The views and recommendations in this report are those of the Expert Group members acting in their personal capacities and do not necessarily represent the opinions of the European Commission or any other body. Nevertheless the Group members would like to gratefully thank colleagues in the Commission, Member States and other organisations active in the ERA for their very useful data, comments and feedback.
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Summary

The vision of the European Research Area is to drive up the efficiency, effectiveness and excellence of the research system through the free circulation of researchers, knowledge and technology and in so doing to support the critical contribution it makes to achieving economic competitiveness and addressing grand challenges. The ERA Communication of 2012 placed a clear emphasis upon implementation and, based on an analysis of strengths and weaknesses, set out five priorities with the potential to induce step-changes in Europe’s research performance and effectiveness by 2014. These are:

1. More effective national research systems – including increased competition within national borders and sustained or greater investment in research;
2. Optimal transnational co-operation and competition - defining and implementing common research agendas on grand-challenges, raising quality through Europe-wide open competition, and constructing and running effectively key research infrastructures on a pan-European basis;
3. An open labour market for researchers - to ensure the removal of barriers to researcher mobility, training and attractive careers;
4. Gender equality and gender mainstreaming in research – to end the waste of talent which we cannot afford and to diversify views and approaches in research and foster excellence;
5. Optimal circulation, access to and transfer of scientific knowledge including via digital ERA - to guarantee access to and uptake of knowledge by all.

This report analyses these priorities and recommends a set of key actions that are needed from the Commission, Member and Associated States and Stakeholder Organisations in order to make rapid progress. The priorities were examined by expert sub-groups who also identified examples of national practices that could be learned from or emulated and produced specific recommendations. Working in plenary the Expert Group also identified cross cutting issues.

A full summary of recommendations is presented at the end of the report and detail provided in each section.

Some of the key recommendations for each priority are given below:
More effective national research systems require a target that no Member State should remain below the current EU average of 40% of funding allocated competitively, that institutional funding should be subject to periodic evaluation and that a series of steps are taken to support the internationalisation of peer review.
Optimal transnational competition and cooperation through jointly addressing grand challenges require ways of improved information sharing on national level initiatives, and better alignment,
synchronisation and harmonisation of the procedures, cycles, rules and regulations that underpin
them. More data on benefits and impacts and evaluation are also needed.

*Effective investment in and use of research infrastructures* requires greater clarity in the guidelines for
elaboration of national roadmaps, an annual indication of financial commitments by Member States
and steps to promote the development of a European Charter for Research Infrastructure Access.

*A more open labour market for researchers* requires European financial instruments to be used to
incentivise the rapid implementation of ERA principles, including the European Charter for
Researchers\(^2\) and the Code of Conduct for Recruitment of Researchers\(^3\). Doctoral programmes should
seek to empower candidates and give them interdisciplinary and transferrable skills.

*Gender equality and gender mainstreaming in research* requires systematic gender mainstreaming of
R&I policies and policies and structures to foster cultural and institutional change. Member States
should enhance the availability of sex–disaggregated statistics and the Innovation Scoreboard should
include the share of women researchers in Grade A positions. It is vital to eliminate gender bias from
assessment.

*Optimal circulation, access to and transfer of knowledge via digital ERA* requires coordinated national,
RFO and RPO policy development on open access. A research-friendly copyright framework is needed
to maximise circulation of knowledge. The Commission should fund European research data
infrastructures, ensure interoperability and facilitate an EU framework for identity management.

Looking across the recommendations the actions needed fall into five categories:

i) **Harmonisation**: the application of common principles for action or common approaches,
or synchronisation of decision cycles to facilitate joint working;

ii) **Monitoring and evaluation**: Improving the measurement of the progress of the ERA,
evaluating existing practices and supporting mutual learning between actors;

iii) **Information sharing**: greater and more effective sharing of information about national and
organisational initiatives and provision of infrastructure to support this;

iv) **Use of funding or other incentives to change behaviour**: Funding the actions needed to
progress the ERA or linking existing funding sources to compliance with core ERA
principles;

v) **Governance and regulation**: In exceptional cases achieving progress via agreed mandates.
Also embodying key principles in Charters and Codes for good practice.

Four topics recurred across the priorities and need particular highlighting:

*Using peer review effectively*: Quality of research and the means to achieve and assess are manifested
in the central role that peer review plays in many of the recommendations. Facilitation of international
peer review can drive both excellence and fairness but it is not a panacea and is a process that needs
to made free of gender and other sources of bias.


\(^3\) [http://ec.europa.eu/euraxess/index.cfm/rights/codeOfConduct](http://ec.europa.eu/euraxess/index.cfm/rights/codeOfConduct)
Reducing inequality of opportunity: At a macro-level the most striking inequality is the growing gap between those countries that can afford to, or choose to, prioritise research in their public funding priorities and those in which deep cuts or even a failure to invest in the first place create an environment that makes joint activities can become unrealistic or result in uneven benefits. Member States should recognise there is a minimum critical investment for their systems to be viable and a failure to meet that threshold will disadvantage not only their researchers but also their populations’ economic and social prospects.

Inequality in institutional structures and practices is felt primarily at the level of the individual. This has been made highly visible by the gender and research labour market groups who have been assiduous in identifying the almost ubiquitous barriers that need to be addressed. While legislation and regulation provide a framework this is one task that the research system itself must address not only through institutional reform but also through fundamental cultural change.

Ensuring knowledge flows: the free flow of knowledge is well-known as a foundation of the ERA but impediments to this flow persist not only in the outputs of research but also in the knowledge that is needed for the research system to function effectively. Hence we see the development of infrastructures hampered by the lack of access portals to national roadmaps and other information, we see insufficiency still in the statistics that would allow effective monitoring of gender and research career issues, symptomatic of a more general deficit in evaluation which has yet to catch up with a period of innovation in research policy. A cross-cutting theme has also been the need for more investment in e-infrastructures to facilitate these flows.

Making best use of European Structural and Investment Funds: The synergies created by the Common Strategic Framework open new opportunities for the ERA to operate for mutual benefit with the goals and mechanisms of the European Structural and Investment Funds (ESIF). An effective ERA will enhance the functioning smart specialisation and other key drivers of regional development. ERA should be firmly rooted in the ESIF Partnership Agreements currently negotiated with Member States. In turn resources from ESIF should play a critical role in building the level of capacity that is needed to take full advantage of the ERA.
Part I Context and Overview

1. The ERA Context and the role of the Expert Group

The European Research Area (ERA) exists to drive up the efficiency, effectiveness and excellence of the research system across the European Union so that it can maximize the value it contributes to Europe’s economic, social and environmental goals. At a time when challenges loom large for Europe it is crucial to put in place the elements that will underpin innovation-led recovery and growth and address such grand challenges as achieving a healthy population, a sustainable environment, food and energy security and a society which meets the social and cultural aspirations of Europe’s citizens.

A reference point is provided by the definition of the ERA as:

“A unified research area open to the world based on the Internal Market, in which researchers, scientific knowledge and technology circulate freely and through which the Union and its Member States strengthen their scientific and technological bases, their competitiveness and their capacity to collectively address grand challenges”

In the past two years the ERA debate has progressed from strategic debate to a focus on implementation. The ERA Communication⁴ presents five priorities, based upon an analysis of Europe’s strengths and weaknesses and with the potential to induce step-changes in Europe’s research performance and effectiveness by 2014. These are:

1. More effective national research systems – including increased competition within national borders and sustained or greater investment in research;
2. Optimal transnational co-operation and competition - defining and implementing common research agendas on grand-challenges, raising quality through Europe-wide open competition, and constructing and running effectively key research infrastructures on a pan-European basis;
3. An open labour market for researchers - to ensure the removal of barriers to researcher mobility, training and attractive careers;
4. Gender equality and gender mainstreaming in research – to end the waste of talent which we cannot afford and to diversify views and approaches in research and foster excellence;
5. Optimal circulation, access to and transfer of scientific knowledge including via digital ERA - to guarantee access to and uptake of knowledge by all.

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⁴ COM(2012) 392 final
Substantial progress has been made since the launch of the ERA in 2000 but it is recognised that the achievement has not been even across the different ERA dimensions and Member States. The deep and widening gap between the underpinning conditions for research, particularly in the current financial environment has made the need for action both more pressing and more challenging to achieve.

The efforts to meet the 2014 goals are founded in a partnership between the Commission, Member States and key stakeholder organizations, representing research funders and performers. For each of the above priority areas Member States are undertaking specific actions. Progress against implementation is monitored by the Commission on an annual basis, with findings from this and from a survey of key stakeholders being presented in the ERA Progress Report published in parallel with this report.

