research Infrastructures. However, the different budget cycles and national RI policies still make joint

investment decisions for construction, operation and phasing out of pan-European RIs very difficult. This, in turn is reinforced by the absence of joint evaluation mechanisms at national/EU level. This session of the workshop was aimed at addressing all these dimensions in an attempt to propose possible solutions to the different bottlenecks.

The discussion immediately highlighted the importance of **strategic mapping**. In this context, the fact that European Technology Platforms (ETPs) and Key Enabling Technologies (KET) are already presenting integrated roadmaps and mapping was raised as a positive example. The main challenge identified is related to how to better liaise these mapping exercises with the RI national roadmap development processes. As such, smart specialisation strategies in the **Regional context** were highlighted as a good step forward, but global mapping and positioning would still need to be further improved.

Participants also discussed the need for a **better synchronisation** of the different national mapping processes and for a more developed coordination of the EU actors in the field of research infrastructures (decision-makers, funders, RI operators).

The differences between the criteria and policy objectives of the various funding possibilities such as H2020, Regional Funds and other EU funds were highlighted and the main question raised was on how the EU could play a role to facilitate the applicants. An 'ERA-NET' type of action was proposed to achieve a more **coherent overall funding by the various funding bodies**. Synergies between the EU funding sources were also strongly encouraged.

Many participants indicated that the evaluation of an RI for funding purposes should be conducted throughout the EU in a homogeneous manner at a national 'top-level' (instead of at the level of each possible funding instance). This would help ensure pan-European character and consistency, but also lead to more coherent funding cycles therefore overcoming the current situation that sees a multitude of different budgetary cycles due to the differentiation of national processes.

A concrete example was raised concerning the **ERIC** (European Research Infrastructure Consortium) and the need for it to be recognised by all countries involved in the RI, not only by the coordinating or host country, and, at the same time, by all funding sources. In addition, it was broadly agreed that ERICs should have single employment provisions instead of being subject to the various and divergent national laws and regulations.

It was then further observed that there is still lack of sustainable funding and commitment for ERICs which, in many cases, lack in terms of long-term commitments when initially set up. This is recognised as a potential risk factor for the RI operational phase after completion of the "investment phase".
Moreover, the discussion pointed out that pushing for a strong open and free access to data policy could result in a lack of incentives for investment by the ERIC members and ingenerate the risk of 'free riders' since there would not be a requirement to financially contribute to sustainment of the RI to ensure access to generated data by national researchers. This is in particular important for European surveys and other European wide research activities and is not purely limited to the ERIC dimension.
With respect to the **role of the regions**, it was suggested that these should act as good hosts and the RI as good guests, adding value to the region by linking their activities to the (local) economic players. As such, RI can be seen as a bridge between research and growth policies.

More in general, it was discussed that RI funding profiles could be seen as similar to start-ups and, consequently, if RI want to able to attract funding, their business plans should be further improved (in comparison to current practices). These business plans would need to be focused on the RI user strategy, i.e. on what are the user communities' needs. Emphasis is always put on excellence as a relevant factor but, to ensure appropriate sustainability, other factors need to be also considered such as e.g the number of RI in a single scientific domain (in relation to the user demand).

Another important dimension that was highlighted is the role of **Key Performance Indicators (KPIs).** Many stakeholders stressed that without delivery against these KPIs there isn't a strong basis for investment. This argument puts a higher pressure on focusing on tangible results and financial transparency of the RI. Rigorous project management and financial control were also raised as a recommendation.

SESSION 5 – INTERNATIONAL OUTREACH OF RI

The nature and complexity of the societal challenges require a global approach for the design and operation of RI addressing them. Global cooperation is also the main option when pooling of resources is necessary to match investment needed for construction and operation of RI and where research has to be undertaken at a world wide scale.

This session addressed these issues exploring how the European Research Infrastructure ecosystem could better place itself in the international arena.

The discussions highlighted that global outreach is clearly recognised as a key driver for long-term sustainability of those RI that have a clear international dimension. In this respect, participants highlighted **complementarity** between facilities located in different regions should be pursued, when appropriate. This will enable international public acceptance of major endeavours and, consequently, make it easier for decision makers to allocate the required resources.

When establishing a capacity able to address a global challenge, the **international approach is again the most effective solution**. As an example, in the case of observation systems (e.g. Ocean Observing Systems), only a coordinated international effort will enable for both continuous and sufficient coverage, but also for the establishment of an efficient and consolidated data management functionality.

