

THE EUROPEAN RESEARCH AREA: PRIORITIES FOR RESEARCH UNIVERSITIES

LERU RESPONSE TO THE EUROPEAN COMMISSION CONSULTATION:
"THE EUROPEAN RESEARCH AREA FRAMEWORK,
UNTAPPED AREAS OF POTENTIAL"

LEAGUE OF EUROPEAN RESEARCH UNIVERSITIES

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Executive Summary

LERU supports the concept and objectives of the European Research Area (ERA) and has therefore produced this paper as a response to the European Commission consultation on the subject. Based on extensive consultation with the LERU universities and drawing on previous, updated and new LERU views, this paper puts forward the priorities for EU research policy advocated by some of Europe's leading research-intensive universities.

Following the structure of the EC consultation exercise, the paper delivers the following messages:

1. **Researchers: Attracting talented individuals from anywhere in the world to a research career in Europe is the single most crucial factor in developing a globally competitive ERA.**
 - There can be no doubt that in order to attract the best talents, Europe's focus must be on fostering opportunities for excellent people in excellent environments starting with doctoral training and continuing throughout researchers' careers.
 - In order to attract and support leading researchers they have to be embedded in a vibrant research environment providing good infrastructure and enabling strong interdisciplinary, international and intersectoral linkages.
 - Researchers need to be offered clear career perspectives which are built on well-designed employment posts, well-structured career tracks, well-tailored career planning and professional development and strong funding and facilitating processes.
 - New, innovative concepts for improving the structures and processes of doctoral training have been developing at a fast pace. Europe could strengthen these efforts by supporting, in bottom-up fashion, innovative and excellence-driven doctoral schools or programmes.
 - More transparency and easier procedures with regard to social security provisions and visa regulations for researchers are needed to support the mobility of researchers into and inside of the EU.
2. **Cross-border operations: Whilst cross-border actors come in different shapes and sizes - from the individual researcher level up to national and transnational organisations - it is clear that insufficient commitment of financial resources combined with member states' (MS) reluctance to align and coordinate national resources will, unfortunately, continue to prevent true integration of joint research programmes.**
 - This has significant implications for Europe's ability to compete on the global stage and to address major societal challenges in a coordinated way by exploiting research talent and capability across MS.
 - LERU therefore recommends that the ERA Framework should work towards the development and implementation of an effective overarching EU strategy for research programmes, working closely with others such as the EIT to avoid double effort or conflicting priorities.
 - Given the sporadic and, to some extent, disjointed development of the Joint Programming Initiatives (JPIs), it is clear that there is a need for high-level policy coordination and direction on research, whilst ensuring that research is firmly integrated in societal grand challenges.
 - Cross-border collaboration is important not only for addressing societal challenges via top-down steered research, but also to support investigator-driven, bottom-up research through funding programmes that promote transnational mobility and portability of grants (such as the Marie Curie and ERC schemes).
3. **Research infrastructures: LERU is broadly supportive of the idea of the development of European infrastructures in order to maintain EU competitiveness. In the draft consultation there is little in the way of (a) specific proposal(s). As always the 'devil is in the detail' and as such LERU is certainly willing to discuss details in the future.**
 - Nevertheless, it is clear that EU research infrastructures must not become the overarching and dominant EU research expenditure which often becomes

the case from a research funder's perspective. This can be ensured by allowing for appropriate governance controls, critical review and a built-in assumption of closure rather than maintenance in perpetuity of the infrastructure itself.

- In addition, high level controls on movement between budgets for all aspects of research funding are needed to prevent redirection of additional resource to these developments. Unfortunately, a major concern has to be that member states' political imperatives can often drive the decision-making rather than the pure scientific need. Ultimately this would neither serve universities' nor the EU's long-term interests.
4. **Knowledge transfer: Research-intensive universities (RIUs) as the bedrock of internationally competitive research are hubs of creativity which attract research-intensive companies and investment into a region and help to catalyse knowledge transfer (KT) and innovation in local businesses.**
- KT offices at RIUs act as entrepreneurial centres pushing out research throughout the entire innovation network which develops around them, thus fulfilling a pro-active supply side function. They need to be able to operate in a permissive, incentive-led environment to allow flexible interaction inside and outside of the university.
 - Within the university a culture of KT awareness and value should be actively developed; experienced KT offices and personnel are vital in this process. The significant investment in training and recruitment for KT activities required of universities needs to be justified in terms of the possible return on investment.
 - On the "pull" side, volume market demand needs to be increased in Europe. This can be promoted by providing incentives that stimulate university-industry KT interaction, including such measures as patent boxes, targeted tax incentives, leveraged funding for commercial development of academic origin technology and well-managed patent pools.
5. **Open access: Access to research information must be optimised if the European research community is to operate effectively. Open Access to research output and data can help solve access problems and advance the Open Science agenda.**
- EU copyright legislation needs to be updated as
- new publishing and research trends develop. In addition, the EU Database Directive should be re-examined so that it allows Open approaches to data management.
- Publication repositories are interoperable but far emptier than they should be. Mandates for deposit linked to institutional strategies for research and publication can help in this respect.
 - Data repositories are not sufficiently interoperable. A major issue to solve is who will be responsible for creating, managing and funding such repositories.
 - There is a lack of coordination of open publication and data policies across the EU member states and at the EU level. Given the differing national contexts, the EU should play a facilitative role, providing funding for infrastructure, as well as consultation, advocacy and guidance in best practice, especially in the area of long-term digital preservation of research outputs and data.
6. **International dimension: Interaction and partnership with leading research expertise and talent anywhere in the world is a high priority for research-intensive universities. More can be done at the EU level to leverage EU and MS resources for specific, large-scale collaborative programmes with research funding programmes across the world.**
- The EU should step up its efforts to increase interaction with and attract top talent from established and strong emerging competitors to institutions in Europe at all stages of a research career. Obstacles to researcher mobility need to be addressed.
 - Financial pressures on RIUs in the current economic times can be a serious threat. It is important to make the most effective use of limited resources, for example through better alignment of EC and MS programmes, without however compromising funding levels or research excellence.
 - ERA international activity focused on global challenges is important and if carefully deployed can support EU policies in other areas. Care needs to be taken not to promise more than can be delivered and not to move away from funding open-ended frontier research.

7. Managing and monitoring the ERA partnership: A single market with free circulation of knowledge as its fifth freedom, needs a better structured and managed approach of issues. The experience with the other four freedoms (persons, capital, services, goods) has shown there is no alternative.

- In the continued absence of effective MS action, the best option is to develop (next to a continued selective use of non-legislative instruments), a framework directive which lays down the basic goals, principles, limitations, instruments, actions and actors of the EU research and innovation policy.
- Such a framework directive must take into account the basic principles of EU action (in particular attribution, subsidiarity, proportionality and integration) as leading principles for the development of a future EU research and innovation policy.
- Only in this way can a balanced policy in the field of research and innovation be developed which can achieve a well-managed and -monitored European Research Area, guaranteeing a free circulation of knowledge and respecting Member State autonomy.

8. Gender: It is vitally important to make progress towards ensuring that the research profession attracts and retains a larger proportion of women. The imperative stems not only from the argument that appreciation of diversity enables a more adequate assessment of quality, but also from an economic argument. Europe cannot afford to waste its talents, particularly its hitherto most wasted female talent for research.

- Universities can take actions at the level of HR management by providing good work-life balance conditions for both women and men as well

as the other diversity groups and by taking specific measures to support women's careers. In a competitive research environment access to funding is crucial for career advancement.

- An unwavering commitment of the university leadership to gender equality is essential to translate gender equality plans into successful actions in all university divisions, faculties and departments, giving due consideration to local and scholarly-field differences.
 - Responsibilities also lie with research funders, governments and others to define frameworks and to promote or mandate gender equality and other quality-based diversity actions.
- 9. Ethics: Freedom is the golden rule of research and, as a consequence, an indisputable, fundamental and internationally recognised right of researchers. Research should not be restricted by political agendas and researchers should not normally be restricted as to what questions they can ask or what fields they should research into. Yet this does not mean that such liberty can brook no limits.**
- Communities can adopt specific sets of ethical standards or codes of practice to be applied in their own research fields. Such rules should also be stated formally and widely disseminated.
 - Academic institutions may entrust ethical committees with the power to adjudicate on ethical issues drawing their inspiration from freedom, self-criticism, precaution, respect and responsibility.
 - Researchers should reflect on the impact that scientific assumptions, discoveries and research products may have upon nature or society.

