CESAER

conference of european schools
for advanced engineering education
and research

Statement on Long-Term Sustainability (LTS) of Research Infrastructures (RI)

Leuven, 9th December 2016

Fifty-one leading doctoral-granting universities of science and technology from twenty-six countries united within the Conference of European Schools for Advanced Engineering Education and Research (CESAER) herewith provide input into the debate on LTS RI feeding into the preparation and adoption of a dedicated action plan called upon by the Competitiveness Council on 26th May 2016.

- The conclusions from the consultation on LTS RI by the European Commission (EC) demonstrate that the European Research Area (ERA) is not only about implementation at national level. We welcome the call for an action plan from the Competitiveness Council and call upon the EU to embed its preparation, adoption and implementation in the broader context of the realisation of the ERA.
- Fulfilling different roles, universities of science and technology are key and indispensable for ensuring scientific excellence of RI, unlocking the innovation potential of RI, delivering impact by RI and reaching out to society in creating acceptance for RI. We thus consider ourselves as key stakeholders in safeguarding the LTS RI. Establishing institutional RI roadmaps outlining the policies for RI development, operation and use of universities feeding into regional, national, European and global RI roadmaps might be a promising way forward.
- LTS RI is at the core of our vital interests. We underline the importance of transparent road mapping, RI funding instruments and cost calculations and plea for a considerate and balanced approach between ensuring basic provider-driven infrastructure on the one side and eligibility of access costs in principal investigator-driven and competitive research grants on the other.
- The current open data policies have to become more specific concerning the different scientific domains, responsibilities among stakeholders (RI, universities, funding agencies, national RI for e-infrastructure, researchers, business, industry and public services), services and costs. More coherence and consistency between the RI is needed concerning FAIR and secure data schemes in this respect.
- We endorse the definitions, principles and guidelines in the European Charter for Access to Research Infrastructures and encourage its application for all RI.
- We encourage the EU to develop a Sectoral Qualifications Framework (SQF) for RI staff and to establish a dedicated scheme linking mentors/tutors to young talent.
- We urge national governments to transmit political support into financial commitments early on.
- We need to promote a fundamental and conceptual understanding of knowledge within society and to unite people around thought.

Role of universities as key stakeholders in LTS RI

Universities - in particular universities of science and technology - and other Research Performing Organisations (RPO) host, (co-) operate and (co-) own significant RI based at our institutions. We are active partners (operation and funding) to national and regional RI and contracting partner to many pan-European, international and global RI. Our researchers and research groups are at the forefront of the scientific case of RI: as frontier (lead) scientists and reviewers of RI and we educate, train and deliver key scientific, managerial, operational and support staff for RI. We are the employers of researchers as users, advisors and governors of RI and underline the importance of involving our faculty and us in all phases of the RI lifecycle. Universities and other RPO are key and indispensable for ensuring scientific excellence of RI, unlocking the innovation potential of RI, delivering scientific, economic, social and societal impact by RI and reaching out to society creating acceptance for RI. We consider ourselves key stakeholders in safeguarding LTS RI.

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Ensuring scientific excellence

Stimulating multidisciplinary approaches, in particular, to address societal challenges in our view does not concern the direct mission of an RI. It is rather part of the mission of universities and other RPO in cooperation with business, industry, public services and civil society. However, RI should be flexible and adapt to accommodate and facilitate projects and programmes that address societal challenges - e.g. their access policies should enable multidisciplinary research as well as complimentary technical adaption. Excellence-driven access exclusively dependent on the scientific merit, originality, and quality, technical and ethical feasibility of an application, evaluated through peer review, is one of the crucial measures ensuring scientific excellence at RI. We emphasise internal and external experts may be used for such peer review. We encourage the recognition and recycling of review results, i.e. make appropriate re-use of the scientific evaluations of quality and relevance for research projects that have been granted competitive funding at any level. In addition, appropriate and - where needed - distinct bodies in the governance of RI for developing science agendas and portfolios, advising on and periodically reviewing them are key measures to ensure the continuous delivery of excellent scientific results. Particular attention is needed in the area of independent ethical review. The balance between scientific desires and opportunities on the one side and the technical feasibility and engineering possibilities and constraints on the other is important too. Sharing best practices and targeted support to newcomers seems opportune.