The broad remit of this expert group is to assist the Commission in defining relevant policy support to in turn assist Member States in the implementation of the ERA Priority Actions and to advise on ways to reinforce these actions and other initiatives, measures or instruments which may be needed. The formal Terms of Reference are appended. In practice these were interpreted as:

1. Identification of priorities among the actions addressed to Member States in the ERA Communication;
2. Identification of the main steps and actions needed to implement the identified priorities;
3. Assessment of the extent to which the proposed progress indicators can be operationalised and progress measured;
4. Identifying and presenting good practice examples recently operational in Member States;
5. Delivering recommendations on how the Commission could assist Member States in the implementation of ERA.

The means of working has been through sub-groups with particular expertise in the areas addressed by the priorities. Priority 2 was divided between jointly addressing challenges (hereafter referred to as 2a) and effective investment in and use of research infrastructures (2b). The sub-groups also worked in plenary to ensure a consistent approach and to identify cross-cutting issues.

One aspect of the ERA Priorities which is not addressed directly in this report is that of open innovation and knowledge transfer. This is being addressed by the ERAC Working Group on Knowledge Transfer and addressed in a dedicated separate high level expert group on Open Innovation and Knowledge Transfer. We recognise the equal importance of this remaining aspect of the ERA priorities and the importance of such actions of Member States as development of national Knowledge Transfer and Open Innovation strategies and stakeholder commitments of ensuring optimal interaction and linkages and strategic partnering between academia and industry, defining joint collaborative research agendas to maximize the use of research results and improve recognition and professionalization of knowledge transfer activities. The expert group on Open Innovation and Knowledge transfer will
address the issue of what can be done to foster knowledge sharing and utilisation. The report is expected in November 2013.

2. Overview of the ERA Priorities

In this section each of the ERA priorities is introduced in terms of its significance and the need for action. In so doing, the Expert Group seeks to present a vision of the position and practice of research in Europe that is a step change ahead of the starting situation. Nonetheless, it is a vision that can be attained by the systematic adoption of the actions identified in this report. Collectively it describes a research system in which there are incentives and support to succeed in all countries, where that success is also founded upon working without inhibition across borders, infrastructure is easily available and supported by both electronic and physical access, research careers are based on open and transparent principles and broad training, there is genuine equality for females and males in both the structures and the content of research, and the outputs of research are fully accessible to all who need them, aided by state-of-the-art e-infrastructures and the services that use them.

**Priority 1: Effectiveness of National Research Systems.**

At a time of constrained resources for research it is particularly important that maximum value for public money should be demonstrated by national research systems. This is a necessary step in securing increased investment. Open competition for resources allocated by peer review is associated with success as defined by the quality and quantity of outputs and by research reputation. Such competition is usually associated with research grant funding systems but it also takes place through institutional assessments of past performance when these are linked to future investment in research. The ERA has a particular role to play in facilitating mutual learning about best practice in the design and implementation of peer review based competition and more directly in providing the foundation for international peer review, where all research is potentially exposed to the scrutiny and feedback of the highest levels of expertise.

There are many manifestations of competition and of peer review and this report will argue that neither are panaceas. There can be too much as well as too little competition although lagging systems usually are held back by a deficit rather than a surplus. Peer review also has inherent limitations and needs careful design to ensure that individuals and projects are treated with fairness and transparency. An effective national research system involves, we shall argue a well-constructed balance between selectivity between fields, concentration on more successful institutions and individuals and ensuring sustainability, particularly in ensuring the replenishment of human and physical capital. Underpinning the need for these improvements in effectiveness there is also a need for adequate investment in the first place and Member States and Associated Countries are urged to ensure that they continue to prioritise investment in knowledge and consequently in innovation and growth.
Priority 2A: Optimal Transnational co-operation and competition: Jointly addressing Grand Challenges.

Transnational collaboration in joint programmes and funding opportunities within Europe is at the heart of ERA, it epitomises ERA. This is so because the advantages of collaborative research as regards effectiveness of research and efficiency of use of resource are so apparent. Joint initiatives are a major way forward to maximise those benefits. Prior to the ERA development, reaping these benefits has largely rested on the EU Framework Programme and other supranational initiatives. The impetus of ERA instruments for flexible geometries has catalysed a development of joint cross-border funding activities. However, there is a danger that this impetus is lost at a point in time when much more joint activities are needed. We need a quantum leap, we need to maximise the opportunities for scientists to collaborate as their subject matter demands. It is neither realistic nor desirable that the opportunity structures needed to do so are solely provided by supranational, integrated programmes fed by national budgets. Rather, the existing funding and programming initiatives at national level, which represent the vast bulk of funding in Europe, need to be mobilised, to open up, to join forces. This report addresses the issues that need to be addressed at national and at EU level to fulfil the promise of a coordinated and open European Research Funding Area as cornerstone of ERA.

Priority 2B: Optimal Transnational co-operation and competition: Effective investment in and use of Research Infrastructures.

Research infrastructures are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. Where relevant, they may be used beyond research, e.g. for education or public services. They include: major scientific equipment (or sets of instruments); knowledge-based resources such as collections, archives or scientific data; e-infrastructures, such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be ‘single-sited’, ‘virtual’ or 'distributed'. Two of the actions in the ERA Communication relate to the identification, funding, development and use of research infrastructures. These important actions have particular relevance for the ERA, in that it is increasingly the case that no single country can afford the high costs associated with the construction and operation of many RIs. By pooling resources and sharing access, the ERA can realise and exploit the scientific opportunities stemming the operation of large scale scientific instruments and associated scientific data. Concerted action by Member States and the European Commission, together with a clear role for the European Strategy Forum for Research Infrastructures, will help support and drive the ERA to a position of global leadership in many fields of scientific enquiry.

Priority 3: A more open labour market for researchers.

The creation of a single, open, transparent, merit- and equal opportunities-based labour market for researchers in Europe is a pre-condition for the achievement of the European Research Area. Despite existing norms ‘imposing’ merit-based and transparent procedures for recruitment and career progression, these procedures are still largely perceived as insufficiently open and a wide gap persists...
between policy and practice. Removing this gap by the wide and substantial adoption of a Human Resources Strategy embedded into the principles of the European Charter for Researchers may contribute to improve the attractiveness of the European Research Area and to substantiate the very concept of ERA.

Reducing the mismatch between the demand for research by the society and the supply of researchers from higher education institutions may significantly contribute to the creation of several hundreds of thousands of new research positions in Europe. Reducing this mismatch demands improved training and skills of first stage researchers (R1). This can be achieved by adopting and implementing the Principles for Innovative Doctoral Training.

The EU financial instruments to support research (the Framework Programme Horizon 2020, but also the European Structural and Investment Funds) should be consistently used to incentivise the implementation of the ERA principles, according to the Council decision on implementing the Horizon 2020 Programme: ‘Institutions presenting innovative concepts for the rapid implementation of ERA principles, including the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers, will be supported’.

Leading by example through the use of the EU funding mechanisms may have a powerful structuring effect on Member States. Transparent mechanisms should be put in pace and monitored, to ensure that all Member States and, within them, research (performing and funding) organisations utilise EU research funding in compliance with the ERA principles; where there is evidence of a failure, funding should be withdrawn and any future funding made conditional upon effective remedy.

**Priority 4: Gender equality and gender mainstreaming in research.**

Gender equality is about fairness and the quality of research and innovation, two inherent values of the research profession. The achievement of the European Research Area is therefore impossible without tackling the issue of gender equality and gender mainstreaming. Two issues are central here. Firstly, statistics show that the percentage of women in higher education and in doctoral programmes in Europe has steadily grown, yet this increase is not reflected in the research profession and even less in decision-making and governing bodies. The situation is not self-rectifying. Europe is investing in scientific training of women but these resources and talents are poorly utilized due to continued career development constraints and bias facing women researchers in Europe. With increasing internationalization, stress on mobility and continued increases in research funding and positions distributed on a competitive basis, the challenge remains to ensure that level playing conditions are in place and that gendered factors are reflected in assessment criteria. Related to this, eliminating gender bias from individual researcher evaluation is vital to ensure that inefficiencies are removed from the research and innovation system. If we cannot select the best and most talented people because of outdated gender-biased preconceptions, the quality of research is ultimately compromised. Secondly, research and innovation play, if often indirectly, a key role in people’s lives. It is therefore necessary to make sure that they answer the needs and concerns of the entire population, men and

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women alike. This has not always been the case in the past but the advantages and opportunities are clear. Integrating the gender dimension in research and innovation brings more nuanced understanding of natural and social phenomena, research findings that are more robust, research knowledge that is more responsible and accountable, and innovation that creates new economic, social and environmental opportunities. The first step in this is gender mainstreaming in all phases of research and innovation policy making from design to evaluation, but cannot be reduced to policy alone; the gender dimension must be also addressed in research programmes and projects by research teams and institutions. To achieve these goals, concerted effort is needed by the European Commission and Member States on the one hand and stakeholder organizations at the European as well as national levels, including research performing and funding organizations. In this report we make recommendations to all these actors in line with the three priorities of creating legal and policy environment, fostering cultural and institutional change, and ensuring 40 % representation of the under-represented sex.