I. Introduction

1. This paper represents LERU's response to the European Commission's consultation on "The European Research Area Framework, untapped areas of potential"¹. As an organisation of some of Europe's leading research-intensive universities (RIUs), LERU very much welcomes the consultation. In this paper we analyse what LERU universities consider to be the most important challenges and bottlenecks to achieving a more effective and efficient European Research Area (ERA). We explain our universities' guiding principles and main concerns relating to ERA, hoping that the Commission will find our views useful in developing concrete measures aimed at the ultimate goal of achieving the "fifth freedom" by creating a genuine single market for research and innovation in Europe, in which, as Commissioner Mairé Geoghegan-Quinn has pointed out, "all actors, both public and private, can operate freely, forge alliances and gather critical mass in order to compete and cooperate on a global scale" and "which measures up to the major economic and societal challenges of our times"².
2. There is broad agreement that research and innovation must be at the heart of the Europe 2020 agenda to enable the European Union to escape its current economic difficulties and foster a sustainable economy. As such, LERU supports the concept and the objectives of the European Research Area and Framework. Within the EU, the potential benefits of ERA for RIUs and for society more generally stem from the following factors:
 - *Intensified competitive pressures for funding and students, driving improvements in productivity and quality of education, research outputs and (more recently) commercial and policy translation;*
 - *Greater opportunities for collaboration to exploit economies of scale and scope, allowing larger-scale initiatives with a wider range of expertise and larger investments in research infrastructure/facilities (e.g. ITER, CERN, ESA);*
 - *Higher productivity/human capital growth from the diffusion of knowledge and techniques, e.g. within EU-wide collaborative projects and consortia and through enhanced mobility of students and researchers;*
 - *Enhanced resilience of the research sector at an EU level. Since RIUs are diverse and face differential funding and other constraints, external shocks to research and education funding and priorities are therefore likely to affect individual RIUs even within a single Member State somewhat differently. The benefits of a diverse EU-wide set of RIUs are even greater, with resilience further enhanced by access to more and more diverse funding sources and opportunities.*
3. Naturally, universities need to weigh the potential benefits of ERA against disadvantages or difficulties stemming from a variety of causes. In the document accompanying the on-line public consultation questionnaire, the Commission has correctly identified the major components that hamper the realisation of ERA and has even provided potential or actual solutions for problems. Following the structure of the consultation exercise, we will analyse the potential benefits of and obstacles to realising ERA from the perspective of research-intensive universities for the following key areas: 1) researchers, 2) cross-border operation of research actors, 3) research infrastructures, 4) knowledge transfer, 5) open access, 6) international dimension, 7) managing and monitoring the ERA partnership, 8) gender and 9) ethics. Although these key areas are treated separately in the next sections, it should be clear that they are inter-linked, that they share some common characteristics, and that consequently actions taken in one key area may have implications for others.

1 http://ec.europa.eu/research/era/consultation/era_consultation_en.htm

2 http://ec.europa.eu/research/era/pdf/consultation_commissioner_message.pdf

II. Researchers

Key points

- Focus on excellent opportunities for excellent people, starting with doctoral training and continuing throughout researchers' careers.
- Offer researchers clear career perspectives built on well-designed employment posts, well-structured career tracks, well-tailored professional development and strong funding and facilitating processes.
- Strengthen in bottom-up fashion, innovative and excellence-driven doctoral schools or programmes.
- Enhance researcher mobility with more transparency and easier social security provisions and visa regulations.

Attractive careers

- The maintenance and development of a globally competitive research base in Europe depends fundamentally on its ability to attract and retain the best talents from Europe and beyond within a framework of structures, processes and opportunities that researchers are able to exploit to good effect. Although research careers can rarely compete with the salaries of the private sector, it is important that they are seen to offer unique opportunities for well-supported research, creative freedom and personal satisfaction. The key objectives of policy for research careers must be 1) to attract highly talented graduates from the international pool of talent, 2) to support the realisation of a researcher's potential for creativity and 3) to maximize benefit to knowledge, learning and society. To do this, we must maximize the potential for high achievement and provide an attractive career framework.
- Realising the potential for high achievement depends upon:
 - a *research environment* with a wide variety of researchers working on cognate topics, strong links with other disciplines in a cross-disciplinary setting, good international connections, cross-fertilisation of ideas from external researchers, and access to appropriate facilities.
 - *independence and responsibility* at an early stage of a research career. These concepts should be embedded in the post by ensuring that for those early-career researchers not in receipt of a personal fellowship, space is formally created to support the development of personal creativity, and that there are opportunities for all to undertake broader responsibilities and to apply for research grants to support their personal research.
- An attractive and efficient research career framework requires:
 - *well-designed employment posts* that are clearly defined in relation to the structure of research career progression, with clearly defined working arrangements, standard and transparent procedures for appointment and an absence of dead-end positions;
 - *well-structured career tracks* that are designed for different purposes and provide a comprehensible career framework, clearly sign-posted pathways within and beyond the university and with the potential for non-disruptive international experience;
 - *career planning and development procedures* that support, including relevant skills training, career counseling that includes the option of non-academic routes, arrangements for career development well adapted to the needs of the individual, and consideration of wider promotion criteria;
 - *strong funding and facilitating processes* to ensure that research posts are funded at internationally competitive levels; that funding is allocated and managed in such a way that universities can be flexible in adapting to the needs of research and researchers; and funding that covers full economic costs so that the most successful research institutions are not progressively impoverished by their success.
- In a recent paper, LERU has analysed the main challenges in meeting the objectives above. We have formulated key policy principles and have offered examples of good practice at LERU universities³.
- It is important to note that the issues raised above are interwoven parts of a tapestry that determines the attractiveness of research careers. Whilst the LERU and other universities, in partnership with the

³ League of European Research Universities. (2010). *Harvesting talent: Strengthening research careers in Europe*.

researchers they employ, work to discharge their responsibilities in ways that address these issues, not all the levers are in their hands. Patterns of responsibility vary amongst European countries, not least because of the varying degrees of university autonomy. It is vital that there is strong interaction between stakeholders at both national and European levels if we are to enhance the standing and support for the most important pillar of any research system, namely the quality of the people working in it. Such interactions are also means whereby national initiatives and EU initiatives can be effectively implemented, for example in the area of institutional HR strategies, social security coordination, open recruitment, monitoring and information gathering and distributing.

High quality doctoral training

9. Excellence in doctoral training is a vital factor if Europe is to maintain a competitive advantage in the world as a centre of intellectual and innovative prowess. In a recent LERU paper we have stressed the variety of skills that LERU universities aim to develop in their doctoral candidates as a way of preparing them for a wide range of careers⁴. The number of graduates at LERU universities that go into non-academic careers is high, although it varies significantly depending on the country and on the academic field⁵. Moreover, it continues to grow, indicating there is a strong demand for the skills that a doctorate instills beyond the education sector.
10. Doctoral training aims to train researchers to the highest level to become creative, critical and autonomous thinkers who push the boundaries of knowledge. Besides deep research knowledge PhD candidates should also develop a broad transferable skills set, which can include entrepreneurship training when appropriate. To build the necessary competencies and prepare them for a research career, doctoral candidates are best embedded in a fertile and dynamic research environment. Such an environment generally has components of structured and unstructured training and is often international, interdisciplinary and/or intersectorial, although this should not be perceived as a requirement for each doctoral candidate.
11. We support the EU's ambition to strengthen doctoral training in Europe. We suggest that EU efforts should be aimed at producing excellent researchers and on supporting and improving the organisation and management of doctoral training. Many European universities have for years, even decades, been implementing successful models for doctoral schools embedded in research-intensive environments, with a variety of models reflecting the varying needs. New, innovative concepts for improving the structures and processes of doctoral training are being developed at a fast pace. Europe could strengthen these efforts by supporting, in bottom-up fashion, innovative and excellence-driven doctoral schools or programmes.
12. To ensure maximum impact and effectiveness, we recommend that EU actions consider (and fund) all stages of early career researchers (postdoctoral, doctoral and possibly Master's) and have scope for seconding academics to undertake leadership roles.
13. In fostering intersectoral links, all professional sectors should be given due consideration in accordance with discipline-related needs, i.e. not just private industry and business, but also government, charities, the public health care sector, etc.
14. Doctoral training programmes should not be over-regulated but permitted to develop promising research lines without undue interference. They should be evaluated on the quality of the research and training environment, the potential of the participants, the quality of supervision of researchers, the opportunities for broad future career prospects for researchers, and on outputs, impact (including movement of researchers to professional sectors) and sustainability.
15. Quality standards, assurance, and enhancement for doctoral training is the responsibility of existing structures such as graduate schools or equivalent and are often tied to national QA. Doctoral, postdoctoral and where appropriate Master's training should be integrated with broad opportunities provided across disciplines by existing structures (such as transferable skills training and networking with researchers in other fields) to provide incentives for

4 League of European Research Universities. (2010). *Doctoral degrees beyond 2010: Training talented researchers for society*.

5 In LERU universities the majority of PhD graduates typically take employment outside of academia. The figure can be less in some disciplines, but goes up to over 80% in some cases.

choosing a research career and to ensure that all early-stage researchers are embedded in strong and diverse research environments. Early recognition of research talent at the Master's level is important.

Mobility of researchers

16. Research is a global phenomenon, both at the institutional and individual level. As the free circulation of knowledge has become as important a driver of globalisation as the movement of people, goods, services and capital, it is crucial that Europe does everything in its power to realise the so-called "fifth freedom". Researchers are the prime vehicle through which new ideas and cutting edge technology are circulated.
17. Unfortunately, researchers face some daunting obstacles when they decide to spend time abroad to conduct their research. Besides the obvious issues related to the job, housing, travel, partners and children, they need to worry about some not so obvious, technical, legalistic and complex arrangements covering their health insurance, family benefits and pension rights.
18. Mobility in Europe is restricted by the employment policies of some states, with the consequence that researchers do not benefit from the cross-fertilisation of ideas and research links that open employment creates. In addition, many research grants and fellowships are not easily portable or are not accessible to non-residents and funding opportunities and recruitment procedures are not always sufficiently open and transparent.
19. LERU has recently called attention to the need to improve social security arrangements for mobile researchers⁶. Keeping in mind that measures should not over-regulate or over-prescribe, we propose that at least minimal social protection should be granted to early stage researchers who do not have the professional status of employee. We also ask for more transparency and easier procedures when it comes to coordinating social security benefits across the EU member states. In addition, social security regulations should be interpreted and implemented in ways that are compatible with the specificities of the

research profession. The development of a cross-border pension fund for researchers is an interesting concept which would address a real albeit often underrecognised problem for researchers.