Some examples presented during the workshop also illustrated how the coordination of a European approach in the frame of a wider international setting provides the advantage of **strengthening the European position** and, at the same time, of better fostering national commitments to the overall initiative (e.g. EURO_ARGO). However, it was also stressed that such coordination has a cost which, for the time being, single Member States are not necessarily willing to undertake. As such, most stakeholders suggested for the EU to consider contributing to the costs related to the functioning of any European RI coordinating functionality

In this context, the **ERIC instrument**, while non-guaranteeing long-term sustainability of the Infrastructures per se, can contribute to consolidate and strengthen the EU positioning in broader international initiatives.

The discussions also showcased that the establishment of structured dialogues or collaborative mechanisms between European facilities and their potential third country counterparts is not as straightforward as it could appear merely from a scientific perspective since many other sensitive political factors factor in the discussion and need to be appropriately taken care of in the early stages of negotiation. In addition, the CERN experience demonstrates how the process of attracting and concluding agreements with potential new members is considerably slow, but robust. This needs to be taken into account if the RI sustainability is based on potential engagement of new funding members. Experience also showcases that **a credible and transparent RI governance and funding model** helps in attracting new

potential members since this allows them to better assess the implications of their possible engagement.

In such context there is widespread recognition that **ESFRI is a key reference forum** for any third country wishing to initiate a dialogue with the EU on RI development and that the EC also showcases it in the Joint Science and Technology Dialogues. The ESFRI roadmap allows an understanding of the European strategic direction in RI development and, consequently, the possibility for the third country to verify potential overlaps with their own national strategy. It also appears that third countries with tight links to the EU would have an interest in having their national initiatives referenced in the frame of the ESFRI landscaping exercise in order to stress and reinforce (at political level) the complementarity with European initiatives. Before referencing these, ESFRI should carefully evaluate their scientific case.

The participants also indicated that it is vital for internationally relevant Research Infrastructures to attract users in order to guarantee the optimal exploitation of the facility itself and to maintain its state of the art international recognition. Best practices have demonstrated that **service catalogues tailored to the different possible target communities** (e.g. public at large, Academia, industry) contribute significantly in attracting potential users.

The discussion emphasised how International partnerships can be effectively sought only if the RI are well known beyond the European borders. **Better visibility is widely acknowledged as key** to enhance the international relevance of European RI. Research Infrastructures must put in place better communication strategies to effectively reach the different target audiences at international level.

In order to better enable cross national collaboration, participants highlighted the need to further promote the **alignment of standards at the international level** (e.g. data management standards). This would also better support (e.g. in the case of Data management) interoperability and re-use of data cross domain.

An important role in promoting a global approach to RI development is played by the international fora established for such purpose (e. g. the Group of Senior Officials (GSO) on Global Research Infrastructures established by the G8, the Working Groups dedicated to RI established under the umbrella of the Global Science Forum (GSF) of the OECD or the Research Data Alliance (RDA) when dealing with international standards related to data management). It was indicated that the **EU should promote**

a better engagement in the frame of such International Fora and invite strategic third partners to actively contribute to the activities being conducted there.

ANNEX 1: SHORT BIOGRAPHIES OF THE SPEAKERS

Setting the Scene - Strategic Approach on RI Long term sustainability

Antonio Di Giulio, European Commission, DG RTD, B4, Head of Unit Research Infrastructures

Dr. Antonio Di Giulio is currently Head of the Unit Research Infrastructures in the European Commission Directorate-General for Research and Innovation.

Previously he was Head of the Food and Health Unit, then of the Strategy Unit and Interim Director in the Bioeconomy Directorate.

He started his professional career as an agricultural economist with the United States Foreign Agricultural Service-Department of Agriculture, (FAS/USDA) in Rome, Italy. Prior to his post with the European Commission, he was Principal Administrator with the International Centre for Advanced Mediterranean Agronomic Studies, (CIHEAM).

He holds a Master degree in Agricultural sciences and a specialized Master degree in rural development, programs and projects. He has a Doctoral degree in food economics.