Priority 5: Open circulation, access to and transfer of scientific knowledge via digital ERA.

ERA is about the free circulation of researchers, scientific knowledge and technology that create the enabling environment to increase competitiveness and innovation in the Union. Therefore this priority lies at the heart of the ERA. This priority addresses the current attested problem of the restricted circulation of and uneven access to scientific knowledge, i.e. research papers, books, research data. Additionally, it addresses the uneven access by researchers to the e-infrastructures and digital research services that afford the ability for cutting edge research within their Member States and throughout Europe. Through the effort to harmonize Member State policies this ERA priority seeks to broaden access to scientific outputs and e-infrastructures, especially those funded with public national and/or European funds, to all European researchers, as well as, where possible, businesses and the wider public in view of facilitating the free flow of scientific knowledge and services provisioned in the ERA.

Member States present a diverse picture with regard to these issues, while harmonization at the European level is far from present. This priority proposes actions to rectify the situation. Fragmentation of policies and practices hamper the free circulation of scientific knowledge and broad access to technologies and services. Access to scientific information varies not only among Member States, but also within them. Continually rising subscription prices in scientific literature, especially to online scientific resources, create an imbalance in the ability to access the scientific output: more privileged institutions and Member States have more access to the results of cutting edge research, while not as financially fortunate institutions and Member States do not. Open access to scientific information, the proposed policy, has demonstrated benefits for research and economy. Through the ERA Communication and a relevant Recommendation, the European Commission calls Member States to define coordinated policies for access to and preservation of scientific information. Additionally, research publications stemming from Horizon 2020 funding will be openly accessible to all.
Further to this, the fragmentation is also observed in the lack of coordination of policies to regulate the access to e-infrastructures and digital research services within and between Member States. Enabling seamless access to publicly funded e-infrastructures through common access policy principles will maximize the use of available resources for researchers and research-performing enterprises. Indeed, the benefits that businesses are to reap from increased access to research outputs and digital research services is expected to have an impact in their ability to innovate. Finally, another means through which this priority proposes to address fragmentation in access to knowledge and services is the national strategies for electronic researcher identity.

Conclusively, optimizing access to and transfer of scientific knowledge in the ways described above is expected to create economies of scale, foster collaboration of researchers within and beyond Europe, facilitate e-science and foster excellent research.
Part II Sub-Group Reports on the ERA priorities

Priority 1: Effectiveness of National Research Systems

1. Identification of priorities

1.1 Framework

This section addresses the effectiveness of national research systems and in particular the ERA priority of increased competition within national borders and sustained or greater investment in research. Competition for research funding involves selection between competing options, normally via peer review. Work by the OECD and the European Commission has indicated that the share of competitive funding as a total of public R&D funding (GBAORD) varies from 20 to 80% among Member States with an average of around 40% allocated through open calls for proposals. The remainder is institutional funding, allocated in a block. This type of funding can also be allocated competitively, through an evaluation of performance, normally ex post, but the bulk of this funding is allocated without reference to competition. This section addresses competitive funding for both project and institutional funding.

Although this section addresses national aspects of research funding, the broader European context, and specifically the increasing role of EU funding (the Framework Program, new cohesion policy, etc) needs to be taken into account. There are two important aspects justifying such an approach. First is the internationalisation of scientific research and increasing role of scientific collaboration across borders. The second is the financial scale of the EU support (in the new financial perspective, the EU-based funds dedicated to research and innovation (the CSF) will amount to well over €20bn EUR/year vis a vis about €80bn from national research budgets). This means that in the coming years well over 20% of public funding of scientific research funding will come via Brussels. The proportion of competitive funding will be still higher. These argument leads to the conclusion that there is a need for a synergetic approach (which includes first of all the need for compatibility and similarity of funding rules) across the EU-27 Member State and the EU-based funding. Without that the original goals of the European Research Area will remain elusive.

It is useful to characterise research support systems in terms of three dimensions which between them condition the terms and framework for competition for resources:

- Selectivity refers to the degree to which there is prioritisation between fields. In the context of current initiatives such as Smart Specialisation and Key Technologies it normally results in targeted competition for resources against a set of predefined priorities. This highlights the processes by which those priorities are determined. Normally they combine scientific promise

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6 This section draws upon the material prepared before and during the ERAC Mutual Learning Seminar 2013 http://www.consilium.europa.eu/policies/era/erac/erac-mutual-learning-seminars-2013.

with socioeconomic potential. Policy decisions may concern the proportion of resources to be made available for responsive-mode or investigator-driven research compared with those which are targeted strategically.

- Concentration addresses the question of which institutions or research teams to support and the degree to which funding should be concentrated on the best performers. Hence, concentration is a natural outcome of competitive funding.
- Sustainability describes whether the funding model allows for the replenishment of human and physical capital within the research system, and hence maintains and grows institutions in the long-term. Unlike the previous two dimensions this feature can only be measured over time. The unit of measurement can be either the research institution or the system as a whole.

The outcomes of selectivity and concentration decisions impact upon sustainability, while in the longer term, sustainability determines which actors are available to take part in those choices.

All forms of research support can be allocated on a more or less competitive basis. Normally funding project proposals via grants is regarded as pure competitive funding but within that broader frame it is possible on the one hand to design the terms of competition to create a fairly flat distribution with a high success rate moderated mainly by a quality threshold, and on the other hand to award major grants which attract large numbers of applications but where only very few are awarded. The latter situation has become more common as some funding agencies, following the ERC example, move to ‘elite model’ in which larger and longer grants are given to the top echelon of researchers. Institutional block funding also varies in the degree of competition. It can be allocated non-competitively on the basis of factors such as historical precedent or formulae based on the scale of activity (for example numbers of researchers by field but increasingly performance based criteria are being applied to drive the distribution of these funds.

1.2 Selected priorities
The ERA Communication argues that open national-level competition is necessary to improve the effectiveness of the national research systems and thus contribute to deriving maximum value from public money invested in research and innovation. Best practice in this respect Recommends Member States to:

a) Introduce or enhance competitive funding through calls for proposals and institutional assessments as the main modes of allocating public funds to research and innovation, introducing legislative reforms if necessary
b) Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review

1.3 Rationale
The academic literature supports the broad argument that excellence in science is linked to the degree of competition between researchers. For example Hicks reviewed fourteen performance-based research funding systems and concluded that it was likely that the goal of the governments that operated them to enhance research excellence would be met. She found that their most significant

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8 Diana Hicks, Performance-based university research funding systems, Research Policy 41 (2012) 251-261
effect was to create powerful incentives within university systems driven more by the competition for prestige rather than the actual level of resources allocated. However, studies also show that there is not a linear relationship between increased competition and higher performance levels as other incentives and environment factors are also relevant. Dawson et al note that the German Research Foundation (DFG) in Germany has an acceptance rate for proposals in the range 50-60% while Denmark and the Netherlands are at around 30% and the UK 25%. They raise the issue of whether in a system with low acceptance rates the benefits of competition may be outweighed by the cost of proposals and their selection. They suggest an inverse U-shaped curve relating competition and scientific performance. On the basis of a comparison of six European research systems, they state that scientific performance in the Netherlands and Denmark improved when there was an increase in competition but that competition in the UK has become too high, such that the costs of competition exceed the benefits. Evidence remains very limited. A recent study in Canada compared publications and citations across a range of grant sizes and concluded that impact is positively, but only weakly, related to funding. The authors deduce that “funding strategies that target diversity, rather than “excellence”, are likely to prove to be more productive”. However, Canada in the period studied (to 2010) was a country where awards were thinly spread by international standards, with under 10% of grants and scholarships from the Natural Sciences and Engineering Research Council of Canada exceeding $100k. Grant size also needs to take into account issues such as equipment, data and labour requirements and the duration of funding.

As noted above, in most cases resources for research are allocated by means of peer review, either in its pure scientific form or modified by the addition of extra criteria, normally relating to expected socio-economic benefits. Increasingly an international frame of reference is used for peer review and many countries, particularly smaller ones, use foreign peers to seek greater independence or to raise domestic standards.