20. Mobility is also increasingly of an intersectoral nature. While many researchers find employment outside the university immediately or soon after obtaining a doctorate, it becomes increasingly difficult at later career stages. Moreover, it is difficult for researchers to return to an academic career after a period away from the university or even to manage short-term exchanges. The development of an ERA would benefit if the boundaries between industry/ other sectors and university were more permeable. This requires the development of relationships between the sectors that are based on a vision of long-term, mutually beneficial cooperation, trust and recognition of complementarities. It is important that the notion of intersectoral mobility should not be interpreted narrowly as industry and enterprise, but applied broadly to all non-academic sectors, including government, charities and not-for-profits.

6 League of European Research Universities. (2010). *Improving the social security of internationally mobile researchers*.

III. Cross-border operation of research actors

Key points

- Develop an effective overarching EU strategy for research programmes to address global challenges in both top-down and bottom-up fashion.
- Work closely with all stakeholders to avoid double efforts or conflicting priorities.

Background and policy context

21. It is clear that Europe faces a series of major societal and global challenges where cross-border collaborative research can play a key role in providing solutions which cannot be solved within national borders alone. Current global challenges such as climate and environmental change, energy, food security and population growth would benefit greatly from networking or aligning of national programmes at a European level. Some of the challenges are so great that national research programmes are unable to tackle them effectively on their own⁷. However, 85% of European public research funding is spent nationally without transnational collaboration between programmes or competition between researchers from different Member States, while only 15% is coordinated in intergovernmental organisations (such as CERN) or spent jointly in the Research Framework Programme. While we do not suggest that this proportion should be changed, it is clear that coordination and dialogue across MS should be supported as a means to address global challenges and to avoid fragmentation and duplication of research effort in Europe.
22. In addition to this, the EU continues to underperform in terms of growth against other global players such as the US, Japan or the BRIC countries. A key problem for EU policy-makers in this analysis is that the EU is not homogenous: results of internationally peer-reviewed competition for funding within Framework Programme 7 show that MS with a high level of R&D intensity lead the field (both in terms of winning funding and research outputs) while MS with low level R&D intensity form a long tail⁸. This highlights that research capability in low R&D-intensive MS is not being used as effectively as it

could be. If Europe is to tackle major societal challenges and hold its own in a globally competitive environment, it is essential that research capability across all European member states is fully exploited while maintaining the focus on research excellence.

Joint Programming Initiatives

23. It is difficult to stipulate the optimum degree of research actors' transnational operation that is needed to jointly tackle major societal challenges, since each societal challenge is unique. The development and so far varied implementation of Joint Programming Initiatives (JPIs) throughout the EU illustrates this difficulty. The development of JPIs is a good example of where, in theory, a more coordinated approach at EU level should complement funding at a national level. However JPIs - which are MS-driven - have in reality taken too long to develop in areas of global and societal challenges - areas that clearly require urgent responses.

Openness and transparency

24. LERU has recently argued that Joint Programming should be based on a common vision of how to address the major societal challenges, which should be defined by relevant stakeholders through a transparent process and with the contribution of leading researchers⁹. Transparency in the establishment and management of JPIs is crucial. A proliferation of different rules of participation should be minimised. Leading scientific experts (academics or industrial players) should decide on the challenges that grow into JPIs, instead of national ministerial delegates who may fail to properly consult appropriate stakeholders. Consensus needs to be built on the exact meaning and scope of specific challenges enabling the scientific community to engage appropriately.

7 League of European Research Universities. (2011). *Clear choices for Europe: Smart investment in research and innovation*.

8 <http://www.era.gv.at/attach/GPCcontributiontoERACinputonERAframework-1stdraft-05092011.doc>

9 League of European Research Universities. (2010). *Universities, research and the 'Innovation Union'*.

Collaborations across a wide range of disciplines are required with vital contributions from the humanities and social sciences. The European Commission should take on the role of 'gatekeeper' by establishing efficient and harmonised governance. It should also ensure that excellent researchers from countries that are not part of the JPI discussion are able to participate. Finally, enough flexibility should be built into JPIs to include both innovation-driven applied research as well as basic research.

European initiatives: addressing global challenges

25. Whilst LERU agrees on the need to tackle global societal challenges, the approach taken thus far by the various EU institutions appears uncoordinated and haphazard. "Grand challenges" are mentioned not only in relation to JPIs, but also in the Knowledge and Innovation Communities (KICs), FP7 Work Programmes and European Innovation Partnerships (EIPs) proposed in the EU 2020 strategy. LERU is concerned that the term has developed into the latest buzz word to be introduced into every instrument regardless of how appropriate or meaningful it may be. We would suggest that European approaches to addressing "grand challenges" should have a clear focus and rationale. EIPs, for example, should only be created if they can truly ensure better coordination or harmonisation, transparency and effective governance of already existing European initiatives. They should not be developed as yet another layer to be added to existing platforms, which would create an even bigger web of European projects. Similarly, Joint Programming Initiatives would be more effective if concentrated in a strategic manner on a few clearly defined societal challenges with a large impact on Europe, such as quality of life and environment, health, food, water and energy supplies.

Programmes that facilitate cross-border operation

26. Cross-border collaboration is important not only for addressing societal challenges via top-down steered research, but also to support investigator-driven, bottom-up research through funding programmes that promote trans-national mobility and portability of grants. The Marie Curie (MC) Programme which

requires fellows to undergo transnational mobility as a pre-requisite for funding has helped structure the European Research Area. In addition to the MC scheme the relatively new but highly successful European Research Council (ERC) programme has as a key characteristic the portability of the grant, once awarded. The trans-national and portability features of the MC and ERC schemes are good examples of complementarity with national programmes clearly facilitating cross-border activity whilst, importantly, retaining and promoting the excellence imperative. LERU strongly endorses the ERC and MC programmes as an effective way of supporting excellent researchers across Europe.

Infrastructures

27. European-level development of expensive infrastructures provides major benefits in developing a truly European research base (see section IV). It gives European researchers access to major facilities that no or few MS might individually be able to afford, and benefits researchers by providing opportunities that might otherwise be beyond reach. The creation of European research infrastructure, thus ensuring that the very best talents have access to world class facilities, clearly impacts on cross-border operations at European, national, regional and researcher level and fosters European and international research collaboration¹⁰.

¹⁰ League of European Research Universities. (2010). *Universities, research and the 'Innovation Union'*.

IV. Research infrastructures

Key points

- Allow for appropriate governance controls of EU research infrastructures, as well as critical review and a built-in assumption of closure rather than maintenance in perpetuity of the infrastructure.
- Set high level controls on movement between budgets for all aspects of research funding to prevent redirection of additional resources.
- Ensure that decision making is based on scientific need rather than political imperatives.

28. As was stated in the introduction, there are links between the nine focus areas under consideration in this paper. In this section we briefly examine some of these areas in relation to research infrastructures before turning to specific research infrastructure issues.

Researchers

29. Employment conditions, mobility and career prospects underlie all infrastructure developments. Several issues arise:

- What employment conditions will exist at EU research infrastructure facilities?
- Where will they be geographically located from the perspective of their utility to and access by researchers?
- The role of universities in the provision of skilled manpower and researchers is insufficiently recognised.
- The portability of national Member State (MS)/EU grants to and from research infrastructures to support projects for which that infrastructure will be used needs to be discussed.

Cross-border operation of research actors

30. EU schemes for cross-border operation of research are vital if the EU is to be a unifying entity promoting transnational cooperation. There are a number of issues with respect to EU research infrastructure:

- Largely, national research programmes do not provide for cross-border research (cf. section II).
- The legal system under which an EU research infrastructure operates has to be clearly defined, as it may impact on MS research funding. It cannot just be the law of the host country of a facility.
- MS legal restrictions such as exchange of patient information or material have to be addressed.
- Intellectual property (see below).

Knowledge transfer

31. If research infrastructure is a route by which to establish a better collaborative and cooperative direction, then this must be addressed. The key questions are:

- Which intellectual property law will govern an EU research infrastructure? If a single intellectual property court is agreed for the European Union, then there is some hope of uniformity but where individual MS national awards continue to be the major source of funding for work undertaken in a shared research infrastructure then the terms and conditions as well as the legal jurisdiction in which disputes may be considered has to be resolved before such an infrastructure is established.
- How will research from an EU infrastructure, conducted by a university employee and funded by multiple MS and commercial funders, be protected and exploited?
- Interaction with industry cannot just be defined by the Board of an EU research infrastructure.

32. LERU universities have considerable experience in this regard and their staff will be a key factor of interaction with EU infrastructure. Arrangements for knowledge transfer and industry should be established early in the discussion and in the creation of governance systems.

Open access and open innovation

33. Open access should not cause any difficulty to LERU universities as most would contend that publicly funded research is made available. However, once an EU research institute/infrastructure is established, then their position in relationship to open access must be clarified (see section V). LERU universities have to consider this with regard to their own and sectorial policies. Open innovation is a development which will influence policy relating to intellectual

property and its future exploitation. LERU and other universities and some industry sectors may find difficulties in this regard and appropriate early steps must be taken in considering EU research infrastructure.