- We consider the definition, planning, monitoring and evaluation of Key Performance Indicators (KPI) for all aspects of the RI and the resulting science important.
- We recognise the responsibility of RI to properly develop, plan, monitor and evaluate their business case and later business plans, effectively translating their access policy into long-term income. Making access costs – including the costs for Data Management and Stewardship (DMS) - eligible in research and innovation grants is key in this respect.
- We underline the importance and value of the European Charter for Access to Research Infrastructures and encourage its application. We call upon the EC to follow up on its continuous review and update together with the ERA stakeholder organisations and offer our cooperation through CESAER.

Attracting and training the managers, operators and users of tomorrow

A coherent and consistent understanding of the required knowledge, skills and competences of the different RI staff at all levels is lacking, i.e. a Sectoral Qualifications Framework (SQF) for RI staff. Particular attention is drawn to leadership and data science and stewardship qualifications. Such a SQF for RI staff would allow for the personalised assessment of the existing workforce and enable the existing (best practices of) full degree and further education and training providers to improve offerings. It would also enable existing and new RI to identify better staffing needs, to define better staffing plans, to define and monitor KPI in this respect and to recruit, educate and train the workforce in a more targeted way. Such a SQF for RI staff would enable the internal quality control mechanisms and the existing accreditation bodies to improve the evaluation of full-degree and (further) education and training programmes. A SQF for RI staff would allow for the design and effectuation of personalised career paths and advancement, certainly if combined with the recognition of (newly) acquired knowledge, skills and competences. The validation of informal and non-formal learning is crucial. This would also enable the design of attractive salary schemes and enhance personal and professional development. However, it would not solve the persistent and regretful issues with social security and pension schemes of transnationally mobile staff. It is crucial to arrange for full and real cost remuneration of (long-term) secondment arrangements to RI, allowing staff to keep their rights acquired in the country of employment.

The assessment of the qualification level is key to design any staff exchange programmes in a meaningful way. The tricky question is how to fill and manage the vacancy when a member of staff is away on a mobility programme, in particular for smaller RI. Arrangements providing some form of reciprocity might help in this respect. Conferences and seminars dedicated to RI staff - particularly also at our universities - are key to encourage cross-border mentoring and tutoring of RI staff.

Making the access to RI on offer better known and improving (online) brokering between the offer of RI and (potential) user demand are important steps towards broadening the user communities of RI. We have positive experiences with the use of external `ambassadors`, i.e. experienced users in the community that stimulate and assist new users and lower the barriers for them. The involvement of users from academia, business, industry, public services and the broader public in all phases of the RI lifecycle is crucial. It goes without saying that in the RI concept development, design and preparation phases care needs to be taken to undertake careful user surveys and engage respondents in the development of their access policies and business cases and plans. Moreover, this involves dedicated and continuous dialogues between RI staff and potential user groups in the latter phases of the RI lifecycle - i.e. that the RI staff takes time to visit our research groups and talk about our researchers` needs in relation to what the RI can offer. Finally, user groups need to get involved and be heard in the respective governance of RI.

- We encourage the EU to support the development of a SQF for RI staff and a dedicated scheme linking mentors/tutors to young talent. We draw attention to the large unexploited potential of retired (senior) RI staff effectively reducing the investment costs as only travel and accommodation costs would have to be covered.
- The EU should reinforce its efforts to solve the issues of RI staff mobility across borders alongside with those of other researchers in the implementation of the ERA (e.g. transferable social security/pension rights). We particularly emphasise the great potential of tax benefit for such mobile staff.

Impact and innovation potential of RI

One must differentiate between scientific (e.g. bibliometric, peer reviews), economic (econometrics), social (statistics, e.g. longitudinal studies) impact and impact on innovation (statistics). We emphasise the need to increasingly address the broader societal impact (primarily via qualitative methods) and underline that the main impact from RI comes from scientific output (new knowledge) and the resulting innovation. As governments and funders increasingly ask for proof that their investments into RI are transformed into concrete and practical innovation and applications, the relevant question is therefore: What is the role of RI for performing research with high socio-economic impact? One therefore has to evaluate whether the research was possible to perform (or not) without access to the RI. Particularly in the construction phase of RI, there are other direct benefits - such as employment (internal and external partners), revenues for suppliers and cooperating institutes - and indirect benefits - such as innovations through procurement and in kind contribution, staff turnover (technology transfer through human capital and international cooperation).