Peer review is also recognised to have inherent limitations. It may promote conservatism by militating towards safe choices reflecting a consensus view and screening out work that may pose a radical challenge. Interdisciplinary research can be particularly at risk as it may stray from the norms of each of the disciplines whose panels take part in its judgment. A different discipline-related issue that can arise in peer review comes when panels are operating in parallel across fields. There is a risk that members may feel that low scores could damage the reputation of their own field. As a result, peer review may be characterised by ‘grade-inflation’ – a steady upward trend in the mean scores awarded - even though the level of discrimination and hence the proportion of projects awarded remains similar. It is reasonable to state that peer review is indispensable in cross-cutting research and it is essential but not sufficient in targeted research. There are also concerns about unconscious bias in

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peer review particularly in the context of gender. This issue is addressed in more detail in the section on Priority 4 Gender equality and gender mainstreaming.

1.4 Missing Priorities
It is the view of the Expert Group that progress on the two identified priorities is core for the improvement of research systems and hence that efforts should be focused on these two priorities. However, it should also be noted that both activities can only function when the research system is adequately funded. Competition becomes inefficient when success rates are too low to support enough of the highest quality proposals. International peers are unlikely to be motivated to work effectively if they are put into a situation where austerity is focusing on cuts to research rather than identification of excellence. While the ERA Communication is rightly seeking ways of strengthening efficiency within the existing resource envelope we should also recognise that cutting research can unbalance a system and create inefficiencies, while growth of investment allows a more rapid evolution towards reformed and effective systems.

2. Main steps and actions to implement priorities

2.1 Clarifications
A first step for Member States is to clarify the scope of funding that can be allocated competitively and to assess their current standing. A clear and quantified tabulation of the terms and conditions under which research resources are allocated forms a useful starting point. By funding scheme and/or organisation should indicate proportions of funds allocated to specific priorities (degree of selectivity) and funds which are open to investigator driven proposals. Success rates should also be added. A similar process may be attached to institutional funding. In the same tabulation the proportion of resources allocated by peer review may be noted along with an indication of whether international peer review is used.

This initial assessment should be done at a level of detail below that used in current public statistics. At the same time data on the degree of concentration of research resources across research institutions should also be compiled. For many Member States such data already exist but for the rest they will provide an essential dashboard for assessing efforts to restructure the national research system.

2.2 Granularity
As indicated above the unit to be addressed is the funding initiative since rules and legislation normally apply in a specific way. However, there may also be framing legislation which affects the totality of activity.

2.2.1 Peer review
The Expert Group endorses the principles for peer review set out in the Voluntary Guidelines on Framework Conditions for Joint Programming in Research 2010 which recognise excellence in research as the central pillar of any system but also note the need in many circumstances for what

they term ancillary elements, namely the inclusion of wider criteria such as socio-economic relevance. Very similar principles are also set out in the European Science Foundation’s European Peer Review Guide 2011\textsuperscript{13}. These can also form the basis for a self-assessment framework for Member States and stakeholder organisations, namely:

1. Excellence - availability of experts who can assess high quality
2. Impartiality - all proposals treated equally
3. Transparency - clearly described rules and feedback
4. Appropriateness for purpose – in proportion to the nature and scale of the work
5. Efficiency and speed – as rapid as possible
6. Confidentiality - of all proposals, IP etc
7. Ethics and integrity - compliance a basic criterion

For a Member State organisation seeking to upgrade its peer review capability, the first two items – assessment of excellence and impartiality are the core requirements. Both are dependent upon the supply of suitable reviewers and hence are likely to drive towards the internationalisation of peer review, particularly for countries with smaller research communities in the relevant fields.

To this we may add detailed points for assuring the quality of peer review and resource allocation, and hence the fairness of competition including:

- Clear definition, communication and application of criteria for funding through the call cycle;
- Ensuring that reviewers are competent to assess the proposal and demonstrably independent;
- Ensure transparency by publishing results and providing feedback to unsuccessful candidates;
- Ensuring that competitions are run efficiently to minimise the time to decision;
- Ensuring that principles of equality and diversity are observed, including actions to support proposals from under-represented groups;
- Opening peer review to international evaluators by requiring proposals to be written in English or another language understood by a wide field of reviewers.

In terms of setting the pace for reform it is recommended that international peer review is piloted in a specific initiative before a more general roll-out. A key step is to reach agreement with international agencies/associations or other Member States to identify high quality reviewers.

\textit{2.2.2 Institutional assessment}

In terms of achieving a more concentrated distribution of funding, apart from any specific exclusion of institutions, the evolutionary path comes from placing a greater proportion of resources into the competitive frame (either within grant-funding schemes or via institutional assessment) and then
setting the rules of competition to favour cumulative benefit by earmarking larger and longer tranches of support which allow institutions to plan and build capability.

Frameworks for institutional assessment are very similar to those for peer review. For example the current UK exercise, the Research Excellence Framework (REF) is governed by three principles:

- Equity - All types of research and all forms of research output across all disciplines shall be assessed on a fair and equal basis;
- Equality – application of an internal code of practice on the fair and transparent selection of staff for inclusion with allowance made for factors constraining researchers’ ability to produce outputs (e.g. maternity or adoption leave, illness and disability); and
- Transparency – publication in full of criteria and procedures well in advance and full publication of outcomes with the decision-making processes explained openly.

For countries or organisations planning to introduce institutional assessments some key issues need early resolution. These include:

- Establishing the unit of assessment – is it an entire institution or activity within a particular field or set of fields? It is also necessary to define which work or people are in scope for assessment to avoid double counting;
- Determining the timeframe – which period is covered and what mix of retrospective and prospective assessment?
- Determining the criteria and material to be assessed – publications, citations, impact etc.;
- Mode of assessment – what group of peers or experts are to carry out the assessment?
- Deciding the consequences of subsequent ratings or rankings - are resources attached to the outcome;
- Periodicity – how often is the assessment to be carried out?

In the development of research assessment mechanisms it is good practice to put a progressive amount of resources in the frame for reallocation so that the community learns and adapts to avoid shocks.

3. Assessment of operational feasibility and measurability

3.1 Proposed indicators

The proposed indicators for these priorities are:

a) Share of institutional funding allocated on a competitive basis (Member States)
b) Share of national GBAORD allocated as project-based funding (Member States)

c) Share of institutions applying the core principles for international peer review (stakeholder organisations)

The funding shares described in (a) and (b) above can in principle be sourced from OECD and EU statistics but there are concerns about accuracy of measurement in some countries. Work needs to be done to ensure consistency of definitions at a level of detail below that of the Frascati manual. For example it is important to understand the extent that the time of researchers is counted in allocations. Indicator (c) is highly dependent on interpretation of the definition of ‘institutions’ and does not allow differentiation between pluralistic and monolithic funding systems. Measurement here needs to be extended to a range of indicators. For example the proportion of funds allocated by international peer review could be calculated to a first order of accuracy by factoring in the budgets of stakeholder organisations. There are also risks of response bias that need to be dealt with.

The panel recommends that a study is commissioned to work with administrations and stakeholder organisations and with OECD and Eurostat to develop a better taxonomy of systems and means of measurement.

3.2 Targets

Even assuming that measurement is satisfactorily achieved, attention needs to be given to target levels. As discussed above the optimum level of competition for funding is dependent upon a balance of consideration between selectivity, concentration and sustainability. While all funding, project and institutional, can positively be allocated competitively in a mature system, the resulting distribution also needs to meet the needs of the system. A key factor here is maintaining long term competition in the system. Concentration on too few actors can eliminate the possibility of future competition. This needs to be balanced against maintaining sufficient critical mass among key institutions and research teams for them to be internationally competitive in terms of economies of scale and economises of scope.

For international peer review the target would not be 100%. There is a need to respect national expertise and also to have different proportions of reviewers by origin in culturally based subjects eg sociology or humanities.

4. Good practice examples

There are several cases of good practice in operating competitive funding both for grant systems and for institutional funding. While some are long-standing such as research assessment in the UK the two cases shown below from Sweden and Germany both describe efforts to change and improve national research systems in the direction of excellence.

4.1 Swedish funding reforms
In Sweden the national Research & Innovation bill is up-dated every 4 years. The new R&I bill from 2012 addresses the Council Country Specific Recommendation to Sweden (in the context of the European semester governance cycle 2012) with the objective of improving excellence in research. While the overall level of the research system is good, it is considered that Sweden does not have a sufficient presence in the very top echelon. Specific measures in the bill include increased direct funding to universities. This is both to allow increased risk-taking in research and to increase the permanent employment of researchers. Overall competitive funding for universities accounts for 43% of total funding. 20% of the funding is being redistributed to provide more incentives for universities to specialise. Internal evaluation is done to influence the distribution of direct funding locally. A future allocation system, including peer-review is due to start in 2018. This will also take into account relations with society and industry. The current system of allocation, based on a formula using research grant income and publications is thought to lead to less risk taking and is vulnerable to different traditions of publications across disciplines.