The international dimension of the European Research Area

34. The opening up of the European Research Area to countries outside the European Union merely adds to the complexity particularly when one considers their access to shared EU research infrastructure. How will they operate under the agreed rules on intellectual property, legal jurisdiction and engagement with MS especially where national funding and mobility programmes are involved? Fellows and postdocs from these states are less problematic but if these countries invest in programmes or the infrastructure itself, then the terms under which those interactions occur have to be clearly defined. This will put particular pressure on directors of EU research infrastructures to ensure that there is an EU dominated priority of the utilisation of that infrastructure. Again LERU universities are willing to be participants.

Cross-cutting governance issues and next steps

35. Governance is a significant issue for EU research infrastructure. It has to ensure efficient and cost effective utilisation especially as projects will often be undertaken with funding from member states. Since staff from LERU and other universities will be key participants in these programmes, they should be represented in the governance of such infrastructures. The added value of EU infrastructures could be jeopardised if such infrastructures are run by an individual director without reference to universities. It is essential that the European Commission engages with LERU to ensure that new EU research infrastructures are governed such that the interests of all parties - commerce, funders, universities and other research performing organisations - are met for the benefit of the European Research Area.
36. All these aspects will influence the effectiveness of investment in physical EU research infrastructure as much as the specific issues that need to be addressed. Each could become a 'showstopper' for an infrastructure facility and has to be considered before implementation, particularly of fixed physical infrastructure.

Research infrastructures: specific issues

37. Many issues specific to research infrastructure build on the generic aspects discussed above. Large infrastructure has been successful in developing EU leadership and providing opportunities for disciplines that would otherwise have been unable to pursue cutting edge science, such as CERN and EMBL. However, there is little in the draft consultation that enables specific comment. Infrastructure needs to remain vital in many areas, such as astrophysics, and other sciences where expensive joint working is required for Europe to remain a competitive environment. LERU strongly supports joint working to enable our investigators access to such facilities.
38. The mechanism by which these facilities are established is more problematic. ESFRI, as an important example, has established bottom-up priorities but until the development of ERIC it had failed to deliver on more than one project. The difficulties have been that, firstly, ESFRI was required to get agreed funding from participating MS and to ensure sustainability. In addition it was a cumbersome process to define priority between projects; when it ultimately agreed most 'bottom-up' proposals it became a race to see which could raise the money first. Therefore it is of little surprise that the Commission would wish to invest in infrastructure to support major projects which if held up could damage Europe's competitiveness. Unfortunately there is little detail provided and little support can be given until more detailed proposals as to how:
- investment priorities, based on research needs, will be established and by whom;
 - the costs are clearly defined relative to investment in basic and applied science support;
 - mechanisms for programmatic support are clarified;
 - a governance model for EU research infrastructures will operate;
 - sustainability and future-proofing will be established;
 - transition or termination provisions will be addressed in the planning process.
39. Furthermore it raises additional issues relating to shared facilities:
- Cross-border cooperation and barriers (discussed above).
 - EU and national funding organisations' ability to move programmatic funding to utilise the infrastructure must be addressed. Just as with differences in support for capital investment seen in the

ESFRI proposals, there will be variability between MS (in part related to national priorities). There is little evidence of cohesion between national funding agencies to resolve these issues. Joint programming may be a solution but it remains unclear whether MS will participate.

- The mobility of PhD candidates, postdocs and staff is vital.
 - It must not substitute for use of structural funds to support MS research endeavour.
 - Geographical location must be determined by scientific excellence and critical mass, alongside ease of access, and not by political manoeuvring. Locating facilities in close proximity to RIUs will help to overcome the issues of critical mass, sustainability and access.
 - Sustainability of infrastructure is seldom considered when an infrastructure is being planned. Several questions arise:
 - a) Who will support the ongoing projects for which the infrastructure will be used? Is this down to national agencies providing project-based funding or will a director be provided with funding? Will funds be provided by the EU?
 - b) Where will costs for maintenance be provided?
 - c) Who will provide for costs to future-proof the development?
 - d) Most current institutes/infrastructures deem themselves independent. Therefore the director demands a budget in order to develop either pilot work or sustain staff with a scientific programme. How will this be scrutinised and assessed competitively in the future?
 - e) Does an infrastructure merely provide a service or is it a scientific entity in its own right? To what extent will staff from universities be able to help shape the direction and priority of programmes as opposed to a director-led approach? If a director has no control, why should any scientist undertake this role?
 - f) The governance of the institute and its advisory board is often facility- or science-specific without consideration of the needs of outside users from the university sector or industry. How will this be resolved?
 - g) Infrastructure has a limited lifespan, yet the track record of closure of facilities by the European Union is non-existent. Facilities expand their remit and any suggestion of planned closure falls foul of MS interests. Will this be resolved?
40. EU research infrastructures could help the ERA to remain competitive. In some sectors physical infrastructure is essential to attract and maintain the best investigators in the European Union. But one must not fall into the trap of thinking of research infrastructures as purely large physical facilities, since many disciplines require distributed facilities with cross-border collaboration.
41. The proposals also seek a view as to better exploiting research infrastructures that already exist. There must be a critical mass of scientists and investigators from around the EU to justify re-designating such infrastructure. A key element will have to be a change in the governance of such facilities to ensure access and appropriate prioritisation of usage.

Cost

42. Can EU research infrastructures be afforded under current budgetary proposals? Under the preliminary Horizon 2020 proposals, the budget for EU research infrastructures would be part of the pillar "excellence in the science base", which will also fund the ERC, Marie Curie and FET programmes. The EU needs to carefully consider the balance and priorities between programmes. Optimistically the EU proposes an increased budget for R&D, which could fund research infrastructures. If this optimism is not borne out, what will research infrastructures replace?
43. Research infrastructures require support to maintain the infrastructure as well as demands from directors for in-house science and development. This can remove expenditure that may otherwise support researchers. How will such high level allocations constrain expenditure on the infrastructures?
44. Expansion of infrastructures reduces budgetary flexibility as they become a fixed asset that lays claim to continued expenditure. It remains to be seen whether this is in the long term interest of universities and of the EU.

V. Knowledge transfer

Key points

- Promote permissive, incentive-led KT environments ensuring flexible interactions inside and outside of the university.
- Support the development of a culture of KT awareness and value by building experienced KT offices and personnel.
- Increase volume market demand in Europe by providing incentives to stimulate university-industry KT interaction, including patent boxes, targeted tax incentives, leveraged funding for commercial development of academic origin technology and well-managed patent pools.

45. There is no doubt that high quality knowledge transfer (KT) is critical in ensuring that publically funded research is used and exploited to its best advantage. Alone, this does not address the goal of contributing significantly to economic and social benefit; the latter goal requires the former to be performed at scale.
46. Successful knowledge transfer requires:
 - a) high quality intellectual property (supply side);
 - b) skilled, knowledge transfer professionals with commercial experience;
 - c) a significant base of sophisticated and engaged industrial consumers (demand side);
 - d) business leaders, technologists, and business development people willing and able to engage with technology and transaction types appropriate to the academic world;
 - e) explicit long-term encouragement from government;
 - f) a culture of engagement and valuing KT within industry, universities and public research organisations and;
 - g) a permissive environment to allow flexible interaction.
47. High quality intellectual property is founded on high quality (basic or applied) research. It is greatly enhanced by researchers who have performed their work, where appropriate, with consideration of knowledge transfer opportunities.
48. Consequently, making researchers aware of basic principles and issues critical to successful knowledge transfer so that they seek out practical advice and help as needed is imperative. This is best achieved by building a culture of awareness of, respect for and valuing of knowledge transfer and cultivating experienced knowledge transfer professionals.
49. Knowledge transfer can often require researchers to adapt their work from traditional research goals. Thus, knowledge transfer should be recognised as a legitimate and valuable outcome of research. Recognition should be considered in broad terms as researchers are not necessarily best placed to drive the knowledge transfer process and interactions. Recognising constructive and appropriate KT engagement in performance assessment and promotion decisions is critical to building a culture and recognition of KT as a meaningful and valuable outcome of research.
50. Strategies and policies for developing and implementing KT are important in environments without a tradition or history of successful KT. Where such are required, they should build on the expertise and experience of successful institutions, environments or regions and provide appropriate incentives for universities and public research organisations. However, governments, universities and public research organisations should have realistic expectations of what can be achieved and how long it can take.
51. Experienced and effective knowledge transfer organisations and personnel are vital. The skill sets required within a KT organisation, pertaining to relevant technology, science, market, product development, business development and other commercially relevant experience, are not commonly seen in many KT organisations. The development of such a skill base requires significant investment in recruitment and training and can only be justified in KTOs where there is a significant knowledge base to be served.
52. Successful knowledge transfer requires flexible, creative approaches to the interaction between businesses and research organisations and a culture that encourages such. KT cannot be legislated and is best

- achieved through positive incentives. Guidelines to KT should aim to provide principles, guidance and help to inexperienced researchers, KT professionals and transacting parties to facilitate and simplify the process of engagement, interaction and transaction. Guidelines should not be prescriptive or allowed to become effectively binding.
53. The focus of the ERA Framework public consultation questionnaire suggests significant concerns over improving the supply side of knowledge transfer. Knowledge transfer might be considered as market push. The demand, or market pull, side is the other important part and must also be considered¹¹.
54. The evidence presented in the ERA Framework public consultation suggests that EU companies collaborate with their academic counterparts at a lower rate than their US counterparts¹² and suggests that there is less market demand in Europe for KT or its outputs. To substantially improve KT quality and volume market demand must be increased.
55. European companies appear less willing to invest in and take risk with KT opportunities (new collaborations and technology) than their US (and other regions) counterparts. Providing incentives that reduce the risk to European companies of collaborating with universities or public research organisations and/or taking on technology is critical.
56. Specific measures include (i) patent boxes, (ii) targeted tax incentives, (iii) leveraged funding for commercial development of academic origin technology (e.g. proof-of-concept funding) and (iv) well-managed patent pools. Without their use KT within Europe is likely to be considerably harder to foster than it might otherwise be.
57. Knowledge transfer activities should be monitored so as to inform policy makers as to the effectiveness of knowledge transfer incentives so that they can be adapted rapidly in response to success and market failure.

