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The Research Infrastructure Information Base in Europe

Summary of the Roundtable Debate of 6 November 2013



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1. Background

The term ‘research infrastructure’ can refer to any of a vast array of tools, services and resources that researchers need to conduct their work in any field of science, from natural sciences such as physics and chemistry, to social sciences and humanities disciplines such as sociology and linguistics.

These facilities and resources include, for example, large laboratories, databases, research libraries, historical archives, biological databanks, satellite observation facilities and research vessels.

Excellent research infrastructures are not only the *sine qua non* of top-class research; they also play a crucial role in the training of new generations of researchers, in innovation processes and in enhancing European attractiveness and competitiveness more generally. Indeed, the importance of the research infrastructure base in tackling major global societal challenges in areas such as health, climate change and energy cannot be overstated.

However, as science and technology become increasingly complex, so does the research infrastructure landscape. Countries and regions invest in research and infrastructure largely independently, although in Europe many large-scale facilities are financed jointly by the European Union and its Member States in order to achieve critical mass. Furthermore, the nature of research infrastructure is changing – the research facilities and resources of the twenty-first century are increasingly digital and distributed.

This growing complexity prevents research infrastructures all over Europe from being exploited to their full potential. There is a high risk of both duplication of effort and neglect of gaps across the continent.

In September 2013, the European Science Foundation introduced MERIL, a new public database of openly accessible research infrastructures in Europe. MERIL (Mapping of the European Research Infrastructure Landscape) aims to provide a comprehensive inventory of the top level of research infrastructures in Europe across all scientific domains, regardless of size and profile. Its aim is to provide a better picture of Europe’s existing scientific capacities in order to support informed policy making and investment, and to foster collaboration amongst European scientific communities by providing information on high quality and accessible facilities and resources. The development of MERIL is the result of a pan-European, multi-stakeholder effort coordinated by the European Science Foundation (ESF) with initial funding from the European Commission (FP7 Contract # 262159).

Europe has been in need of such an inventory for quite some time. There have already been two serious prior attempts to establish a database, neither of which succeeded, mainly for reasons relating to poor data quality.

Issues relating to research infrastructure policy in Europe and the attendant information needs that could be met by MERIL, both in the immediate and longer term, were discussed at an event held in Brussels on 6 November 2013, which drew key figures and representatives of many stakeholder organisations. Contributing to the debate were:

- **Ms. Ana Arana Antelo**, Head of Unit for Research Infrastructures, DG Research and Innovation, European Commission
- **Dr. Peter Fletcher**, Head of International, Science and Technology Facilities Council, UK; MERIL Steering Committee; Chair, Science Europe Working Group on Research Infrastructures
- **Professor Hermann Grimmeiss**, Emeritus Professor, University of Lund; MATSEEC
- **Dr. Bjorn Henrichsen**, Director, Norwegian Social Science Data Services (NSD); Council of European Social Science Data Archives (CESSDA)
- **Dr. Peter Tindemans**, Secretary General, Euroscience
- **Professor John Womersley**, CEO Science and Technology Facilities Council, UK; Chair, ESFRI

- **Professor John Wood**, Secretary General, Association of Commonwealth Universities;
Europe Co-Chair, Global Data Alliance

The issues discussed all related to the role that accurate and comprehensive information on the research infrastructure base could play in various domains of policy in Europe and beyond. The articulation of these needs will help shape the next phase of development of the MERIL database.

This paper is a summary of the discussion and the conclusions drawn. For further information about the MERIL database, please refer to Appendix A or go to <http://portal.meril.eu>.

2. The debate

2.1. How well are research infrastructures understood by policy makers?

The European Union's new funding programme for research and innovation, Horizon 2020, will run from 2014 to 2020 with a total budget of €70 billion and a mission to support excellent science, foster industrial leadership and tackle societal challenges. Ca. €2.5 billion of this is earmarked for support for research infrastructures (RIs), to ensure that researchers have access to world-class facilities and resources.

Despite this sizeable allocation, the role of research infrastructures in the European Research Area, it was argued, is not well understood outside their immediate user communities. Some would go so far as to say that the role of basic science, research and higher education in innovation and growth processes is not well understood by policy makers, with universities and laboratories being seen predominantly just as the places where research gets done. Innovation itself, a buzzword of our times, is a complex, non-linear process that is not easy to understand or steer.

Panellists countered that any limited understanding of research infrastructures by policy makers is part of a larger problem of poor communication and even mutual suspicion between science and society. Modern science can be extremely complex, and the research infrastructure landscape in Europe is multifarious and multi-layered. Efforts to rationalize and pool resources have to a certain extent added to the complexity, as large-scale EU-funded initiatives can combine several types of activities under one umbrella, networking dozens of partner facilities and sub-projects. Getting to grips with this sector is challenging for researchers and policy makers alike.