Jan Hrusak, Czech Academy of Sciences, ESFRI LTS WG Chair

Senior scientist at the J. Heyrovský Institute of Physical Chemistry. of the Academy of Sciences of CR. Advisor to the Academy Council of the Czech Academy of Sciences, National delegate to the European Strategy Forum for Research Infrastructures (ESFRI), serving as ESFRI vice-chair.

Previous duties – Member of the presidium of the Academy of sciences of the Czech Republic - in charge of the Academy's EU oriented science policy related issues and supervision of Department of European Integration and Knowledge Management of the Academy. Director general for science and research at the Ministry of Education, Youths and Sport of the Czech Republic. Elected member of the General assembly of the Academy of Sciences of the Czech Republic. Elected member of the European Academy of Sciences and Arts.

Involved in formulating national research strategies and other position papers. Expert in evaluation of national research programs, member of the monitoring committee for the Czech Operational Program Research and Technical Development for Innovations. Has been scientifically active in several countries: TH-Merseburg and TU-Berlin, Germany; IMC CSAS Prague, Czech Republic; University Toulouse, France; and IMS Okazaki, Japan. Has published cca 100 scientific papers in international journals (over 2500 citations, SCI citation index ~21, Hirsch index - 32).

Session 1 – Unlocking the innovation potential of RI

Moderated by Annika Thies - *EARTO representative (Helmholtz Association Brussels Office)*

"'Infrastructure for Innovation in an Ecosystem"

Jo De Boeck, IMEC, Senior Vice President & Chief Technology Officer

Jo De Boeck received his engineering degree in 1986 and his PhD degree in 1991 from the University of Leuven. Since 1991 he is a staff member of imec (Leuven). He has been a NATO Science Fellow at Bellcore (USA, 1991-92) and AST-fellow in the Joint Research Center for Atom Technology (Japan, 1998). In his research career, he has been leading activities on integration of novel materials at device level and new functionalities at systems level. In 2003 he became Associate Vice President at IMEC for the Microsystems division and in 2005 started Holst Centre (Eindhoven) and became CEO of IMEC-Netherlands. As SVP he headed IMEC's Smart Systems and Energy Technology Business Unit. He is professor at the KU Leuven and held a visiting professorship at the TU Delft. In 2011 he was appointed CTO of imec corporate and is member of IMEC's Executive Board.

"Co-Innovation and Co-Development"

Markus Nordberg, CERN, Head of Resources Development, IdeaSquare

Dr. MARKUS NORDBERG is the Head of Resources Development of the Development and Innovation Unit at CERN, Switzerland. He is currently involved in launching a sensor and imaging R&D initiative called ATTRACT (www.attract-eu.org) aiming at both scientific and societal impact. He also manages the new IdeaSquare initiative at CERN (cern.ch/Ideasquare) that hosts detector R&D and society-driven MSc-student projects. Prior to this function, he served 12 years as the Resources Coordinator of the ATLAS project at CERN (www.atlas.ch). He has also served as Visiting Senior Research Fellow at the Centrum voor Bedrijfseconomie, Faculty ESP-Solvay Business School, University of Brussels, and as a member of the Academy of Management, Strategic Management Society and the Association of Finnish Parliament Members and Scientists, TUTKAS. He has a degree both in Physics and in Business Administration.

"How to stimulate the growth of an innovation ecosystem around a major research infrastructure in the construction phase?"

Lars Börjesson, European Spallation Source ERIC, Chair of Council

Lars Börjesson is Professor of Physics at Chalmers University. He was Vice-President of Chalmers University 2012-16, and has earlier been Vice-Dean for School of Physics and Department head for Applied Physics. He has a PhD from Chalmers in 1987 and he became Professor at Royal Institute of Technology in 1993. His specific research interest concerns fundamental aspects of disordered and soft materials, highly correlated magnetic and superconducting materials as well as materials for energy technology and electronics. He has published more than 280 scientific papers in international journals.

Lars Börjesson was Secretary General to the Swedish Research Council, Council Research Infrastructures 2003 – 2010 and was also vice-Chair of the ESFRI 2010 – 2012.He is now Chairman of the Council of the ESS, planned to be world's most powerful neutron source, which is presently being built in Lund adjacent to the MAX IV Laboratory, world's most brilliant synchrotron source for X-rays. He was chair of the MAX IV facility in the start of the construction 2010-2013. Lars Börjesson was awarded the Baltic Sea award in 2012 for initiating the European Spallation Source project in the Baltic Sea Region. Lars Börjesson is currently also Vice-Chair of the XFEL free electron laser facility in Hamburg and also Vice Chair board of the global radio-telescope project SKA to be built in Australia and South Africa.