¹¹ League of European Research Universities. (2010). *Universities, research and the 'Innovation Union'*.

League of European Research Universities. (2006). *Universities and innovation: the challenge for Europe*.

¹² As measured by the number of public-private co-authored research, for which the figures for the US are double of those for the EU, Innovation Union Competitiveness Report 2011, I-203.

VI. Open access

Key points

- Promote an Open Science agenda.
- Update EU copyright legislation and re-examine the EU Database Directive.
- Support the development of mandates for deposit.
- A major issue to solve is who will be responsible for creating, managing and funding repositories.
- The EU should play a facilitative role, providing funding for infrastructure, as well as consultation, advocacy and guidance in best practice, especially in the area of long-term digital preservation of research outputs and data.

58. A university's mission is to create knowledge and to disseminate it; Open Access can help universities to fulfil this mission. Universities benefit from the aggregated impact of their researchers. The new audiences that Open Access brings to research can use this access to build on research findings and to make further discoveries. Having university research open and showcased to the world potentially boosts a university's profile and enables the uptake and use of the fruits of research effort funded for the benefit of Society¹³.
59. Access to research information must be optimised if the European research community is to operate effectively, producing high-quality research that has a wider social and economic impact. A recent report's key finding is that access is still a major concern for researchers. Although researchers report having no problems finding content in this age of electronic information, gaining access is another matter due to the complexity of licensing arrangements, restrictions placed on researchers accessing content outside their own institution, and the laws protecting public and private sector information¹⁴.
60. There are also compelling reasons to improve access to research data. However, there is a lack of comprehensive support infrastructure across Europe. There is a host of issues to be addressed to support data-driven approaches - academic, cultural, financial, technical and legal. Whose responsibility is it to curate and ensure that data can be shared and re-used? Do academics accept that data they produce can be used in this way? How much will it cost, and who will pay? Are such approaches legal¹⁵?
61. How much of the pan-European infrastructure to support Open Access to research publications and data should be at the European level, how much at the Member States level and how much at institutional level? Some infrastructure, for example major infrastructure for the storage of research data emanating from international scientific experimentation, is best managed at a European/global level. Other data outputs could be handled at the national, or even local, level through well-funded repositories for data, which are interoperable. The frameworks for creating and managing these repositories could be agreed at European level, but implemented nationally and/or locally. For research publications, academic researchers are likely to deposit in a subject repository (if this exists for their subject area) or in an institutional repository. Deposit in an EU-level repository is less likely, because a researcher's primary loyalties lie elsewhere.
62. There is one important area which the EC consultation does not explicitly address, and this is the long-term digital preservation of research outputs and research data. Simple access to such materials is different from a guarantee of the sustainable, long-term preservation of such materials. Long-term access to digital publications and data (which is the definition of digital preservation) is essential for the ERA. It is irresponsible to create digital objects

13 Quoted in paragraph 11 of: The League of European Research Universities. (2011). *The LERU Roadmap Towards Open Access*.

14 Research Information Network. (2009). *Overcoming barriers: access to research information content*. Available at http://www.rin.ac.uk/system/files/attachments/Sarah/Overcoming-barriers-report-Decog_o.pdf.

15 Some of these issues are being explored in the EU-funded ODE (Opportunities for Data Exchange) project at <http://www.alliancepermanentaccess.org/index.php/current-projects/ode>.

(research publications or data) and not to be able to guarantee long-term access to them. The EU has an important role to play in this area. Does every research university need to create digital preservation infrastructures to tackle this challenge? Is the challenge best dealt with at an EU level with pan-European infrastructure? What would this look like? Where should it be based? What is best practice in this area? The LIBER-supported LIFE project (Lifecycle Information for E-literature) has done ground-breaking work in the area of costing for digital preservation of a range of material types¹⁶. What is needed now is pan-European infrastructure to deliver the vision.

63. What actions, other than funding, are needed at an EU level to remedy some of these issues? The EU can and should play a major role in co-ordinating the development of joined-up Open Access infrastructure across the ERA. Funding is part of this, but it is far more than an issue of funding. There needs to be advocacy, identification of best practice, alignment of policies and mandates, and proactive intervention to ensure that the infrastructure is in the right place when needed and is sustainable. The EU should work with champions to ensure that all these actions are carried out. The LERU Roadmap Towards Open Access (2011) identifies infrastructure for the embedding of green and gold routes towards Open Access into the European landscape. This submission identifies key challenges in terms of the management and re-use of research publications and data. The EU through funding, advocacy, guidance, proactive intervention and consultation with relevant stakeholders can help develop an era of Open Scholarship in Europe. LERU is ready and willing to contribute to this task. What is needed is partnership between the organs of the EU, research universities (represented by LERU) and research funders to identify what infrastructure is needed and how it should be deployed.
64. In terms of negotiations with scholarly publishers, there are examples in Member States where discussions about subscription prices are linked to Open Access models, in at least one case with the national government as an intermediary. Benefits to small- and medium-sized companies (SMEs) are a driver in looking at the possibility of turning subscriptions into licences which allow Open Access across a whole country. However, such discussions are currently the exception rather than the rule.
65. EU copyright legislation does cover scientific research outputs, but needs to be updated as modern publishing and research trends develop. The principle which should underpin such legislation is the necessary balance between the interests of the author/researcher and the public interest. This is essential and should be a priority for the EU to work towards. There are a number of immediate concerns. Commercial licences can over-ride fair dealing exceptions and this is wrong. Nor is there a level playing field across the ERA. EU copyright legislation works alongside legislation at the MS level, and many EU copyright frameworks simply offer recommendations to, rather than propose obligations on, Member States. Additionally, in an era of Open Data, the EU Database Directive should be re-examined to ensure that it allows Open approaches to data management.
66. Publication repositories across Europe are interoperable and they are indexed by major search engines such as Google. Developments in the Europeana portal¹⁷ will also in future allow repository content to be discoverable through that site. In a digital ERA, there is not one road to discovery, but many. Repository content should be discoverable through as many routes as possible. The issue is not so much one of interoperability, but of the deposit of content. Repositories are far emptier than they should be. Mandates for deposit, linked to institutional strategies for research and publication, and funder mandates help in this respect. However, for academics to be convinced, the benefits of Open Access also need to be clear and transparent - so further advocacy across the ERA is needed.
67. It is certainly true that repositories for open data are not sufficiently interoperable. However, this is not the most immediate concern. The larger, prior questions are, who is responsible for creating such repositories, how will they be funded, how will they be filled with content, and how quickly can they be established to support data-driven science?
68. Should Member States have national policies for Open Access, linked to EU policies? This is really an

¹⁶ For LIBER (Association of European Research Libraries), see <http://www.libereurope.eu>; for the first two of three phases of the LIFE project, see <http://discovery.ucl.ac.uk/14954/1/14954.pdf>.

¹⁷ See <http://www.europeana.eu>

issue of research governance. In many Member States, it is unlikely that national governments will issue such policies, as this would be seen to infringe the autonomy of universities. The framework of policies and mandates will therefore, by necessity, be more disparate across the ERA. Certainly, there are funder mandates in place from many funders, and the EU has taken a lead in making it obligatory for research outputs from the Framework Programme to be made available in Open Access. However, is the EU joined up on this? Does the same apply to funding made available by the European Research Council? Certainly the EU should present a common position on these issues.

69. Concerning Member States' policies on research data, the issue that needs to be addressed here is different. Again, it is unlikely that Member States themselves will issue policies/mandates on this topic. The real issue at the current time is actually the lack of awareness amongst relevant bodies and researchers in the Member States that research data present challenges that need to be addressed.
70. Are the policies of Member States on research publications and data sufficiently co-ordinated? Currently, there is a lack of co-ordination in this area at an EU level. Even at a national level in the Member States, there is often a lack of co-ordination or buy-in by universities, research bodies and independent researchers. It is unlikely that more stringent co-ordination at an EU level would itself automatically lead to greater compliance across the ERA. Rather, the EU should play a more facilitative role, providing funding for infrastructure and advocacy and guidance in best practice, which will demonstrate yet more clearly the benefits of Open Access to research publications and data, thereby encouraging take-up.

VII. The international dimension

Key points

- Leverage EU and MS resources for specific, large-scale collaborative programmes with research funding programmes across the world.
- Make the most effective use of limited resources in the present time of severe financial pressure, for example through better alignment of EC and MS programmes, without however compromising funding levels or research excellence.
- Strengthen ERA international activity focused on global challenges to support EU policies in other areas, but do not move away from funding open-ended frontier research.