4.2 German excellence initiative
The German Excellence Initiative was launched in 2005 to promote outstanding research projects and institutions in Germany’s universities. The aim was to strengthen cutting-edge research and to make German science and research more visible in the scientific community. A competition was organised to select outstanding projects in three areas: 39 Graduate Schools to promote young scientists and researchers 37 Clusters of Excellence to promote cutting edge research, and 9 Institutional Strategies on projects to promote top-level research. The competition was run by the Deutsche Forschungsgemeinschaft (German Research Foundation, DFG) and the German Council of Science and Humanities. A total of 1.9 billion euros was made available by the Federal and State Governments to fund the selected projects. The aim was very explicit:

“a departure from a long-cherished – and fatally wrong – conception that all universities are equal and hence should be treated equally. Instead, the Excellence Initiative pursued a path of inequality and of funding elites.”

Following further funding decisions the Initiative stands at 45 Graduate Schools, 43 Clusters of Excellence and 11 Institutional Strategies. The exercise is seen by the government as highly successful, not only in academic terms but against wider indicators such as creation of jobs. Kehm and Pasternak have expressed some concerns about inflationary use of the term excellence which does not always distinguish between performance and reputation. They also raise the question of the effect of the creation of an elite group of institutions upon the system as a whole. An official evaluation by an expert commission of international experts is scheduled for 2016, with a data-based report being submitted in June 2015.

14 http://www.excellence-initiative.com/excellence-initiative
Other countries, while not in the category of beacons at this stage, provide examples of progress that others may emulate or learn from. Several Member States have been implementing reforms in the direction of competition for example in Lithuania, the new Law on Higher Education and Research (adopted in 2009) and accompanying bylaws led to considerable increase in the share funds that are allocated through competitive procedures. In Portugal the Act on principles of science financing (2010) strengthened the importance of open and formalized competitions for R&D funding, with commitments to distribute at least 50% of the science budgets through competitive calls.

In the case of international peer review one clear example of good practice comes from the European Research Council whose uncompromising commitment to excellence has set a standard that several countries use indirectly to influence their own funding decisions. In several countries, particularly the EU-12 New Member State undergoing systemic transformation, new ERC principles-based agencies have been formed. A good example is the NCN in Poland – the national funding agency distributing grants, mostly for the frontier research, de facto copied literally the ERC assessment and decision model.

5. Recommendations

Research funding

1. External and internal incentives should be used to help RFOs to improve their governance models and to build up their competence in handling competitive and selection processes. It is not just bureaucratic-financial complexity but “financial regulations” at both EU and national level that should be overcome. Basic principles (independence; accountability; clear rules for selection procedures...) can be used as benchmarks to assess how RFOs handle public resources.

2. National funding agencies with the help of the Commission should consider drawing-up common funding principles for project-based and block funding of research. By no means should these common principles be understood as a way of standardization or homogenisation of research funding instruments but rather should foster awareness that public funding instruments should be manageable, efficient and accountable.

3. Funder’s strategies should consider the needs of RPOs and ensure their financial sustainability in the long term. There is a need to balance at national level between the percentage of competitive funding of individual or research groups and institutional funding of research –otherwise disbalance may leave very little funding (or none) for supporting research based activities, infrastructures and human resources strategies. We recommend that no Member State should remain below the current EU average of 40% of funding allocated competitively through grant funding.
4. **We also recommend that institutional funding should be subject to periodic evaluation** (on a longer timescale and in substantially larger units than for grants) and that the normal consequence of a positive evaluation relative to other units should be an increase in the share of future resources. **To avoid shocks to the system the proportion of resources allocated via such assessments should in the first round of evaluation be partial.** The proportion may be progressively increased as the system learns how to operate in an assessment culture.

5. **European Structural and Investment Funds**, following evaluation procedures aligned with best practices, could be a way to: a) **allow less favoured players to build capacities and redress concentration of competitive funds** and b) **to improve the balance between cohesion and excellence**. Structural funds should be linked to smart specialisation strategies but also recognise that these need to be underpinned by broader research capacity. ERA should be a component of Partnership Agreements.

6. The panel recognises that competitive funding can have implications for minority and disadvantaged groups. **As such we recommend that the normal practice of peer review should give weight to individual circumstances such that judgements of track record in particular take full account of career breaks, illness and disability.** Furthermore it should be the norm that statistics on gender are published at the end of each call.

**Peer review**

7. A major constraint upon the improvement of peer review and its subsequent use in competitive allocation of funds is the identification of qualified experts. As stated in the Academia Europaea (AE) response to the ERA green paper\(^\text{16}\) “Excellence can only be guaranteed if advice and assessment comes from recognized authorities”. **We, therefore, recommend that the Commission works with Science Europe, Academia Europaea, European Science Foundation and other Research Funding Organisations to develop a European College of Peer Reviewers.** As well as detailing the expertise and other capabilities (e.g. knowledge of languages, experience of particular national research systems) the College should also be constructed such that **active membership is regarded as an esteem factor and given weight in circumstances such as applications for European or national funding.**

8. It should also be recognised that international peer review can be costly. While electronic review can replace the bulk of travel requirements there remains a core requirement for experts to meet which may be a barrier for some countries. **The possibility of a fund to encourage internationalisation of peer review by contributing to the cost should be explored.** This should address both travel and honoraria.

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**Priority 2a** Optimal transnational co-operation and competition: Jointly addressing grand challenges

1. Identification of priorities

1.1 Framework

The work of the expert group presented here focuses on joint programming, that is the *creation and implementation of joint programmes* (in this case between Member States or between RFOs in different Member States). The definition of the joint programme (not to be confused with Joint Programming Initiatives, JPI) is taken from Lepori et al.\(^{17}\), where a joint programme is a public research funding program in which at least one of the following processes is shared between more than one country:

- An explicit goal and mission statement;
- The identification of scientific priorities and of the type and mode of research supported;
- Procedures and rules for submitting proposals, as well as for their evaluation and selection;
- Procedures for contract management, including follow-up and reporting.

Three types of joint programme are identified. They differ according to the ways in which they deal with internationalisation, namely integration, coordination and cooperation.

The typology is based on the analysis of 11 European countries (Czech Republic, Denmark, France, Germany, Italy, Netherlands, Norway, Poland, Switzerland, Spain and the United Kingdom), covering about 85% of the total ERA public research funding. 97 programmes were identified, covering a range of initiatives.

1.2 Rationale

Joint programming, in the broad definition used in this report, has a range of benefits which, however, are not yet fully perceived as having been realised to outweigh the additional transaction costs. The benefits are fourfold:

First, there is an inherently scientific rationale for enabling international collaboration. Joint programmes:

- *Enable complementarities* and thus research that would not be feasible in a smaller space. Knowledge production is increasingly specialised and there is a growing need to offer opportunities for researchers to link their specialised skills. This is more important even when research is directed towards grand challenges, adding the need for speed and for working in a most effective way towards the challenges and enabling more heterogeneous collaboration (targeted science-industry collaboration);

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17 Benedetto Lepori, Emanuela Reale, Edwige Chassagneau, Liv Langfeldt, Philippe Larédo, Maria Nedeva, Emilia Primeri, Duncan Thomas, Institutional logics and actor’s strategies in European joint programs
Potentially to *increase quality* in two ways, through increased *collaboration* and increased *competition*. Various studies have demonstrated that international collaboration enhances excellence. On average, international co-publications have a higher citation impact than national co-publications or single authored papers\(^{18}\). There are limits to productivity gains which can be achieved through international collaboration, especially if it becomes a goal in itself, a response to funding requirements, or is used as an indicator of excellence\(^{19}\). The mission is thus not maximizing international collaboration, but optimizing the opportunity structure for appropriate collaboration to achieve scientific (and societal) goals. Further, more competition between different researchers and teams is increased in joint programmes, as the space for application to calls is enlarged and peer review is pooled over a larger area, increasing the pool of high quality reviewers.

Second, joint programming offers a range of benefits in terms of *efficiency* and *management*. This includes the build-up and use of shared data and infrastructure which optimises the return on investment and the efficient use of peer review expertise across countries. Joint programmes also can lead to a more efficient use of research budgets, as results relevant for selected challenges are shared and duplication of effort already done elsewhere is minimised. Joint effort can, over time, reduce the bureaucracy of international cooperation (when national and international calls and procedures are harmonised) and contribute to cross-border learning and transfer of good practice in defining and implementing programmes.

Third, joint programmes potentially increase the *attractiveness* of Europe, and its participating funding agencies and ministries, as partners for non-European programmes, thereby enhancing the logic of targeted collaboration around challenges to a truly global scale.

Finally, joint programming has a *science policy and an overall policy benefit*, as it helps to coordinate science policy with other policies of European importance and supports the identification and definition of grand challenges\(^{20}\), in an interplay of bottom up and top down dynamics.