Acknowledging the need for RI to internalise full-grown stakeholder engagement strategies within their mission, the fostering of innovation through multidisciplinarity and the promotion of uptake and development of non-technical innovations primarily lie within the mission of universities and other RPO in cooperation with business, industry, public services and society. Building on the experiences and cooperation in traditional linear expert- and Technology Readiness Level (TRL)-oriented knowledge management models, the challenge lies in unlocking disruptive market-creating innovation. Key concepts to establish a culture of 'innovation' for staff concern openness; risk taking; flexibility and agility of interactions; trust, integrity and confidence between partners; rapid reaction; and co-creation. We highlight the existing mechanisms at the institutional and regional levels linking the various players within regional or thematic innovation ecosystems. We are convinced, that the future European Innovation Council (EIC) - if implemented properly - can offer opportunities to determine and unlock the innovation potential of RI and recall our concrete recommendations on its implementation. The suitability of mechanisms to bring industry and RI to joint technological development depend on the type and kind of technologies: A mix of dialogues at the operational level of users and providers and at the strategic management level is effective for those technologies that result from use of the RI. However, industrial users should be treated as any user - as far as possible and reasonable. Innovation procurement modes (i.e. joint technical development programmes) and tax incentives work for those technologies that result from development, construction and upgrade of the RI.

- Rather than launching new initiatives to foster co-design and co-innovation, the EU should reform its current innovation funding instruments landscape filling the evident gap in the current TRL-driven linear approach to innovation and enable scientific results from RI to feed into disruptive innovation. The EIC thus should provide three types of funding opportunities, i.e. 1) an open Proof-of-Concept (PoC) scheme, 2) a true bottom-up instrument targeting innovators and their ideas and 3) support local and thematic innovation eco-system players. A flexible approach to types of applicants is needed and portability of grants should be allowed.
- Universities and other RPO should provide for adequate reward systems for our students, teachers and researchers. Research-driven disruptive innovation resulting from access to RI leading to (unexpected) breakthroughs and paradigm shifts requires broadening the competence of the expert staff of our Knowledge Transfer Offices (KTO) also to FAIR and secure access to data.

- We support the development of a common, reliable and normalised reference framework for impact assessment, which takes into account the diversity of RI as well as the evolution of the impact along the lifecycle. The assessment methodology should be based on a set of common minimal indicators along the lifecycle, essentially linking the external (political) demand for proof of impact with the internal mission, strategy and monitoring of RI.
- We urge the various international players to cooperate closely when defining and collecting standard data on RI, not least with a view on increasing comparability and reducing the administrative burdens to researchers and RI. The identification of the set of common indicators linked to the mission and monitoring of RI (KPI) opens interesting perspectives for close alignment between the various players.

Better exploiting data generated by the RI

The prerequisites for better exploiting data generated by RI are that data is available together with the resulting publications and is easy to find. It is not the mission of the data to break silos, but again there are prerequisites: `libraries` for finding datasets, descriptive metadata and that the data is stored in an interoperable fashion (i.e. that different systems can read the data). In essence, scientists break silos between their disciplines and it is up to their employers to stimulate them to do so.

RI are not only providers of data, but – in admittedly varying degrees and ways – have key roles in standardisation, adding meta-data, cleaning of data, modelling and simulation of data, storage, re-use and dissemination of data to various user groups. These diverse and encompassing contributions put them and us at the heart of the European Open Science Cloud (EOSC). An over simplistic approach of `providers and users` will not work and co-design and co-ownership are the key to its success.

The additional costs must be planned for, regardless what source they will be taken from (universities, RI, governments etc.). These issues are all important and relevant for policies on `open` data. However, it is important that the general discussion on principles is more mature and criteria and modes for FAIR and secure data in particular disciplines are better defined, before the discussion of the technical nature and specifics of the EOSC is led.

- We call upon the EU to not simply consider universities as `users`. It is of importance to involve the different scientific communities in order to identify their needs and ensure the adequate provision of e-infrastructure and e-services to them. In developing the EOSC, the EU must avoid – comparable to the situation with scientific publications – an escalation of costs.
- Research Data Management (RDM) policies should address and tackle standardisation, interoperability of services and improve research replicability by securing data. However, we draw attention to the enormous differences between and varying achievements of the scientific disciplines. Therefore, we consider it important that this is a science-driven endeavour.

Governance and funding of RI

Road mapping should not be solely based on (top-down) political considerations, but must be rooted in (bottom-up) sound scientific projections and ultimately strengthen the research base at universities and other research performing organisations. The EU Member States (MS) and Associated Countries (AC) within the European Strategy Forum on Research Infrastructures (ESFRI) have reached a common framework for the definition of the lifecycle of RI.

ESFRI is the RI road mapping body in Europe and has made excellent progress throughout its roadmap updates. It should now address its entire RI portfolio of Projects and Landmarks. Further work is needed to improve the link between access policies and the business case of RI and transparency in funding instruments and cost calculation has to be created. The concept development, design and termination phases of RI need to be better used.