71. Within the EU, the potential benefits for RIUs and for society more generally of the ERA stem from a number of factors outlined in the introduction: intensified competitive pressures, greater opportunities for collaboration to exploit economies of scale and scope, higher productivity/human capital growth from the diffusion of knowledge and techniques, and enhanced resilience of the research sector at an EU level. RIU engagement internationally is also likely to exhibit similar benefits, albeit at a different levels. But the role, contribution and needs of RIUs operating at an international level also reflect other motivations, chief of which is access to and interaction with world-leading expertise and facilities outside the EU, given the relative and declining ranking of EU R&D spend and performance against major developed (US, Japan) and emerging economies (China, India). While existing instruments such as FP7 provide mechanisms to develop such collaborations, more needs to be done to build jointly funded research partnerships between leading institutions within and outside the EU, effectively leveraging EU and Member State resources for specific, large-scale collaborative programmes. For example, while for health applications the EU already has in place a reciprocity agreement with the US NIH, more could be done to extend such agreements, with the appropriate funding bodies, into other subject areas.
72. A second dimension of RIU activity internationally is linked to the ambitions of several smaller but very wealthy developed economies, for example in Asia, who now have the desire and resources to build world-class research and educational institutions from a very low baseline in a very short timeframe. This brings research and commercial opportunities for European RIUs in the short term but leads to intensified competition for top talent in the medium to long term if the EU and individual Member States are unable to match their rate of progress. Whatever the future funding landscape, EU RIUs will want to forge close and durable collaborative links and partnerships with the new elite RIUs in these regions. The ERA and Member States could help EU RIUs address this competitive threat through a number of measures:
- a) An increased level of investment in world-class research facilities in key areas of existing EU research strength and future opportunity, clustered around world-class EU RIUs.
 - b) Generously endowed and competitively awarded research professorships for leading EU RIUs to help attract global talent to EU institutions, rather than to competitors, for example following and strengthening the successful ERC model.
73. A third critical dimension of the ERA will be how it helps shape and support EU RIU collaborations and relations more generally with RIUs in the rapidly growing major economies of China, India and Brazil. RIUs within and across these countries are hugely diverse and at different stages of maturity, presenting opportunities for EU RIUs to build strong partnerships for the future through investments in PhD scholarships and mobility and research programmes to foster inter-institutional collaborations and exchanges. The EC has already recognised the importance of this issue and has broad S&T agreements in place with them. The scale of funding is however inadequate to the challenge and there are additional supporting actions such as the development of the relevant language skills among young EU researchers, which could usefully be developed.
74. Shaping the international dimensions of ERA to enhance the economic benefits to the EU from international R&D activity is a fourth crucial issue. The EU is pioneering new ways of encouraging innova-

tive collaborations between education, research and industry within the EU; this could usefully be extended internationally using jointly funded programmes with technologically advanced economies to develop even deeper partnerships between EU RIUs and the many globally excellent research-intensive companies that may not have been aware of European research and innovation strengths. In some important countries, leading research-intensive companies have closely allied institutes and universities that may not be the top universities in that country, let alone internationally, but may have some particular strength that is valued by the associated company. ERA engagement will need to be sufficiently smart and flexible to allow EU RIUs to engage with niche players if the EU is to exploit the benefits of international R&D collaborations.

Challenges for ERA

75. Research and innovation are only as good as the people within the universities. Enhancing the attractiveness of the EU as a destination for top research talent globally is therefore a vital role for the ERA. We are losing out to two of the three categories of economy outlined above (i.e. (i) major developed; and (ii) smart, small and wealthy) and over the next ten years we will increasingly see RIUs in major developing economies becoming major magnets for top research talent globally. There is a non-negligible risk that within a few decades, without coordinated and effective action, EU clusters of excellence may be degraded to the point where they are no longer so prominent within the leading RIUs globally and may struggle to sustain effective research collaborations with the new elite institutions outside the EU. The EU and Member States need to support an increased flow of, and interaction with, top quality students (both at undergraduate and postgraduate levels) and funding top-quality researchers wanting to come to the EU, e.g. with junior and advanced fellowships. Attracting top talent is also dependent on investing in Europe's research base. The level of public and private investment in R&D is too low and further threatened by the European financial crisis.
76. While the EU aims to establish a single market for knowledge, there is currently no level playing field in terms of the market for non-EU international research and other students. In some countries, international students may be highly subsidised either through direct funding of the RIU or through institution or nationally funded scholarship schemes. In other countries, RIUs may be less generously supported at a national level and rely on a business model of attracting international students at premium fees. This creates risks. EU RIUs must compete for PhD student researchers and research opportunities but they are negotiating with countries that have significant bargaining power. Individual EU RIUs therefore find it difficult to extract adequate value from their international relationships, with much of the value captured by our current or future competitors.
77. Fiscal pressures across the EU may undermine current funding models for RIUs. The extent to which international student and research income can compensate is limited given emerging strong RIUs in other parts of the world, potentially damaging the financial position of some of the EU's world-leading RIUs and their ability to compete internationally. More effective use of limited resources is important (e.g. better alignment of EC and MS programmes) but must not be used as an excuse to reduce funding levels or to compromise on excellence.
78. Mobility barriers to international talent may act as a deterrent driving students and researchers away from the EU. The Commission's efforts to facilitate the ERA via its research and innovation funding schemes will face a number of structural obstacles since many of the critical immigration, social and pension issues are largely or completely determined by Member States rather than the Commission.
79. ERA international activity focused on global challenges is important and if carefully deployed can support EU policies in other areas. But real care is needed, both in terms of not demanding more of science than it can deliver (e.g. climate projections) and in not neglecting the very real need for developing extensive and close collaborations with world-leading expertise in so-called "fundamental" or "pure" research areas.

VIII. ERA partnership: monitoring and managing

Key points

- Take into account the basic principles of EU action (in particular attribution, subsidiarity, proportionality and integration) as leading principles for the development of a future EU research and innovation policy.
- Develop an EU framework directive to achieve a well-managed and -monitored European Research Area, laying down the basic goals, principles, limitations, instruments, actions and actors of the EU research and innovation policy.
- Take care to respect Member State autonomy and continue to selectively use non-legislative instruments.

Identifying the problem

80. The management and monitoring of the ERA Partnership remain problematic issues, which urgently need to be tackled. Although progress has been made since the initiative was launched a decade ago, it is clear that much remains to be done. As was pointed out in the 2010 Belgian Presidency Progress Report on the realisation of the ERA, better policy mixes and better coordination with national and sub-national policies focusing on complementarity, prioritisation and efficiency are required at the EU level¹⁸. Moreover, stronger national policies are needed, "setting research and innovation as a priority and providing sufficient funds for it. Moreover, Member States should learn from each other, through the exchange of best practice and peer review". The report furthermore states that "all stakeholders, ranging from the European Council, the European Commission and national and regional governments to enterprises, research organisations and researchers, should be involved in building a single knowledge economy based on a single market".
81. The 2010 Belgian Presidency conclusions are also reflected in the ERA Framework consultation documents where the European Commission clearly states that the issues to be tackled relate to governance deficiencies and to the underdevelopment of a clear and coherent research policy between the EU and the Member States with clear objectives and a monitoring system, as well as links to innovation, education and cohesion policies; furthermore, a lack of coherence and synergies between different ERA-

related initiatives and instruments also results in a lower impact than would otherwise be the case¹⁹.

Possible solution

82. That the issues described above persist, may come as somewhat of a surprise because as of December 1, 2009 (date of entry into force of the Lisbon Treaty) the EU institutions have had sufficient tools to address these issues in the Treaty on the Functioning of the European Union.
83. Article 179, 1 of the Treaty on the functioning of the EU (TFEU) states that "The Union shall have the objective of strengthening its scientific and technological bases by achieving a European research area in which researchers, scientific knowledge and technology circulate freely, and encouraging it to become more competitive, including in its industry, while promoting all the research activities deemed necessary by virtue of other Chapters of the Treaties".
84. Added to this broad attribution of power, Article 182, 5 of the TFEU stipulates that "as a complement to the activities planned in the multiannual framework programme, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure and after consulting the Economic and Social Committee, shall establish the measures necessary for the implementation of the European research area".
85. The question then is why the EU institutions have not started to make use of these powers. If there

¹⁸ Securing the Knowledge Area. Belgian Presidency Progress Report on the realisation of the European Research Area. (2010). p. 2-3.

¹⁹ ERA Framework Public Consultation: Areas of untapped potential for the development of the European Research Area. Document accompanying the on-line public consultation questionnaire on the ERA framework. (2011). p. 10.

were ERA Partnership management and monitoring problems, then these certainly could have been tackled on the basis of the Treaty competences.