The existing evidence on the impact of joint programming as reported in the JO REP project\(^{21}\) shows that the initiatives deliver on increased collaboration, but are less successful in creating science-

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industry linkages or reducing bureaucracy. The latter is important, as the distinctive feature of joint programmes in the perspective of researchers and funders is that the “integration of the submission procedures, selection and evaluation criteria that is considered a critical issue of joint and open programmes to make them different from other national schemes”\textsuperscript{22}.

There is no hard, quantitative evidence as yet as regards the net benefits of joint programmes. In the future, monitoring and evaluation procedures should be set up to analyse and compare the quality of output, the scope and nature of collaboration (as compared to FP 7, for example) and the level of efficiency gains in the implementation of programmes.

1.2 Selected Priorities

The ERA Communication invites Member States to:

1) Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas and that common ex post evaluation is conducted

2) Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions

3) Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant.

2. Main steps and actions to implement identified priorities

2.1 Step up efforts to implement joint research agendas

2.1.1 Sharing information between Member States about activities in priority areas

Sharing of information about activities between countries will support mutual learning and open possibilities for further streamlining of activities. The following is proposed to contribute to information sharing:

- Transnational activities of member states were so far included in ERAWATCH. At the time of the preparation of this report, the Research and Innovation Observatory, which is to replace ERAWATCH, is being prepared. According to the available information, it will not offer possibilities for focused exchange of the Member State information regarding cross-border activities. Instead, the information should be included in the ERA Monitoring Mechanism (EMM)\textsuperscript{23}. If not covered in the sufficient detail, the topic could be further elaborated by NETWATCH, the European Commission's information platform on transnational R&D programme collaboration. The information provided by the two information platforms, could be further discussed by the High Level Group on Joint Programming Initiatives (GPC).

\textsuperscript{22} ibid., p. 100

\textsuperscript{23} At the time of the finalisation of the report, EMM is not yet available.
Where a challenge is addressed by a Joint Programming Initiative (JPI), this platform should be used for the exchange of information related to Member State activities in the specific topic as is done for example in the SETIS platform for the SET plan\(^\text{24}\). The platform would also offer the possibility of stock taking by Member States before opting for a new national programme in addition to exploring the potential for joint activities. The Commission has already been supporting these platforms through Coordination and Support Actions. Where the challenge is addressed by the Innovation Partnership (IP), JPI representatives should contribute to the platform in order to enable better alignment of European, as well as national initiatives.

2.1.2 Ensuring that in selected areas national funding is strategically aligned at European level

A prerequisite for the strategic alignment of the initiatives running at Member State level is a good exchange of information. The channels proposed under 2.1.1. are EMM, GPC, JPI and, where relevant, IP.

Within FP7, a number of strategic research agendas have been created within the ERA-NET scheme. It is proposed that JPI assume the role of an umbrella organisation, enhancing cooperation and further alignment of public to public-public initiatives on European, national and regional level.

Despite numerous existing strategic research agendas, stimulation of the formation of few additional joint strategic research agendas would contribute to the alignment of national agendas on EU level in certain areas. Research performing organisations could be more strongly mobilised to join up their strategies. Also, owners of bilateral programmes with 3rd countries may be incentivised to align their programmes (e.g. the CSA call on transatlantic cooperation). In the absence of the ERA-NET instruments in the Horizon, the activities may be carried out as a CSA.

2.1.3 Step up efforts to implement joint research agendas

A number of joint research agendas have been created in the past, but are only slowly being implemented or not at all. Also, funds allocated to the activities are increasing only slowly. The following activities may step up their implementation:

*Clarification of roles and harmonisation of processes and procedures, including synchronisation of rules and tools.* Despite significant progress in the recent years, brought about particularly by the strong involvement of the key stakeholders in the development of ERA Learn platform (and ERA toolbox in particular) and Guidelines for Framework Conditions of the GPC, national procedures, budgetary cycles, rules and sometimes regulations are still largely unsynchronised. This imposes high transaction costs on the RFO as well as additional work on researchers that apply to the calls. It also results in long and sometimes problematic procedures. In addition to decreasing the administration costs, synchronisation of the rules and procedures by the research funding organisation would catalyse the opening of the existing national programmes. It is proposed that the Commission continues to support

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\(^\text{24}\) Strategic Energy Technology Plan @ [http://setis.ec.europa.eu/](http://setis.ec.europa.eu/)
the development and the implementation of Guidelines for Framework Conditions of the GPC and ERA Learn through CSA.

Joint calls with a synchronised date and a joint peer review are expected to increase the level of cooperation between the RFO, increase the quality of peer review, reduce the costs and increase the competition between the actors. Harmonising rules and synchronising calls would lead to the increased use of the lead agency principle and thus opening of the national programmes to transnational cooperation (a trial CSA running).

A synchronised call could also be applied to some larger initiatives funded by structural funds, which in many convergent regions represent the largest source of competitive RD funding. While these funds may be used for funding of national contributions in JPI calls (as long as they are not based on the Commission’s instrument), most of the funding will likely be allocated at regional levels. One important instrument that is often implemented at regional level is that of competence centres, a multi-annual structural collaboration between Universities, research organisations and firms. Those “industry led competence centres” with an average funding of € 1-3m per initiative per year, are a good example of largely regionally based instruments that could be coordinated across Europe. They are longer in duration than traditional R&D projects, they involve more partners and they contribute to a structural change in the way organisations cooperate. The use of the instrument in regions is likely to increase in the next funding period due to the smart specialisation strategy and the introduction of the Regional Innovation Scheme by the European Institute of Technology, for which this instrument is particularly well suited. Coordinated calls would enable a more effective and efficient configuration of those centres, whereby a regional core of a centre would open up to broader international participation. Support for preparation of a call can be given via a CSA, while the centres would be funded using structural funds and would contribute to increased synergies between Horizon 2020 and Cohesion policy, which is a recurring topic in the EU policy arena. While there is ample funding available within structural funds for organisation of a synchronised call, it has not been implemented as yet and there are no indications that it will be organized in the future. Rather, a CSA, which is straightforward and familiar to the funding agencies, while involving a contract with the Commission, is likely to be better suited for the purpose.

In the areas where Strategic Research Agendas (SRA) have already been developed (SET plan, agricultural sector, etc.), their implementation may be stepped up by aligning the efforts of the research performing organisations (RPO), which are the recipients of non-competitive, institutional funding. A review of the non-university RPOs demonstrated that basic institutional funding amounted

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25 Slovenian Statistical Office reported that the government budget appropriations (including structural funds, SF) in 2011 was 0.75% GDP, of which 26% (71 mio EUR) were structural funds (http://www.stat.si/novica_prikazi.aspx?id=5011). Since SF are awarded exclusively on competitive basis in SI, they constitute a larger share of competitive funding than national funds.
28 Public research performing higher education institutions (universities) as well as non-university Public Research Performing Organisations
to more than half of the Government Intramural Expenditure on R&D (GOVERD)\textsuperscript{29}. The pilot ERA NET + (IMERANET+) is considered a good example of how to align institutional funding in a specific area. Strategic priorities have also been developed on macro-regional level, which could lead to better aligning of RPOs activities. Good examples are six recently established scientific clusters of RPO organisations within the Danube region (water; land & soil; bio-energy; air; data exchange & harmonisation; and smart specialisation).\textsuperscript{30} Their coordination efforts could be stepped-up using an instrument offered by the Commission (e.g. CSA), while structural/national funds would be the main source of the implementation of the activities.

As emphasized by the European Research Area Committee High Level Group for Joint Programming – (GPC), it is important to keep in mind that in addition to their contribution to the alignment of the national RD funding programmes, JPIs may contribute also to the smart specialization, research networks, common talent programmes, co-ordinated and structural exchange of researchers, research managers and civil servants, pooling capacities, common use of infrastructure, common use of highly specific and scarce expertise and/or joint forward looking activities.\textsuperscript{31} Structural funds may contribute to the implementation of the activities, other than joint R&D carried out as an ERA-NET or Article 185.

