10 November 2016

Comments by the Helmholtz Association on

Long-term sustainability of Research Infrastructures

The Helmholtz Association welcomes the relevant debate on long-term sustainability of research infrastructures (RI) as an acknowledgement by the Council and the European Commission of the paramount importance of RI for a competitive research and innovation landscape in Europe. Without world class RI, Europe would not be able to attract the bright minds it needs. Major breakthroughs in many fields are only possible with the help of RIs, and RIs often are a crystallisation point for high-impact clusters of research organisations, start-ups and industry. Europe is traditionally strong in this field, but it is facing growing competition around the world.
Helmholtz centres operate the majority of Germany's large RIs, many of them of more than national relevance, and are involved in many of the ESFRI Projects and Landmarks. The portfolio of Helmholtz RI comprises a multitude of facilities, from satellites and synchrotrons to ocean vessels, research airplanes and supercomputers, and serves a large variety of fields of science. The following comments therefore encompass the commonalities of many different types of RI in the broad spectrum of scientific fields which are part of the Helmholtz mission: energy, earth and environment, health, key technologies, matter; and aeronautics, space and transport.

Towards long-term sustainability – Recommendations

1) **It's a funding problem**

Our first overall recommendation addresses funding of RI in the European Union: The European Union has set itself an important goal in both the Lisbon agenda and the Europe 2020 strategy, namely aiming for **3% of GDP** investment in research. This goal is still not met. A key factor for long-term sustainability of RIs, however, is the availability of continuous, dedicated and adequate funding. We propose to emphasize the high importance of the 3% goal for sustainability of RI in Europe and to aim for meeting the 3% goal by taking steps towards increasing financial support to contribute to the long-tern sustainability of RI. If Europe achieves the 3% goal, the positive impact on the long-term sustainability of RI in Europe, both for national RI and for ESFRI projects, will be significant. The action plan for long-term sustainability is thus an excellent means to strengthen the implementation of the 3% goal.

2) **Excellence is essential**

We strongly support the conclusion of the EC report which prioritises **scientific excellence**, since this is the prerequisite for any meaningful funding of an RI. In practical terms, the key to supporting scientific excellence of an RI is to attract a large number of excellent scientists to use the RI for their research projects, since these will push the RI to constantly stay at the forefront of what is technically feasible and to provide optimal services.

This hen-and-egg-situation requires:

- Keeping the RIs at the forefront of science and technology to enable them to provide excellent and cutting-edge services (including IT tools) by highly experienced personnel for their users[1].

This is only possible if the RIs

- are properly integrated in regional and national science programmes and secure long-term funding and staffing is ensured, while also foreseeing international peer-review, e.g. via international scientific advisory councils. In addition, it requires long-term strategic planning and coordination of R&D on the European and international level.

Much of this needs to be initiated at national level. **The European level** can, however, have a significant impact in several ways: providing collections of good practice examples, e.g. via the Charta for Access, and initiating strategic planning of large RI (ESFRI). It also should take a more active role in funding technology development at RIs (where appropriate in innovation partnerships with the private sector) and common

[1] The term user is used in the document according to its definition of the Charta for Access to RI, i.e. encompassing academia, business, industry and public service.

solution to e.g. IT and data related issues, since the cost benefit would be better at the European level than at the national. Most importantly, EU support for user access across national borders in Europe should be increased to ensure the best scientific users can select the best facilities, regardless of whether they are located in their own country.

3) **Specialized training is needed**

Developing skills for RI managers and staff is essential to ensure the excellence of RIs. The Helmholtz Association has set up an internal training programme together with an Institute of the St. Gallen University to provide management skills to research managers within the Helmholtz Association and to cooperation partners[2], and we strongly believe that such training is highly relevant and further training on the specificities of RI would be useful.

The main measures we see as vital to support skills development of European RI managers are:

- Establishing staff exchange programmes at European level to increase mutual learning.
- Adding relevant networking activities in the framework of EC projects and providing an overview on trainings available in the field as well as fostering the exchange of existing programmes and their potential collaboration.
- Establish blended learning RI management programmes.

In this context the Horizon 2020 funded RItrain Project (2015-2019) should be taken into account. RItrain professionalizes the training of RI managers and leaders by capturing the requirements competencies, mapping these to existing training, identifying gaps and developing innovative training programmes offered by European universities. RItrain also promotes staff exchange programmes.