86. It is clear that the EU research and innovation policy field is undergoing a crucial transformation. For years the remit of this policy field and its administration, DG Research and Innovation, was limited to running programmes and distributing money - nothing more, nothing less. An overarching framework guiding all initiatives launched and instruments used was however lacking.
87. This period has now clearly come to an end. The TFEU forces the research and innovation policy field to adopt an approach which structures the whole field of research and innovation at the European level. This means that a legal framework for the policy field must be adopted, principles and goals must be put forward for the policy, instruments must be selected, institutions must be identified as competent actors, etc. Since this is more or less unknown territory for the EU actors involved, it should not surprise us that there is some uncertainty and hesitance to use and develop the powers invested.
88. However, we have seen similar evolutions in other policy fields of the EU. Environment, energy and transport, for instance, are all policy fields in which a similar evolution has taken place: after their anchorage in the EU Treaties, a legal framework, policy principles, policy goals, policy instruments, policy institutions, etc. have been developed by the entities responsible within the European Commission, the European Parliament and the European Council. This has led to structured and mature policy and legislative frameworks in these policy fields. The same has to happen now for EU research and innovation policy. To be clear, we do not have to start from scratch: over the past years, we have seen prudent steps in developing institutions and instruments such as the ERC, EIT and ERIC.
89. How should we proceed? The best option is to develop a framework directive which lays down the basic goals, principles, limitations, instruments, actions and actors of the EU research and innovation policy. As such, this should lead to a better co-ordination of the EU R&I policy and a better compatibility of EU actions and instruments.
90. Such a framework directive must take into account the basic principles of EU action, namely:
- attribution: the EU should only act if it is competent on the basis of the EU Treaties,
 - subsidiarity: the EU should only act when it is the appropriate level for action,
 - proportionality: the EU should only act as far as and to the extent it is needed, and
 - integration: the EU should integrate research and innovation considerations in decisions in other policy fields.
- Next to these principles, we can also refer to the principles of non-discrimination, equal opportunity and transparency as leading principles for a future EU research and innovation policy.
91. In developing such an approach, a number of the issues mentioned above certainly can be tackled:
- a) putting forward a framework directive will not only structure the EU R&I policy, but will also support, if and where needed, the development of Member State R&I policy; this will help to eliminate and reduce possible large gaps and disparities between research systems at national and regional level;
 - b) putting forward a framework directive will also improve reporting and monitoring at European and national level, making it possible to have a better view on the progress of the realisation of the ERA;
 - c) in such a more structured policy field, the European, national and regional stakeholders should clearly be involved in a structured way; therefore, the establishment of an ERA Stakeholders' Platform is a good idea; through this Platform, the exchange of information and the active participation of the European, national and regional stakeholders should be guaranteed;
 - d) all governments, be it at European, federal, regional or local level, will be supported or encouraged to devote more attention to research and innovation in their own global policy development;
 - e) the bigger awareness of the urgency of the problems at different levels of policy will in turn lead to more cross-level consulted policy development and implementation.
92. A major contribution can thus be made to building a single knowledge economy, based on a single market. A single market with a free circulation of knowledge as its fifth freedom needs a more structured and managed approach of issues. The experience with the other four freedoms (persons, capital, services, goods) has shown that there is no alternative for that.
93. However, not all issues will or must be resolved by means of an EU framework directive on research and innovation. Instruments which have been developed

over the past years will and can keep their value. Reference can be made to the European funding programmes and voluntary coordination mechanisms (such as the open method of coordination, the ERA partnerships, the ERA-nets and the Joint Programming Initiatives).

94. All in all, the combination of binding and non-binding instruments must lead the EU research and innovation policy towards the following goals, as put forward by Prof. Susana Borrás (Copenhagen Business School, Denmark) during the ERAC Stakeholders' Seminar at the occasion of the launch of the public consultation on the ERA Framework (Brussels, 13 September 2011):

- improve the coherence between EU and national policies, requiring focus on overall ERA governance going beyond the current main focus on managing funds;
- enhance the efficiency in ERA, requiring a moratorium and even reduction of the number of instruments;
- develop the principle of EU-national level partnership, requiring the development of ERA "coordination" and "legislation" mechanisms to their full potential;
- enhance support capabilities for strategic decisions in ERA, requiring structures for the monitoring and evaluation of ERA mechanisms;
- generate governance overview for strategic purposes, requiring appropriate governance structures by developing theme-specific ERA initiatives (as today) or a single comprehensive ERA framework (as suggested above), or both;
- strengthen stakeholder participation, which will require rethinking and expanding national stakeholders' participation in ERA governance.

IX. Cross-cutting issue: Gender

Key points

- Ensure that Europe's female talent is properly used and valued in research.
- Promote or develop actions at the level of HR management and measures by providing good work-life balance conditions for both women and men and by taking specific measures to support women's careers.
- Promote and support an unwavering commitment of organisational leadership to gender equality.
- Bring together all research stakeholders including universities, institutes, funders, governments and others to define frameworks and to promote or mandate gender equality and other quality-based diversity actions.

95. Gender bias has been a persistent problem and continues to be a significant issue in academia. Among the broad diversity categories, which in addition to gender include race, national origin, religion, age and disability, the relative failure to eliminate the existing bias with respect to gender is very striking, even if gender is the most pervasive category of diversity. This is why gender mainstreaming still remains a major area of consideration in academic politics. In view of evidence both from universities and enterprises, diversity of staff can be linked to better performance. In other words, a significant gender bias equals loss of quality. LERU endorses diversity and gender policies in order to enhance the quality of research and teaching.

96. It is well known that Europe is still underutilising a considerable amount of its female intellectual capacity. Whereas the men-women ratio is relatively balanced up to the level of the doctorate, there is a steep decrease afterwards and up the university's career ladder. On average in 2010, European universities had 30% of female staff but only 18% of full professors. For all grade A academics at EU-27 level²⁰, women account for 23% among 35- to 44-year-olds, 21% among 45- to 54-year-olds, and 18% among those aged over 55²¹. It is clear that at this rate of increase time in and of itself will not redress the underrepresentation of women in an adequate fashion and that specific measures are needed to support women's research and academic careers on individual and structural levels.

97. Female careers in academia exhibit significant turning points after the PhD and at the transition point

from postdoc to first established post and, most notably, to full professorship or another leading position. The first turning point is at least to some extent a matter of free choice by which many talented young women choose not to have academic careers. Next to working conditions, this is particularly related to the prospect of the fragmented nature of funding and difficulties in securing established posts, which apply to both men and women, but deter more women than men from choosing an academic career. What is needed are generic career support measures (structured and varied career tracks, well-designed posts, career development support, etc.) that are likely to have the most impact in retaining women in research and academic positions. The second turning point, on the other hand, concerns women who made their decision to stay in academia, but who are facing socio-cultural mechanisms which partly prevent them from achieving leading positions. To address the problems arising at these points action is needed on two levels: the first is to be situated at the level of HR management and measures, the second one is in terms of institutional commitment and organisation.

HR management and measures

98. At the level of HR management and measures, there are three crucially important areas to help young women to decide in favour of an academic career and to successfully master the necessary stages on this career path: 1) the implementation of supporting measures for young (female) researchers, 2) good work-life balance conditions, and 3) the availability of sufficient funding. Transparency of all assessment

²⁰ Grade A academics are full professors (cf. She figures 2009 - Statistics and Indicators on Gender Equality in Science, pp. 133-141).

²¹ European Commission. (2009). She figures 2009 - Statistics and Indicators on Gender Equality in Science. p. 73.

and recruitment procedures is essential at junior and senior levels; having consistent and rigorous recruitment processes for academic staff is critical for women's success. At more advanced career stages institutional organisation and leadership become increasingly relevant compared to HR measures.

99. In terms of supporting measures for female researchers, there are various types of effective measures. One example are funding programmes to award stipends for so-called "protected time" freeing grantees from certain responsibilities and allowing them to focus on research as a means to reach a specified goal (e.g. high impact publications, competitive funding or tenure). Secondly, mentoring and training programmes have been shown to be particularly effective to help women advance. They can be offered in various formats to suit the needs of particular cohorts or individuals. In addition, for awareness of committees and self-awareness of young female researchers it may be important to know that gender mainstreaming is an effective secondary criterion which comes into place if by the primary criterion of quality the percentage of female grantees significantly underscores the percentage of female applicants. In such a case a renewed discussion of the criteria for quality is required. This type of awareness with committees and with young female researchers themselves can be very effective in eliminating unconscious bias and in changing attitudes without resorting to targets or quota's.

100. A second key area covers work-life balance conditions. Work-life balance involves provisions for flexible working hours while children are small, dual-career options, supporting measures during maternity or parental leaves and child-care options. Moreover, it is well-known that research often requires periods of international mobility, which can put serious strain on families. International mobility and visibility are increasingly becoming a decisive criterion for higher university positions. Possible measures are to develop and recognise alternatives to traditional research stays abroad, e.g. virtual or short periods of mobility. Well-designed infrastructural and financial measures to support researchers who plan international collaboration and travel also prove to be helpful.

101. Work-life balance measures are gender-blind, but can be shown to help women overcome career obstacles during biologically productive periods in their lives which coincide with the career-productive periods. It is crucial that such measures are well-designed,

-implemented and -monitored, otherwise they risk perpetuating rather than eliminating gender bias.

102. A third key area relates to funding. The acquisition of research funding is a central element of a research career. Acquired funding is often regarded as an indicator of someone's scientific reputation and value in the scientific community, which may be particularly important in appointment and promotion procedures. Sufficient funding is essential as a supporting measure in the form of research stipends during initial career stages, but also as a means to develop and consolidate research areas. It is imperative that women are given the same possibilities as men; this also holds for academic positions on specified salary scales, which do not prevent women from obtaining functionally and financially lower positions. Any overt or covert pay gaps must be acted upon. At the level of professorships, salary negotiations are crucial for the financial appreciation of the position and women must have access to training for salary negotiations. This should be monitored and universities should have gender-specific statistics about salaries.