"RI to look at research gaps and unlock innovation potential"

Teresa Ponce Leão, Portuguese National Laboratory of Energy and Geology (LNEG), President

Teresa Ponce de Leão, Professor at the Department of Electrical and Electronic Engineering of the Faculty of Engineering, University of Porto, and President of the Board of Directors of National Laboratory of Energy and Geology. Member of the Board of Directors of Wave Energy Center (since 2009); Member of the Scientific Council or EnergyIn – Portuguese Cluster for Energy Technologies (since 2010); Member of the Scientific Council of EnerGaia – Energy Agency of Vila Nova Gaia city (since 2009).

Member of several boards, at a national and European level, concerning Energy sustainability and innovation, and author and co-author of more than 70 papers in international books and Reviews on the scientific area of power systems planning with integration of renewables.

"How to collaborate with Industry efficiently?"

Tomas Mocek, HiLASE - New lasers for industry and research, Project coordinator

Tomas Mocek (born 1970) received his Ph.D. in Physics from the Korea Advanced Institute of Science and Technology (KAIST), South Korea in 2000, and in Applied Physics from the Czech Technical University in Prague, Czech Republic in 2001. He is employed at the Institute of Physics of the Czech Academy of Sciences since 1994. In the period 2002-2004, he stayed as a Marie Curie Fellow at the Ecole Polytechnique-ENSTA-CNRS in Palaiseau, France. He is currently the Director of HiLASE Centre (www.hilase.cz) and the Head of the Division of High Power Systems at the Institute of Physics. To date, he has been Principal Investigator of numerous research and technology development projects with total cumulative budget exceeding 35 mil. EUR. He is the Coordinator of HiLASE Centre of Excellence project selected for funding under the Teaming Phase 2 instrument of H2020.

Session 2 – Ensuring data preservation and exploitation

Moderated by Juan Biccaregui - *EOSC Pilot coordinator, STFC*

"European Open Science Cloud as a tool for Ensuring Data Preservation and Exploitation"

Caj Södergård, HLEG on 'European Open Science Cloud' member

Dr Caj Södergård is Research Professor in Digital Services and Media at VTT Technical Research Centre of Finland. He graduated (with honors) from Helsinki University of Technology and worked for some years as a product developer in industry before joining VTT. His research has focused on image and multimedia processing primarily in the media industry as well as on context aware computing. He has hold various managerial positions at VTT being at present in the research area steering group Currently, he is a member on the EU High Level Expert Group on the European Open Science Cloud and on the board of the Big Data Value Association.

"Data for science - the ENVRI+ approach for data life cycle harmonisation of environmental Research Infrastructures"

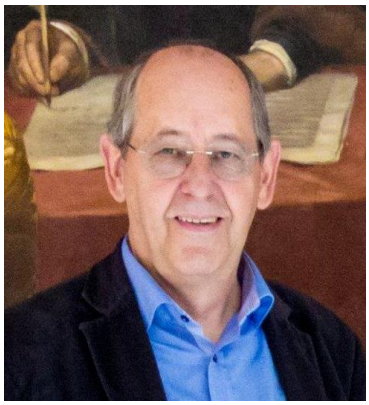
Werner Kutsch, ENVRI+, Coordinator

Dr. Werner Kutsch is Director General of ICOS ERIC since March 2014. He is biologist and ecosystem scientist by education and has worked on ecosystem carbon cycling for 25 years in Europe and Africa. He is experienced in data acquisition, post-processing and modeling of ecosystem carbon budgets. Integrating ICOS-internal data streams and fostering usage of ICOS data e.g. for GHG modeling and supporting decision processes after the PaRI agreement is currently a core work of ICOS. Werner Kutsch is also the coordinator of the H2020 cluster project ENVRIplus that is providing common solutions e.g. for data life cycles, technical developments and access mechanisms for environmental research infrastructures.