2.1.4 Improving the appeal of joint programming

In addition to ample argumentation in favour of addressing challenges jointly, presented under 1.2, these activities also have strong political commitment from The Council of the European Union. However, despite this, insufficient commitment to transnational coordinated research is observed amongst Member States.\textsuperscript{32} The following actions could address this:

- **Alignment of national programmes with transnational Strategic Research Agendas.** The topic is addressed under 2.1.2.
- **Synchronization of rules and procedures** would reduce the transaction costs of RPOs involved in joint programming, lowering the entry barriers for participation. However, while this would contribute to their increased participation in various transnational initiatives, in itself it would not necessarily lead to an increased level of funding of each of the initiatives.
- **In order to broaden the appeal of joint programming and its accountability,** more quantitative data on the societal impact/benefits of addressing challenges jointly is needed. In addition, a better communication strategy on the efficiency and effectiveness benefits of transnational cooperation could contribute to a broader buy-in from the academic community, national policymakers and politicians and the affected stakeholders at large. This is addressed under 2.1.5.
- **The use of ERA-NET and, where appropriate, Article 185 initiatives,** should be more strongly promoted. In the implementation of joint research agendas, RFOs often resort to instruments provided by the Commission, which offer complementary top-up funding to the national efforts. It had been demonstrated that the top-up in particular stimulates Member States and RFOs to opt

\textsuperscript{29} European Commission (2009), "Non University Research Performing Organisations: who are they? What are their challenges in ERA?" (2009).


for the joint implementation of a programme and at the same time, increase their financial contribution.

2.1.5 Common ex post evaluation of all joint funding activities

Ex-post evaluation involving an assessment of relevance, effectiveness and impact of a programme or a project after its completion is important in order to identify results and impacts, and to draw conclusions relevant to other initiatives. In addition, joint ex-post evaluations would contribute to the cost effectiveness and higher quality of the evaluations undertaken and would add another dimension of learning to improve the effectiveness of joint programming. Despite the benefits, ex post evaluations of joint funding activities have so far received a limited attention. Since ex-post evaluation is only meaningful a couple of years after a project has finished, its application to ERA-NET projects was so far limited. Also, a recent Joint Programming Conference Report emphasized that blurred expectations, different levels of maturity in evaluation cultures and the complexity of the matter itself have so far hindered the process of measuring JPIs on their impact and benefits.\(^{33}\)

It is proposed that the Commission supports the development and the implementation of the methodology for the ex post impact evaluation of joint transnational RD activities, which would include many different benefits and typologies of the transnational projects, with a dedicated Coordination and Support Action (CSA).

2.2. Improve national peer-review systems and ensure mutual recognition of evaluations that conform to international peer-review standards

Mutual recognition of evaluations would simplify the development of joint programming and lower the overall costs of implementation. However, the pre-requisite for mutual recognition is the trust of all countries involved that the peer review process in all countries meets the international standards of good peer review. We would thus expect a re-enforcing dynamic between mutual recognition, the overall improvement of peer review across Europe and an increase in joint programming initiatives.

So far, no obstacles at the Member State level can be identified in the available documentation.\(^ {34}\) The obstacles were informally reported by some RFO and a question relating to the issue was subsequently included in the ERA Survey 2012. In fact, Member States have a long tradition of participation in ERA-NETS, EUREKA and lead agency approaches, which drive us to believe that only minor obstacles to mutual recognition exist in Member State.

In the opinion of the expert group, the major obstacle in mutual recognition of evaluations is the lack of trust in the quality of evaluations across Europe. This report thus recommends supporting Member States in their efforts to improve quality and comparability of their peer review systems and to lift it to international standards. This could be done through the exchange of supporting information and good practices.


practice beyond what already has happened through the experience in ERA NET and other co-funded activities and a formal commitment of all funders across Europe to explicit common standards for evaluation and peer review that could be formulated following a process already elaborated by the ESF/EUROHORCs (e.g. European Peer Review Guide\textsuperscript{35}). The use of high quality international peers, e.g. from The European Peer Review College, would further contribute to the quality of the evaluations, also by reducing obstacles and criticisms concerning costs and procedures.

A push towards increased quality of peer review across Europe and subsequently increased level of mutual recognition of evaluations would incentivise the establishment of Lead Agency agreements and thus further contribute to the opening up of the programmes in Europe. The EC could provide such incentives to mutual recognitions of peer-reviews within Lead Agency Agreements e.g. by making the COFUND scheme available to RFO, which could fund mobility in projects with international partners based on the Lead Agency Agreements.

Agreed guidelines on mutual recognition of evaluations and possibly also certification would significantly contribute to mutual recognition of evaluation. Science Europe could produce such Guidelines and possibly provide certification.

2.3. Remove regulatory, financial and language barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant

No legal barriers have been reported in a review on R&R related regulations in Europe.\textsuperscript{44} The following obstacles can be identified in the available literature:

- Insufficient compatibility of national and European rules and procedures was identified as a constraint regarding participation in JPI by Czech Republic and Italy.\textsuperscript{36} Inquires with the national representatives reveal that this most likely refers to the differences in national procedures, budgetary cycles and rules, which results in long procedures and increased efforts on Member State, RFO and researchers. This issue was addressed earlier.

- The commitment to use national languages in the calls for proposals and in the implementation of the projects has been identified as a barrier to opening up of national programmes.\textsuperscript{37} The language regime in international evaluations is also likely to present an obstacle in certain Member States. Although not an easy issue to tackle, by incentivising Lead Agency Agreements discussed earlier, Member States would be motivated to address such obstacles.

3. Assessment of operational feasibility and measurability

The following indicators are proposed by the EC:

1. Assessment of the implementation of joint research agendas addressing grand challenges (Member States)


2. Share of joint research agendas initiatives addressing grand challenges which are subject to common ex-post evaluation (Member States)

3. Share of Public funding allocated to transnational R&D cooperation. (Member States)

4. Share of national GBAORD allocated to transnationally coordinated research based on grand challenges (Member States)

The proposed indicators address all but one priority within section 2.1 – sharing of information about activities in priority areas, where it is mainly the quality, rather than quantity, which needs improvement.

Indicator 1 addresses the issue of joint activities in the area of grand challenges. It is qualitative and is concerned with the actual implementation of joint activities. This is important, as RFOs and ministries still need to learn and exchange good practice in order to be more efficient and effective. This would be supported by indicator 2 which provides information about the way joint research agendas are actually assessed ex post and thus provides the evidence needed to further develop joint programming in the future. This is a new indicator.

Indicators 3 and 4 are quantitative; they indicate the relative importance of joint activities within national funding, in general terms (indicator 3) and as regards grand challenges (indicator 4). Indicator 3 excludes MS contributions to Horizon 2020. Since we lack systematic data on national programme funding, for the time being this is best expressed as % of GBAORD.

In general, high quality monitoring should, if possible, address all the priority actions. They should wherever possible rely on the data already collected by the OECD and Eurostat. Also, it has to be kept in mind that Member States are already burdened with a number of indicators, on which they need to report annually. It is important to keep in mind that GBAORD (for indicators 3 and 4) only relates to appropriations from the national budget, excluding structural funds.

4. Good practice examples

According to the taxonomy presented in the JOREP report, there are several good examples corresponding to different typologies of joint programmes, moving from integrate programmes to collaborative initiatives. The following list tries to exemplify a selection of good practice in various fields, also taking into account the potential development for future initiatives.

Within Integrated Programmes, the well known Top-level Research Initiative (TRI) was launched in 2008 as the largest and most ambitious joint Nordic research and innovation initiative, to be ended in 2013. It involves Denmark, Finland, Iceland, Norway and Sweden and, in some cases, some autonomous Nordic areas (in particular Greenland and Faroe Islands). The TRI focuses on climate, energy and environment issues and aims to develop reliable climate models to predict future climate change, including impacts and societal aspects. The TRI adopts a shared common fund, instead of national budgets and/or European money. It was established by governmental institutions, NordForsk, Nordic Innovation Centre, Nordic Energy Agency. Six sub-programmes, each with its own managerial body and related to the specific thematic priority addressed, imply a more decentralised governance

model. Nevertheless TRI is considered a highly strategic initiative for Nordic countries, meeting national priorities but also international and European ones. It clearly emerges as a political initiative, based on strengthening collaborations among Nordic countries with a relevant added value and not easy to split within national boundaries. This implies a top-down design and could strengthen Nordic teams in relation to European programmes competition, reinforcing cooperation mainly with Eastern Europe.

In the frame of a large international cooperation, and strictly related on the topic, the International Opportunities Fund (IAF) is a joint funding initiative between the Belmont Forum, a high level group of the world’s major and emerging funders of global environmental change research and international science councils, and G8 Heads of Research Councils (G8HORCs) in the areas of Coastal Vulnerability and Freshwater Security. Australia, Brazil, Canada, France, Germany, India, Japan, Russia, South Africa, UK and the US are directly involved but possibilities for collaboration for non-participating countries and developing countries exist as well. The current International Opportunities Fund is aimed at supporting research on topics of global relevance best tackled through a multinational approach, recognising that global challenges need global solutions. Funding should support researchers to cooperate in consortia consisting of partners from at least three of the participating countries and must bring together natural scientists, social scientists and research users (policy makers, regulators, NGOs, communities and industry). Where appropriate, some Partner Organizations could also support capacity building in some developing countries.