103. One of the objectives must be to generate more research applications by young female researchers. In order to achieve this, flexible funding can be made available for a short period of time in order to stimulate young female researchers to apply for grants. As long as the gender bias exists, such funding should be open specifically to female applicants, because experience shows that otherwise male applicants may obtain a disproportionate share of such funding.

Institutional commitment and organisation

104. As stated above, in addition to HR management and measures, action is needed at the level of institutional commitment. For progress to be made gender equality must be embedded in all levels of institutional organisation with an unwavering commitment of the leadership. Without strong leadership at the top gender policies are unlikely to be translated into successful actions at the level of divisions, faculties, centres and individuals.

105. Experience shows that successful implementation of gender issues in universities depends crucially on the existence of Gender Equality Plans which are discussed and decided at all levels along the hierarchy. Institutional Gender Equality Plans may be mandated, recommended or endorsed by national or other

authorities. Such democratically decided Gender Equality Plans may be binding for the university and may include quantifiable goals to be reached within specific time windows, a clear scheme for their implementation, and a transparent monitoring system. Evaluation of the results should have consequences for future strategic planning, including the possibility of accompanying research. Universities should strive for transparency in all aspects of gender issues.

106. The responsibility for gender equality can be organised in different ways depending on the structure and peculiarities of individual universities, but must as a rule involve all levels of the university hierarchy, from departments and faculties to the president's/rector's office. Whichever model is chosen, it is important to establish a direct connection between the unit in charge of gender issues and the university leadership as well as direct accessibility of this unit to the university community at large.

X. Cross-cutting issue: Ethics

Key points

- Recognise and promote freedom as the golden rule of research and as an indisputable, fundamental and internationally recognised right of researchers, as well as democratically agreed limits to this freedom.
- Promote and maintain environments fostering research of high ethical standards, where mutual co-operation and research integrity are valued and inappropriate conduct is identified and addressed.
- Promote or adopt specific sets of ethical standards or codes of practice to be applied in specific research fields.
- Support the development of ethical committees with the power to adjudicate on ethical issues drawing their inspiration from freedom, self-criticism, precaution, respect and responsibility.

107. Freedom is the golden rule of research and, as a consequence, an indisputable, fundamental and internationally recognised right of researchers. Research should not be restricted by political agendas and researchers should not normally be restricted as to what questions they can ask or what fields they should research into. This does not mean however that such liberty can brook no limits. With academic freedom comes the responsibility to behave with integrity and to consider the implications of one's research, as well as the conflicts which may arise with other fundamental rights²².

108. Limits to the freedom of research can only be accepted if they are democratically agreed and formally approved, either by legislative bodies or by research institutions. Human rights, as stated in international charters or in national democratic constitutions, are a primary source of any such limits. Any limit to the freedom of research can only be justified if it implies the risk of infringing higher principles. If issues are not solved on the basis of a generally agreed hierarchy and of the corresponding rights in the field of scientific research, conflicts between competing principles or rules should be dealt with by each researcher according to her/his conscience.

109. Communities can adopt specific sets of ethical standards or codes of practice to be applied in their own research fields. Such rules should also be stated formally and widely disseminated. They should be considered as secondary sources of guidance for research activities.

110. Academic institutions may entrust ethical commit-

tees with the power to adjudicate on ethical issues. Such bodies should not behave as gate keepers who give or deny access to research inflexibly, according to the opinions of their own members. Rather, they should draw their inspiration from freedom, self-criticism, precaution, respect and responsibility, taking into consideration that both science and ethics change continuously and their achievements are perpetually under challenge.

111. Research is an endless and critical quest. Although researchers look for objective knowledge, they are fallible and should therefore abstain from presenting the outcome of their activity as indisputable and unchallengeable truth. Openness to criticism and discussion within scholarly communities is therefore a primary ethical principle in research, irrespective of the specific study field to which researchers belong.

112. Researchers must be aware that their own personal values and beliefs may influence their research. Therefore, they should be self critical and declare it when any of their beliefs or values might unduly bias their findings.

113. Researchers may personally adopt stricter ethical principles than those commonly practised by international research institutions or emerging from international or national standards, and object in conscience accordingly. Yet such an attitude should not turn into a prejudice of fundamental rights of other people, or become a hindrance to the activity of the research teams with which they work, as well as to the fulfilment of common projects.

22 The League of European Research Universities. (2010). *Academic freedom as a fundamental right*.

114. Any research activity must respect the intangibility, integrity, dignity and equality of human beings to the full. Research conducted on human beings, irrespective of the study field, can only be undertaken on the basis of their informed consent, obtained after due and detailed information, except in those cases in which, according to legal and regulatory guidelines, internationally agreed, consent is impossible to achieve or not needed.
115. Researchers are also called upon to respect any other living being and the natural environment. Research conducted on animals, plants or any kind of biological materials should be carried out in such a way that it may avoid causing harm to living beings or minimise their suffering, as stipulated in several EU directives.
116. Covert research is not recommendable in principle, whereas it can be morally admitted to carry out investigations that undemocratic political agencies wish to bar or to disclose facts that they wish to hide for the sake of their own power aims. The security, anonymity and privacy of the people involved in any manner in research programmes should be granted unconditionally. Anonymity, in particular, should be respected as far as the preservation of biological samples and the access to databanks or biobanks are concerned, under the standards and within the limits stated in international regulations.
117. The impact that scientific assumptions, discoveries and research products may have upon nature or society should be taken into account by researchers at every stage of their investigative activity.
118. The search for excellence and the respect for merit as the only acceptable standard of evaluation of research activity should be considered as ethical principles per se. All researchers and all research institutions are therefore expected to comply with them. Full and unconditional respect must be granted to authorship and the paternity of scientific discoveries and writings. Authorship should be attributed to those contributors and collaborators who have made a significant intellectual or practical contribution to the work. All funders and sponsors of research should be clearly acknowledged.
119. Researchers are called upon to respect both the methods and the good practices of science. This does not imply a dogmatic and repetitive stance toward established paradigms or codified research protocols, since such attitudes might curb innovation, but all departures from usual paths must be justified rigorously. Research methods and the sources of the data gathered should be disclosed in due time in order to allow their scholarly verification.
120. Researchers should recognise that conflicts of interest can inappropriately affect research. Potential or actual conflicts of interest should be identified, declared and addressed in order to avoid poor practice in research or potential misconduct.
121. Researchers should not agree to conduct any projects for which they do not feel to be wholly qualified or which are not sufficiently funded. In bidding for research projects, they should refrain from offering to perform them without the resources deemed to be necessary and from any other unfair practice. Research funds, once obtained, must be used for the specified purposes only.
122. Sponsors, either private or public, may have vested interests in the outputs of the research projects they stimulate or finance. Researchers should try to anticipate any issues that might arise as a result of working collaboratively and agree jointly on how these might be addressed. Agreement should be sought in advance on issues such as intellectual property, publication and attribution of authorship. Expectations must keep faith with the scientific hypotheses and investigation methods considered to be scientifically appropriate for the purposes of the research conducted. Researchers should ensure that the vested interests of research sponsors do not influence the conclusions of their research.
123. Organisations should promote and maintain an environment which fosters and supports research of high ethical standards, mutual co-operation and open and honest exchanges of ideas. They should foster a culture where research integrity is valued and inappropriate conduct in research is identified and addressed.

XI. Final remarks

124. In this paper we have presented both high-level and concrete recommendations towards the realisation of a better functioning European Research Area. By way of conclusion, we would like to emphasise a number of general principles on which our recommendations are premised and which we suggest should serve as guiding principles for EU R&I policy making:

- a) Basic (frontier) research is quite simply the foundation for Europe's future competitiveness. It requires patience, persistence and investment. Innovation is a complex process, not a linear progression of basic science into new products. Investment in the former needs to be unfaltering, especially in times of economic pressures, to ensure the success of the latter.
- b) Excellence in research is best stimulated through EU-wide and global competition and by removing barriers to such competition.
- c) Diversity should be used and supported as a European strength, based on the knowledge that excellence is not predicated on a single model and on the recognition that a one-size-fits-all approach is often unrealistic and counterproductive.
- d) An overly prescriptive and regulatory approach is to be avoided as it clashes with the dynamic, versatile needs and trust-based nature of research and innovation. A justified requirement of accountability needs to be reconciled with the least amount of bureaucracy needed.
- e) EU action in R&I policy should be guided by the principles of attribution, subsidiarity, proportionality and integration as defined in paragraph 90.

About LERU

LERU was founded in 2002 as an association of research-intensive universities sharing the values of high-quality teaching in an environment of internationally competitive research. The League is committed to: education through an awareness of the frontiers of human understanding; the creation of new knowledge through basic research, which is the ultimate source of innovation in society; the promotion of research across a broad front, which creates a unique capacity to reconfigure activities in response to new opportunities and problems. The purpose of the League is to advocate these values, to influence policy in Europe and to develop best practice through mutual exchange of experience.

LERU publications

LERU publishes its views on research and higher education in several types of publications, including position papers, advice papers, briefing papers and notes.

Advice papers provide targeted, practical and detailed analyses of research and higher education matters. They anticipate developing or respond to ongoing issues of concern across a broad area of policy matters or research topics. Advice papers usually provide concrete recommendations for action to certain stakeholders at European, national or other levels.

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