"Call to Action for better integration of e-Infrastructure and RI development"

Tiziana Ferrari, EGI, Technical Director

Tiziana is Technical Director at the EGI Foundation since October 2013 and Technical Coordinator of the H2020 EGI flagship project funded by the EC: EGI-Engage. She was responsible for the direction of the EGI-InSPIRE project and was former Chief Operations Officer taking care of the operations coordination of EGI. She is a promoter of the Open Science Commons and participated in the definition of the EGI governance and service portfolio in the framework of the EGI_DS project. Tiziana holds a PhD in Electronics and Data Communications Engineering from the Universita' degli Studi in Bologna.



"Identifying Islands of Stability in a highly dynamic Data Landscape"

Peter Wittenburg, RDA Executive Director

Exec. Director Research Data Alliance Europe (RDA EU, Member of RDA Technical Advisory Board (TAB), and Scientific Advisor EUDAT

Session 3 – Up-skilling & mobility in RI

Moderated by Markus Pasterk - *RI Train Coordinator/ BBMRI ERIC*

"Developing the human resources of Research Infrastructures"

Jana Kolar, CERIC ERIC, Executive Director

Dr. Jana Kolar is Executive Director of CERIC-ERIC. She is also a member of the board of the European Institute of Technology and Innovation (EIT), member of the ERA Council Forum Austria, a high-level expert body advising the Austrian Minister responsible for Science and Research, and member of Horizon 2020 advisory group on Innovation in small and medium-sized enterpRIes.

Dr. Jana Kolar has a broad range of expertise, ranging from policy development and implementation, research and innovation to entrepreneurship. Among others, she had been Director General of Science in Technology at the Ministry in Slovenia, chairman of the board of Slovenian Technology Agency and member of the board of Slovenian Research Agency.

"Five cornerstones of long term sustainability of a RI with focus on upscaling excellence through interdisciplinary training" (The EMBL model)

Silke Schumacher, EMBL, Director for International Affairs

1997 Docteur en Science, Université PaRI XI, France.
1997-1999 Postdoctoral work at the National Institutes of Health, Bethesda, USA.
1999-2000 Manager Pharma Business Development, Merck KGaA, Darmstadt, Germany.
2001-2003 Managing Director, Anadys Pharmaceuticals Europe GmbH, Heidelberg, Germany.
2003-2005 Cooperation Manager, EMBL, Heidelberg, Germany.
2005-2010 Head of International Relations and Communications at EMBL.
Since 2010 Director International Relations, EMBL.

"Up-Skilling & mobility - from User perspective"

Ullrich Pietsch, European Synchrotron and FEL User Organisation (ESUO), Chair

Diploma in crystallography 1978
Dr. rer. nat. (physics) 1981
Dr. rer. nat. habil. (physics) 1988
Dr. h. c. Mongolian State University 2013
Professor of Structural Analysis (C3) Institute of Physics, University of Potsdam 1994 - 2005
Full Professor of Solid State Physics University of Siegen since Oct/2005
Dean of Faculty of Science and Technology at Siegen University
Chair of "European Synchrotron User Organization"(ESUO) since 2010

Tim de Zeeuw, ESO, Director-General, EIROforum Chair **(replaced by Dr. Silke Schumacher)**

Professor Tim de Zeeuw is the Director General of ESO, the foremost intergovernmental astronomy organisation, which operates the world-leading Very Large Telescope in Chile, is a partner in the transformational radio interferometer ALMA, and is constructing the 39-metre Extremely Large Telescope, with first light in 2024. His research focuses on the formation, structure and dynamics of galaxies including our own Milky Way.

Session 4 –Governance & funding innovative mechanisms

Moderated by Michael Ryan - *Science Europe WG on Research Infrastructures, Chair*

"Better harmonisation of RI road mapping and evaluation procedures"

Martin Muller, Swisscore, INROAD Project Coordinator

Dr. Martin Müller is Co-Head of Office at the Swiss Contact Office for European Education, Research and Innovation in Brussels (SwissCore) since January 2016. SwissCore is co-funded by the Swiss National Science Foundation (SNSF), the Swiss State Secretariat for Education, Research and Innovation and the Swiss innovation promotion agency. Prior to his appointment as Co-Head of Office, Martin was European Advisor for Research at SwissCore in charge of European research policy and programmes notably research infrastructures. He represents the SNSF in the Science Europe working group on Horizon 2020, which he chairs since April 2015 and is a member of the Science Europe working group on research infrastructures. Martin is the coordinator of the Horizon 2020 project InRoad: 'Towards better Synchronisation of Priority Settings and Evaluation Mechanisms for Research Infrastructures Beyond National Relevance'; a Coordination and Support Action starting on January 2017 and involving 13 major RI policy-makers, funders and operators. Martin holds a doctoral degree in biomedical engineering from the Swiss Federal Institute of Technology Zurich (ETHZ).