While acknowledging the access to larger equipment and facilities and the economies of scale, we perceive a decrease of the number of small and medium-sized RI in favour of larger ones. There is high competition to host such large-scale RI, because of the international, high tech and scientific image, the evident boost of technological development, the scientific progress and the proven local and national return on investment. This trend results in concentration of RI in few regions. Regional and national governments in lesser performing regions thus have a challenge in boosting their RI and in attaining and retaining qualified staff.

- ESFRI and funding agencies should assess and monitor the business cases and plans of RI and provide meaningful recommendations directed towards supporting them to move towards implementation.
- The MS, AC and EC should adopt long-term visions and approaches to RI monitoring and governance rather than short-term ones. Essentially, science in general, and RI in particular, must be provided with firm political support and financial commitments and empowered to generate scientific and societal breakthroughs. We call upon MS and AC to fulfil their financial obligations in accordance with the ERIC regulation. Funders should also maintain their funding when the relevance and validity of science are at stake.
- MS and AC should proactively determine their national RI roadmaps prior to an ESFRI roadmap update allowing for the effective and efficient collection of political support and financial commitment. It is important that these national RI roadmaps contain short lists of RI, which realistically will be funded, rather than long wish lists and that, they cover the entire portfolio of national RI in all phases of the RI lifecycle. MS and AC should engage all relevant stakeholders within their science systems - including universities and regional authorities - when developing their national RI roadmaps.
- The EU should clarify which of its funding instruments cover what costs in what phase of the RI lifecycle: the different expected impacts in the various funding instruments (i.e. expected KPI) constitute a problem. They and the procedures and timelines thus should be aligned and simplified. Moreover, the EC should strive towards accepting evaluation and assessment results from ESFRI and FP in the other programmes.
- Regional and national governments of lesser performing regions have a task to reform their research systems and provide for more attractive career perspectives. They should use more European Structural and Investment Funds (ESIF) for RI.
- We urge national governments – effectively providing most funding for RI – to translate political support into financial commitments early on. This is particularly true for the preparation and implementation (construction) phases. We also plea for a considerate and balanced approach between ensuring basic provider-driven infrastructure on the one side and eligibility of access costs in principal investigator-driven and competitive research and innovation grants on the other.
- We encourage ESFRI to refine further its definitions, models, methods and procedures together with other players at international level such as the Groups of Senior Officials (GSO) and the Global Science Forum (GSF). The development of common principles and

guidelines for evaluation and accounting of RI will not only support decision makers and allow for better choices and planning between different options, but will also reduce the administrative burden for RI reporting to their many stakeholders.

- We support the wider analysis of the RI landscapes in dedicated scientific domains, enabling better decisions on the development and termination – e.g. dissolution; dismantling of facilities and resurrection of site; reuse; merger of operations and organisation; and (major) upgrade – of RI.
- The EU should investigate the establishment of a global ESFRI and seek to involve the relevant countries worldwide.
- ESFRI should strengthen the identification of the global opportunities through evaluation and assessment of proposals, Projects and Landmarks allowing Europe to bring forward European opportunities to the global level. We should avoid setting up another mechanism.

Outreach to society

We need to promote a fundamental and conceptual understanding of knowledge within society rather and to unite people around thought. Primarily, universities and other RPO are enablers in this respect. RI often have features that appeal to the public and therefore have a complementary role to the universities and other RPO when it comes to public outreach. Importantly, RI give visibility to science that may stimulate interest in science and technology of young people and students.

- Universities and other RPO need to familiarise more children with science, transmit knowledge through education and training at all ages and involve local communities in our work, not least through citizen science.
- RI, funders and governments need to internalise public engagement strategies into their mission and allocate funding (e.g. scholarships) accordingly.

For more information and enquiries, please contact our Secretary General David Bohmert at david.bohmert@cesaer.org.

The Conference of European Schools for Advanced Engineering Education and Research (CESAER) is a non-profit international association of fifty-one leading doctoral-granting universities of science and technology from twenty-six countries. We stand for scientific excellence in university engineering education and research, and the promotion of innovation through close cooperation with business, industry and public services in order to ensure the application of cutting-edge knowledge in society. CESAER maintains and promotes the highest quality standards. Our mission is to:

- serve as a close network and platform for mutual learning;
- contribute proactively to European developments by conducting a permanent dialogue with and influencing European institutions and other stakeholders;
- inspire reflections and policy decisions of stakeholders at European and national level;
- foster public understanding of the role of engineering in societal and economic development considering the principles of sustainable development.