Nonetheless, research infrastructures have moved up the research policy agenda in recent years, due in no small part to the ESFRI process. A key move here was including social sciences and humanities (SSH) in the scope of ESFRI. Data from SSH is appealing to policy makers, as it has a more obvious and immediate social relevance, and may capture the imagination more easily than other sciences. Less than a decade ago it would have been impossible to imagine that SSH research infrastructure would be taken so seriously, and with such positive outcomes for science as a whole.

Panellists converged to the view that to maintain and strengthen this newly won status on the policy agenda, scientists and other intermediaries must be more active in communicating the aims, requirements and results of research activity. Scientists have to be adept at identifying angles that policy makers can understand, particularly in times of economic crisis, when national and sectorial interests may gain more prominence. They must take advantage of all opportunities to convey the importance of their research and the attendant infrastructure needs to policy makers, rather than being seen to be continually pleading for new instrumentation.

Furthermore, the value of research infrastructures should not be communicated in purely scientific terms; there is an ecosystem around RIs involving the jobs they create, the companies and universities they interact with locally, and the broader scientific and business community that absorbs the trained alumni. The broader, longer-term socio-economic benefits of RIs, although difficult to capture and to quantify, can be tremendous.

In all this, what has been missing to date is a clear and accurate picture of existing facilities in Europe which would help researchers to make their case for investment in new or existing equipment and facilities and conversely allow policy makers to make more informed decisions about such investment.

The introduction of the MERIL portal, which aims to provide a comprehensive inventory of RIs in Europe across all scientific domains, will support policy makers in the process of planning and deploying funding for existing and new research infrastructures. Analysis of the data from MERIL will

make it possible to examine strengths, gaps, needs and opportunities and to issue recommendations that feed into future research and innovation programmes at the national and EU level.

2.2. How much industrial engagement is good?

Research and innovation are a cornerstone of Europe's competitiveness and growth strategy, and research infrastructures both underpin and drive this activity. The "European Paradox" was invoked at the debate to remind the audience of the strength of science and research in Europe and at the same time Europe's apparent inability to transform this strength into commensurate industrial advantage through the creation of new applications, products and services.

Today's infrastructure does not always meet the requirements of industry. But while research infrastructures may have failed to take sufficient account of the needs of industry, it is also possible to say that industry has had difficulties in understanding and taking advantage of the research infrastructure sector and the benefits to be gained from it. A lack of useful information on the research infrastructure base in Europe is a likely contributing factor which the introduction of the MERIL database should help to address.

It was suggested by one panellist that the research infrastructure sector in Europe was highly inefficient, and that stronger monitoring, evaluation and prioritisation, as well as coordination and restructuring was needed, potentially by a single European-level professional authority, to improve its overall performance and efficiency by eliminating duplications, pooling resources and filling gaps.

A fundamental difficulty was acknowledged by the panel, namely that the evaluation of the quality and success of research infrastructures is still almost exclusively related to scientific objectives and targets, and that we know very little about how to evaluate research infrastructures in terms of industrial engagement. We do not know how to increase engagement with industry or even how much engagement is optimal.

There are some examples of good practice in exploring this question. In the UK, the Science and Technology Facilities Council (STFC) is currently working to facilitate industrial use of big facilities. The main obstacle for industry, even for small and medium-size enterprises where much of the growth in business and employment occurs, is not the cost of using the facilities themselves, but rather in the analysis of the data or the preparation and transport samples. The STFC is experimenting with ways to support small, innovative companies by subsidising certain elements of the process in order to learn more about what these companies will find useful and to make the facilities more attractive to use. Giving some time and resources away 'for free' can help to establish the initial relationship and understanding with an industry that subsequently evolves into an enduring and mutually beneficial alliance.

For individual RIs that wish to engage with industry, understanding how a business works and building strong relationships with key individuals are essential. Research infrastructures and enterprises are diverse, and one size of relationship will not fit all. Some of the best-known infrastructures, such as those at CERN, have historically done very little to commercialise their work – their relationships with industry have instead focused more on ensuring the availability of the technology that CERN needs for its scientific activity – and yet the socio-economic impact of work at CERN is undisputed.

2.3. Can Europe lead the way in global cooperation on research infrastructure?

The importance of research infrastructures in European policy making is well established, with the ESFRI process in particular having helped to make Europe a global leader in research infrastructure strategy during the course of the past decade. ESFRI was a unique and high-impact experiment in

prioritising investment in support structures for research in all scientific domains. Now other regions of the world, including the USA, are interested in following the example of Europe and linking up with European processes.