"RI: a key component of regional innovation ecosystems"

Richard Tuffs, ERRIN, Director

Richard Tuffs has been director of the ERRIN network since October 2010. ERRIN is a regional network that promotes the regional dimension of the European research and innovation agenda, European project development and management and raising the profile of the ERRIN network and its member regions in Brussels.

Richard has been working in the regional dimension of European policy in territorial cohesion and research for many years and worked for the Kent and the West Midlands offices in Brussels before joining ERRIN.

Richard has been in involved in numerous EU projects such as science communication, Future Internet, Smart Specialisation, and eco-innovation. He is currently Chair of the Smart Specialisation Mirror Group established by the European Commission and was the rapporteur for the European Commission expert group on the Capital of Innovation prize launched in 2013. Richard is also on the European Commission's Advisory Group for Science With and For Society. He is often invited to moderate and present at conferences on European research and innovation topics. Richard has a degree in geography and social sciences and master's degrees in town planning, applied linguistics and business administration. His

career spans town planning, applied linguistics, language and management training, university lecturing and research and education administration.

"Long term Sustainability and Synergies – ELI"

Carlo Rizzuto, ELI, Director General

Executive Director ELI-DC AISBL (Extreme Light Infrastructure - Delivery Consortium); Chair of the General Assembly, CERIC-ERIC (Central European Research Infrastructure Consortium), Chair of ERF-AISBL (the European Research Facilities Association). Carlo Rizzuto has been active in Low Temperature and Solid State Physics, Criomedicine, Criogenics and Superconductivity, Materials Sciences, Sustainable Energy Technologies, as professor in the University of Genova and visiting fellow at Mc Gill University (Montreal), Imperial College (London), Universities of Lausanne, Zagreb and Santiago de Chile. Other activities were in Research Policy and Evaluation, Technology Transfer, evaluation and support of Spin-Off Companies from Research, as chair of the International Criogenic Engineering Committee (ICEC), founder Istituto Nazionale di Fisica della Materia (INFM), founder and chair Technology Transfer and Venture Capital firms ("ReteVentures" and "Quantica SgR"), chair of Elettra-Sincrotrone Trieste, of the European Forum for Research Infrastructures (ESFRI) and as member of Expert Comittees for Research Evaluation (CIVR) and of Advisory Committees for Research Policy: CEPR (Italy) and CODEST (EU).

"Investing in Research Infrastructures: business plans and financial transparency"

Antonella Calvia-Gotz, European Investment Bank

Antonella Calvia-Goetz is an Advisor on funding innovation in the Projects Directorate of the European Investment Bank (EIB). Prior to this position, she worked as Advisor to the EIB Executive Board and DG-EnterpRIe at the European Commission in Brussels. At the start of her career, she was RIk Manager at American Express Europe in London. Dr. Calvia-Goetz is a recognized expert on European research infrastructures. In 2013, DG-RTD appointed her Chair of a High Level Expert Group tasked with assessing 35 research infrastructures of the ESFRI Roadmap. She routinely collaborates with the Ministries of Higher Education and Research of many EU Member States as expert and author of policy proposals for improving the governance of research funding in the EU. She also serves as a non-executive independent director of a leading private company in Benelux and she is a member of European Corporate Governance initiatives.

Dr. Calvia-Goetz holds a Doctorate in Economics from Oxford University (UK) and a Master's degree in Business Studies and Economics from the University of Venice (Italy). She also earned a Certificate in Strategy and Innovation from the Sloan School of Management of the Massachusetts Institute of Technology (MIT) in the US.

"Sustainability of Pan-European Coverage"

Axel Börsch-Supan, SHARE Coordinator

Professor Börsch-Supan studied economics and mathematics in Munich and Bonn and received a doctorate in economics from MIT (Cambridge, USA) in 1984. After working as an assistant professor of public policy at Harvard University (1984-1987) and as professor of economic theory at the University of Dortmund (1987-1989) he was professor of macroeconomics and economic policy at the University of Mannheim (1989-2011). In his role as director of the Max Planck Institute for Social Law and Social Policy in Munich, he is heading the Munich Center for the Economics of Aging (MEA) since 2011. Professor Börsch-Supan is a full member of the Berlin-Brandenburg Academy of Sciences and German National Academy of Sciences Leopoldina and a corresponding member of the Austrian Academy of Science. He also coordinates the Survey of Health, Ageing and Retirement in Europe (SHARE).