4) **Developing RI user skills & outreach**

Further developing RI user skills and promoting outreach is highly relevant to broaden the user base of RI further, and we suggest the following measures:

- Providing attractive and comprehensive user support via e.g. EC funding programmes to support both academic and non-academic users of RI.
    - Providing simplified access for industrial users and new user groups, including initiatives and programmes for collaborative Research and Innovation Actions developed and performed jointly by RI and non-academic users[3]. Funding lines for such programmes should be established e.g. through European Framework Programmes, such as FP9.
    - Taylor-made models for long-term funding of transnational access for the different RI communities, including the ESFRI Projects and Landmarks.

5) **Unlocking the innovation potential of RI**

First it needs to be emphasized that, rather than having a "locked" potential, RI already now have a major role in making innovation possible – many breakthrough discoveries which have disrupted the business world have their origins in RIs, the internet being only one of them. RIs are essential to the competitiveness of Europe – and the focus on the game changers of the next generation rather than on the game changers in 1 year is important for the overall innovation ecosystem. It thus needs to be recognized that sustainability means fulfilling the mandate of the RI, for which the expectations of its sponsors play a significant role – if this mandate includes focusing on industry contracts, it should be an indicator for the performance of the RI, if not, it should not be the priority.

It should also be emphasized that innovation not only happens when industry acts as end user of RI resources and services, but can be initiated when RI and industry team up to keep RI services at the cutting edge of science and technology.

This being said, there are of course many impressive examples of how to facilitate interaction between RI and industry where useful, and we strongly support developing best practice on this basis and reflecting on how to strengthen positive effects.

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[2] https://www.helmholtz.de/en/jobs_talent/the_helmholtz_management_academy/

[3] See STFC (UK)'s "ISIS Collaborative R&D Programme", http://www.isis.stfc.ac.uk/industry/isis-collaborative-randd-programme14706.html.

The main barriers preventing effective cooperation between RIs and industry

There are encouraging examples where industry and RI cooperate very well. The ESFRI project IAGOS, for example, shows an active cooperation of airlines in the gathering of atmospheric data by transporting sensors on standard flight routes, and some RIs are even set up to serve partners from industry as main users, as e.g. wind tunnels.

In other cases there is little interaction with industry due to, among others, the following aspects:

- Lack of awareness of industry of the potential benefits RIs can offer.
- Knowledge discrepancies between industry and science which leads to a lack of a common language. The potential of RIs cannot adequately be communicated.
- Measurements at the RIs are often not standardized enough and/or too fundamental science for industry; due to little industrial usage of RI the services for individual customers are not as comprehensive as wanted by industry, which often has little own experience and thus requires much more support, and sometimes has additional restraints regarding data secrecy.
- Short-term collaborations (1-2 years) are sometimes not appropriate for developing effective collaborations and to build trust.
- Unclear licensing situation for industrial use of the technologies used, state aid and tax laws.

Main initiatives which we believe should be taken to encourage the cooperation of RIs, academia and industry are:

- Usage of RIs by industry could be enhanced by developing and financially supporting so-called "facilitating companies" or intermediaries which provide full-services for all those preparations and steps (renting run-time, run experiments and analyse the data plus all administrative steps) academic users of RI are familiar with but which industry lacks the know-how to do[4]. These can be set up as spin-offs, or these services can be provided by dedicated staff for industry service at RIs[5].
- Provision of additional resources/programmes for financing joint technology development between RI and industry or for supporting tailored industry user support. Currently, outreach actions and tailored user support for industry are very difficult to realize without third-party funded projects[6].
- There are many successful collaborations with industry to develop cutting-edge technology needed by RIs which assures global market leadership for European companies[7]. Collaborations such as these should be strengthened.
- Entry barriers of industry usage should be lowered by flexible payment modes that allow the decision whether the outcome of RI projects are of commercial interest before and after projects
- Implementation of funding schemes for development of trainings for industry experts to increase their absorptive capacity so that knowledge discrepancies between industry and science diminish.
- Longer-term measures could include measures to have service for industry acknowledged in a scientific career, as well as exchange of staff between industry and RIs.