Another success story for research infrastructures is the European Conference on Research Infrastructures (ECRI), which became the International Conference on Research Infrastructures (ICRI), now the premier forum for multi-stakeholder, multi-domain policy debate and agenda-setting on research infrastructures.

The reward reaped from ESFRI was in learning how to talk across national and institutional borders, and in establishing governance mechanisms, legal frameworks and data management systems for complex international structures. “Outside of Europe, research infrastructures can still be treated as little more than research projects; we’re helping to dispel this perception and people are particularly beginning to see the benefit of integrating social sciences,” said John Wood.

European leadership has been invaluable for other regions of the world that have been involved in joint projects, such as the Square Kilometre Array (SKA) with its sites in South Africa and Australia.

It was noted by the panel that European and global collaboration on research infrastructure policy is enabled by the existing close collaboration among scientific communities. It is positive that Europe can be seen as a world leader, but it is important to remain focused on the collaborative dimension rather than the competitive. “We cannot *lead* the world in global research infrastructures if we’re thinking about *beating* the world”, said John Womersley. At the same time, Europe can be confident about its abilities to lead large-scale international projects.

There is a need for a global exchange of views on common priorities in order to identify areas of potential for global collaboration on RIs. Horizon 2020 will require even more global engagement on research infrastructure strategy. MERIL will be required to take this into account in its future development.

2.4. What do we still need to know about research infrastructures?

There have been two serious attempts in the recent past to make comprehensive inventories of research infrastructures in Europe, which have foundered largely because of failings in data quality and completeness. The increasing appeal and availability of electronic data means there are multiple and often overlapping mappings of research infrastructures and their equipment and services being compiled all over the world, at national, international and regional level. Appropriate e-infrastructure are required in order to make best use of the available information and to ensure that digital platforms are integrated to avoid redundancy.

Given all these mappings and inventories, what do we still need to know? And who needs to know it? Is there a need for a global information system on research infrastructures? What can a database like MERIL do to contribute to better science and strategy?

The opinions of the panellists touched on diverse aspects of the question. One desire was to have a fully comprehensive database covering facilities and resources of all sizes and qualities, not just the top-level, internationally accessible ones, but also the thousands of smaller ones at local and regional level. This raises issues for MERIL, since its content is currently restricted to those infrastructures that allow international access, among other criteria. It was hoped this stipulation would encourage more institutions to improve their information and accessibility to external users; however, it also means that MERIL alone cannot currently provide policy makers with a complete picture of Europe’s current research base. There is thus a tension between being comprehensive and being oriented to specific audiences.

A centralised database like MERIL is already important for changing perceptions. “People often think of research infrastructures as large concrete buildings in a single location, but that’s just a very small subset of what we’re talking about. By encompassing the full suite of facilities, including e-infrastructures, MERIL will help encourage people to broaden their understanding of research infrastructures”, said Womersley. It was also asserted from the audience that terminology has a role to play in changing mind-sets, and that the word ‘facility’ should thus not be used as the only synonym for RIs; rather, ‘service’ and ‘resource’ should be used more systematically to refer to the full range of RIs across scientific domains. It was contended by a member of the MERIL Steering Committee, Milena Zic Fuchs, that policy makers at national level still have a very limited notion of what digital infrastructures are, which helps to explain the poor representation of social science and humanities infrastructures in the database. In this view, MERIL will only be successful when the nature of digital RIs is properly understood by national research funders and policy makers.

The most important issue framing the debate concerned the audience for the database and whether and how MERIL could serve both the scientific community *and* policy makers. Opinion was split on how useful MERIL could be to the scientific community; certain domains of science already have a good overview of the internationally available resources in their field, while others do not, such as the biomedical sciences, material science and humanities.

Policy makers clearly need the information provided by MERIL. The ESF envisages integrating more information on investment and outlays on research infrastructures, such as capital costs and personnel. “Over the long run, such information would allow for a really novel analysis of the evolution of the costs of various types of facilities over their lifespan. This kind of information would be invaluable to policy makers and facility managers.”

Industry is a third key potential audience. Industrial users typically have very little knowledge of the facilities and resources available or how to access and exploit them. MERIL could focus on helping prospective industrial users find their way to accessing facilities and services. With this in mind, it is important that MERIL not be ‘just’ an inventory of the equipment available at different sites – industrial and scientific users primarily need access to expertise, that is, to people who can help them use the equipment or services and analyse data. The strength of RIs is in the people, not the equipment.

A final potential audience which is generally neglected is the wider public. The public can use the MERIL database to locate sources of information that can support public debate about societal issues.

Above all, the data in any database must be accurate and up to date. The MERIL database is currently limited by the reluctance of RIs to take the time to enter information. There is a need for a significant public relations effort to convince the research infrastructure communities of the importance and the longer-term benefits of being visible in MERIL.