Professor Börsch-Supan is a member of the Council of Advisors to the German Economics Ministry (chair 2004-08), a member of the German federal governments' Expert Group on Demography and serves as a consultant to the European Commission, the World Bank, the OECD and several foreign governments.

Session 5 – International Outreach of RI

Moderated by Giorgio Rossi – *GSO Italian Delegate*

"How an ERIC reinforces the European role in an international network?"

Sylvie Pouliquen, EURO-ARGO, Program Manager

Graduate in Computer Science she joined the French research institute IFREMER in 1992, first as the head of the ERS satellite data processing Centre and since 2001 as the lead of the Coriolis inter-agency structure coordination in-situ data collection for operational Oceanography. Since July 2014 she is also the Director of the Euro-Argo ERIC that coordinates European contribution to the international Argo network. She is involved in developing an in situ data management system for operational oceanography and research both at French, European and international levels. She coordinates the In Situ Thematic centre for the Copernicus Marine Service (CMEMS) and lead the Data Information work package within H2020 AtlantOS project. She is also the chair of the DATAMEQ (Data Management Exchange and Quality) working group of EuroGOOS.

"Pioneering International Outreach to Russia: The CREMLIN case"

Martin Sandhop, CREMLIN Coordinator

Senior scientific officer at DESY Hamburg, unit "International Cooperation and Strategic Partnerships" since 2013: Coordinator of the German-Russian Ioffe Röntgen Institute (IRI); Project manager of the H2020 CREMLIN project ("*Connecting Russian-European Measures for Large-scale Research Infrastructures*"). 2008-2013 seconded to Moscow: Head of the Moscow Representative Office of the Helmholtz Association of German Research Centres. 2007-2008: Senior Scientific Officer at the International Bureau of the German Federal Ministry of Education and Research BMBF (Project Management Agency at DLR) - Science & Technology cooperation with Russia. 2002-2007: Head of the Kiev Office of the German Academic Exchange Service (DAAD).

"EVA - International preparedness for Viruses"

Jean Louis Romette, European Virus Archive Global, Coordinator

Life Science PhD and Doctorat Université de Compiègne, Compiègne, France;
Post doctorate fellowship in Chemical Engineering Dpt, Massachusetts Institute of Technology, Boston, USA;
Former R&D Director of the Tetra-Laval Biotec subsidiary company, Zurich, Switzerland;
Currently, Professor in Engineering School of Luminy, in charge of Cell Biology and Health; expertise in Applied Biological Science in Process development and 44 publications in International Journal with referee committee (9 patents).

Coordinator of European projects, such as VIZIER Consortium: (FP6, Integrated Research, Health, 2006-2009) Identification of viral targets for the development of antiviral drugs; European Virus Archive: (FP7 Infrastructures 2009-2014) Establishment of European BRC dedicated to Virus collection; SILVER: (FP7 Health, 2011-2014 21 partners, 11M€. Development of antiviral drug and transfer to Industrial companies; European Virus Archive goes Global (EVAg): (H2020 Infrastructure, 2015-2019) Establishment of International BRC dedicated to Virus collection.

"Scientific and geographical enlargement: lessons learned at CERN"

Charlotte Warakaulle, CERN, Director of International Relations

Charlotte Warakaulle has served as CERN Director for International Relations since January 2016. From 2001 and until joining CERN, she held a variety of posts at the United Nations, from Associate Speechwriter to Chief of the Political Affairs and Partnerships Section of the United Nations Office at Geneva.

Most recently she took on the position of Chief of the United Nations Library in Geneva, where she was responsible for library services, knowledge management, cultural diplomacy and intellectual outreach.

Prior to her work with the United Nations, Warakaulle held a Carlsberg Visiting Research Fellowship at Lucy Cavendish College at University of Cambridge from 1998 to 2001.

She gained her M.Phil in International Relations at University of Cambridge (Pembroke College) and also holds an MA in History (cand.mag.) from University of Copenhagen, as well as an MA in History (coursework) from University of Sydney.