6) Fostering specialized SME suppliers

A different layer of industry-RI interaction is important for **preserving a competitive advantage for the development of the key technologies required for the RI of tomorrow**:

There is need to better foster the often small companies supplying RI, which have development departments working in very close collaboration with researchers and which provide specific key elements which are essential for maintaining the RI at highest quality level on a global scale. This also is essential to ensure less dependence on single suppliers. Notably it is necessary to avoid know-how drops in periods where no new RIs are constructed and to support key technology development for RIs in the long-term. We recommend further strengthening this e.g. via joint R&D projects between RI and industry and by increasing European cooperation in this field.

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[4] E.g. http://hzdr-innovation.de/, http://www.prace-ri.eu/hpc-access/shape-programme/

[5] Some of the projects mentioned above have shown that a joint approach between several RIs regarding industrial outreach can be very effective. Common platforms for industrial access (EU wide or confined to regions and/or certain industry sectors e.g. automotive, life science or nanotechnology) should be considered, either as spin-offs or publicly funded.

[6] Examples at EU level include SCIENCE LINK (www.science-link.eu) and Baltic TRAM (www.baltic-tram.eu) (both Interreg Baltic Sea Region Programme) and SINE2020 (H2020, www.sine2020.eu). An example for a national initiative is LINXS (DK): www.linxproject.dk

[7] see e.g. MicroTCA at DESY, http://mtca.desy.de/

7) **Communication**

RRIs need to **communicate better** and explain **their added value**. This is vital inside the academic circles and beyond.

We need better systems to recognize the contribution of an RI in results and publications. The Journal of large-scale research facilities (http://jlsrf.org) is a relevant example allowing to precisely cite the contribution of a RI via a Digital Object Identifier (DOI), but such initiatives must be strengthened.

The engagement with the public at large also remains vital in order to ensure the population and political decision makers understand the relevance of the activities of RI and benefit from the fascination for scientific research in general emanating from many RI.

8) **Measures to increase recognition of scientific services at RIs**

Working at RIs and providing services to users often is a good possibility to achieve a permanent position as a scientist or engineer. But this is often also the dead end of a scientific career where only publications count. Providing excellent and reliable services with, cutting edge technology, which often is developed specifically for purpose, requires a high degree of scientific and technological excellence. RIs would be much more attractive for excellent scientists if the scientific services at RIs received more recognition, if such service became a scientific qualification criterion just like supervising students (e.g. for ERC grants) and if the personnel was better integrated in top-level science programmes.

9) **Life cycle**

We confirm the importance of upgrading on long-term sustainability as described in the EC report, but want to emphasize that sometimes there is no clear distinction between upgrade and construction of the next generation, which will replace the previous RI. This is especially true in some fields as e.g. supercomputers, which have an average life span of 5 years. We therefore recommend aiming for a balanced description of this aspect in the action plan.

10) **Open access to research data**

Making research data available to the general public is a natural step in the endeavor to fully exploit the potential of a RI.

The extent to which open access to research data presently is granted by Helmholtz RI strongly depends on the scientific disciplines. Some RIs recently have implemented or are currently implementing a PaNData-based policy (http://pan-data.eu); at other RI, serving different communities, open access to research data has already been established for a long time. In September 2016, the Helmholtz Association has agreed on a common position committing itself to open data[8] and endorsing the recommendations of the German Council for Scientific Information Infrastructures[9].

As main issue hampering a fast opening of the access to research data a strong lack of consultancy on best practice for data storage and curation, on data policies and on a portfolio of legal aspects has been identified. This is complemented by the strongly increased costs for storage infrastructure and for personnel.

Setting up expert groups/ advisory groups addressing these issues is therefore suggested.

This should be discussed in the context of the structuring of the European Open Science Cloud.

Brief portrait of the Helmholtz Association

The Helmholtz Association contributes to solving major challenges facing society, science and the economy with top scientific achievements. With some 38,000 employees in 18 research centres and an annual budget of approximately €4 billion, the Helmholtz Association is Germany's largest scientific organisation. Its work follows in the tradition of the great natural scientist Hermann von Helmholtz (1821-1894).

Please direct further questions and comments to

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[8] https://www.helmholtz.de/fileadmin/user_upload/01_forschung/Open_Access/EN_AKOS_TG-Forschungsdatenleitlinie_Positionspapier.pdf

[9] Rat für Informationsinfrastrukturen: Performance through Diversity, 3 May 2016 (http://www.rfii.de/en/category/documents/)