It is generally agreed that nurturing and developing e-infrastructures and interoperable data infrastructures to ensure the open availability of reliable data is becoming increasingly important. The interoperability of data sets is especially important if maximum value is to be gained from the unprecedented quantity of information potentially available.

Martin Hynes explained that it was the ESF’s intention “to be consonant with the open data movement, meaning that the data we gather will be publicly available, but also that MERIL as a platform will support the integration of various information sources relevant to research infrastructures.”

3. Coda

Peter Tindemans summarised the main lines of convergence in the following way.

- **There is a need to communicate the importance of research infrastructures to the outside world.** Despite the good work of ESFRI and others, there is a great deal of work to be done, at national and European level, to convince people that RIs in all their variety are an essential part of the scientific enterprise and of the transformation of scientific results into use in society. RIs have to be understood as embedded in the whole science and innovation framework and as part of a rapidly evolving ecosystem.
- It's easy to make the case for engagement with industry; the question is how to do it. **We have to start experimenting with industrial engagement**, especially with SMEs. We need to collect information and examples of good practice – how can research infrastructures work more closely with industry. This may require that RIs adopt different modes of operation, introduce new financial schemes and support mechanisms, provide more room for routine activities to facilitate industrial users.
- Europe has been doing a lot in research infrastructure strategy over the past ten years and it shows. **Europe is leading the way on digital RIs and RI governance** and its leadership has a wider importance. Through science diplomacy, RIs and Europe can widen their horizons and increase their possibilities.
- **MERIL is an important development, but it will have to think carefully about how best to serve the needs of its targeted user communities, and whether it can serve them all.** Some but not all scientific communities will use MERIL to identify facilities and resources available in other countries, but it's important not to fall into a trap of just listing equipment. Especially valuable for industry would be information on access conditions, on how to use the services/equipment, and on the support offered to use RIs, e.g. from funding agencies. Information on the expertise available would be invaluable. Policy makers are clearly an important audience, but information has to be made digestible for them. MERIL can be a tool for policy makers to learn about the variety of RIs and the evolution in the nature of RIs towards data-based, digital RIs. MERIL should aim to analyse and explain the meaning and importance of the data. MERIL will need a lot of work to maintain, update and enrich the data and facilitate its use by industry. This will require the commitment from all stakeholders, but primarily from its users.

Appendix A

About MERIL

The MERIL project (Mapping of the European Research Infrastructure Landscape) is a pan-European initiative to produce a comprehensive inventory of research infrastructures of major relevance in Europe across all scientific domains, accessible to the public through an interactive online portal.

The aggregation of all this information produces a much better picture of Europe's existing scientific capacities than was heretofore available, and its free availability will help to support cooperation, collaboration and mobility between research infrastructures within and beyond European borders.

The development of MERIL is the result of a pan-European multi-stakeholder effort coordinated by the European Science Foundation (ESF). The longstanding need for such a database was reaffirmed in a 2009 [report](#) from the ESF and European Heads of Research Councils (EuroHORCs)¹, which stressed that an inventory of existing facilities would enhance the information available to policy makers for planning and funding decisions.

The MERIL project was subsequently initiated in October 2010 with competitive funding from the European Commission and significant input from the ESF member organisations and other stakeholders. The stakeholders at the origin of the MERIL project are the scientific community, EUROHORCs, ESF, European Commission, ESFRI, European Association of National Research Facilities (ERF), EIROforum, and Ministries. Most of these are represented in MERIL's governance through its [Steering Committee](#).

Initially funded for two years (2010-2012) by the European Commission under the coordination of the ESF, MERIL is continuing with the financial support of ESF's member organisations.

MERIL was consciously designed to complement the work of ESFRI by producing a survey of existing facilities that could inform recommendations on future investment requirements for large-scale European facilities.

Research infrastructures indexed in the MERIL portal have been identified as being of high quality and of 'greater than national' relevance by responsible national and international 'Data Intermediaries'; they are also required to allow access to external scientific users, nationally and internationally, through a transparent selection and admission process.

The MERIL Portal is still in its relative infancy. From 2013 to 2014 it will focus on completing the data collection for the first round of entries. In the future the ambition is to extend the data collection to include additional information, for example on investment and resources, and to develop the technical services it offers to its users in terms of data analysis or networking and communication functionalities.

The database will be continuously open to the addition of research infrastructures that meet the criteria for inclusion, which is hoped will encourage more facilities to engage with it and with each other and provide acceptable levels of access and information to the wider world.

MERIL can be accessed at: <http://portal.meril.eu>

More background information on the project can be found at: <http://www.meril.eu>

¹ EuroHORCs was dissolved in 2011, making way for the establishment of Science Europe.