Again in the Nordic context, the Nordic Centres of Excellence (NCoE) are established to strengthen cooperation between outstanding researchers, research groups and research institutions within specific priorities in order to add value to research done in the countries. A Nordic Centre of Excellence is an outstanding, creative and efficient multi-site or single-site environment with a joint research agenda; joint management, coordinated researcher training, communication, and research infrastructure collaboration and can include participants from non-Nordic research environments needed to fulfil the goal. NCoE - status and funding - is granted for five years. Special focus is put on the importance of researcher mobility as a means to achieve the goals of the Nordic Centre of Excellence. Therefore, cross-border mobility within and outside the Nordic region is expected of participants, and should be outlined in the proposal. All proposals have to be relevant to the call, of excellent scientific quality, and outline how added value will be created through the cooperation. The evaluation of the research plan includes an evaluation of the feasibility of the proposed budget for the NCoE, including the specification of funding requested from NordForsk.

Social sciences are not neglected in the international cooperation: the current partners in the Open Research Area (ORA) in Europe for social sciences (ANR- France, DFG- Germany, ESRC- UK, NWO – The Netherlands) recently enlarged the participation to the National Science Foundation (NSF) to the 2012-13 round of the scheme, allowing US researchers to collaborate in ORA projects. The scheme will provide funding for integrated projects by researchers coming from at least three of the five participating countries – in any combination of three or more countries. The partner organisations will conduct a co-ordinated peer review and a single common selection process. Funding will be
distributed among the partners according to the place of work of the researchers, and generally according to the funding rules of each individual agency. Within the framework of this call, the disciplinary coverage may vary according to the involvement of the national agencies. Proposals may be submitted in any area of the social sciences.

In the long list of ERA NET projects, CONCERT-Japan (www.concertjapan.eu) represents a good example of a bottom-up coordination between European countries and Japan, and managed by the Turkish Research Council (Tubitak), with a view to further expanding and harmonizing already existing cooperation between them. After positive results of the Pilot Joint Call for research proposals which includes funding institutions from several European Countries and Regions and Japan in the two thematic areas of “Efficient Energy Storage and Distribution” and “Resilience against Disasters” the aims of the CONCERT-Japan project, and funding organizations behind, are to ensure the sustainability of the joint activities and to look into the future to elaborate on possible further schemes and themes of sustained collaboration.

5. Recommendations
The following steps are recommended:

1. Existing platforms for sharing of information of initiatives on national level should be used much more broadly. They involve ERA Monitoring Mechanism and/or NETWATCH, High Level Group on Joint Programming, Joint Programming Initiatives and, where applicable, Innovation Partnerships (through the involvement of JPIs)

2. Alignment of activities of research performing organisations should be supported, mobilising the in-kind contribution of RFOs and building on good practice lessons from successful ERA NET schemes (such as IMERA+). In addition to IMERA+, suitable areas are those with an elaborated Strategic Research Agenda, such as developed in the European Strategic Energy Technology Plan (SET PLAN) and existing JPIs. SRA developments could be supported through EU-funded Coordination and Support Actions.

3. Cross-border cooperation at macro-regional level should be supported with Coordination and Support Actions (CSA) and national or regional funding. The examples show that cross border cooperation is particularly successful on macro-regional level, due to higher trust among similar Member States. Creation of SRA in the case of certain initiatives on macro-regional level could be promoted within the framework of CSA and implemented with national/regional funding. This would also contribute to synergies among EU funds.

4. Despite significant progress in recent years, brought about particularly by the strong involvement of the key stakeholders in the development of ERA Learn platform (ERA toolbox in particular), national procedures, budgetary cycles, rules and sometimes regulations should be further synchronised and harmonised. This will reduce transaction costs and delays in the implementation of the projects/programmes. Synchronised calls are an effective initiative, which will lead to increased harmonisation of the operations of research funding organisations. They
could be extended to other areas, such as e.g. calls for future competence centres, to be funded with European Structural and Investment Funds.

5. Despite a strong political commitment to JPI and convincing arguments in favour of addressing challenges jointly, more quantitative data on the benefits and impacts of addressing the challenges jointly is needed. Joint ex-post evaluation would contribute to this (see Recommendation 6).

6. Joint ex post evaluation should follow joint calls within the frame of JPI, ERA-NETs, Article 185, synchronised calls and other future joint programming initiatives. It is proposed that the Commission supports the development of the methodology for the ex post impact evaluation of joint transnational R&D activities, which would include many different benefits and impacts of the transnational projects, with a dedicated CSA.

7. Lead Agency Agreements are based on mutual recognition of peer-review between the involved RFO. The formation of such agreements could be incentivised by providing top-up mobility funds from, for example, the COFUND instrument.
Priority 2B Optimal Transnational co-operation and competition: Effective investment in and use of Research Infrastructures.

1. Introduction

Research Infrastructures (RIs) are defined in the Commission’s proposal for Horizon 2020 as:

Facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. Where relevant, they may be used beyond research, e.g. for education or public services. They include: major scientific equipment (or sets of instruments); knowledge-based resources such as collections, archives or scientific data; e-infrastructures, such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be single-sited, virtual or distributed.

There are two actions emphasised in the ERA communication 2012 which have relevance for European research infrastructures. These are reproduced below and given short labels for reference within this report:

**Action 1**: Confirm financial commitments for the construction and operation of ESFRI\(^{39}\), global, national and regional research infrastructures (RIs) of pan-European interest, particularly when developing national roadmaps and the next Structural Fund programmes;

**Action 2**: Remove legal and other barriers to cross-border access to RIs.

The subgroup has reviewed information from a variety of sources, including a review of national measures which contribute to the completion of ERA priorities (ERAWATCH 2013), a survey of Member States, briefing information presented at a National Contact Point High-level Training meeting (Rossi 2013), the report of the ESFRI Implementation Group (ESFRI 2012), the ESF project MERIL, the project EuroRIsNet+, established by the National Contact Points of RIs and funded (in its second phase) by DG Connect and a draft report prepared by an Expert Group convened by the OECD Global Science Forum on the formation and operation of international distributed research infrastructures.

The findings of the subgroup and its recommendations are set out below.

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\(^{39}\) ESFRI is an intergovernmental organisation which was formed in 2002 at the behest of the European Council. Its mission is to ‘to support a coherent and strategy-led approach to policy-making on research infrastructures in Europe, and to facilitate multilateral initiatives leading to the better use and development of research infrastructures, at EU and international level’ (http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri)
2. Identification of priorities

Research infrastructures are essential elements of the ERA in terms of the research facilities they offer and the research data and outcomes they generate. Both of the actions identified in the ERA communication are relevant and appropriate. Analysis of the various sources listed above indicates that there are significant problems relating to the construction of national roadmaps and the commitment to funding ESFRI roadmap projects by Member State. Equally, without good access to researchers from across the ERA, the role of RIs as part of the integrating fabric is diminished, leading to suboptimal outcomes in terms of fulfilling the European research potential.

More specifically, and in areas relating to Action 1, the subgroup notes that there are significant variations in national infrastructure roadmaps in terms of their status, the dates when they are prepared, and the cycles for their renewal. More importantly, the existence of a national roadmap may give little information about the financial commitment made by the Member State to the infrastructures so listed. There is clear scope for coordination at the European level in this area. It was also noted that ESFRI project support information, when considered in the roadmaps, is limited and patchy and national roadmaps which include procedures to support ESFRI projects tend to be the exception rather than the rule.

Despite these limitations, the subgroup notes the important role that ESFRI has played in providing strong incentives for Member State to develop a common strategy for pan-European infrastructures. Complementing this work, support by the EC for preparatory phase projects on the ESFRI roadmap and aimed at preparing for the implementation of pan-European infrastructure has proved to be an important catalyst for development.

In areas relating to Action 2, information at country level about cross-border access to national RIs for other Europeans is generally lacking. General guidelines (e.g. on funding conditions, peer review of requests for access, etc.) and/or on regulations surrounding access conditions and qualifications may vary from country to country (e.g. UK emphasises the rule that there is no access for non UK academics except through EU support40). In terms of access, national researchers tend to have priority although, in some cases, bi- or multi-lateral agreements have facilitated international access. Many RIs, however, are nationally and/or locally based. Rules of access to these national or local research infrastructures are often not designed with trans-national access in mind, limiting the potential returns associated to an optimal use of RIs. Support from the EC to trans-national access plays a key role in enhancing cross-border access through initiatives such as the successful I3 projects. While these are well documented in EuroRIsnet, they are generally not mentioned in national roadmaps.

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40 The exact wording in the Annex to the ERAWATCH Facts and Figures Report (2013) is:

‘Access to UK research infrastructures is open to all UK and non-UK nationals who are registered as UK academics; postdoctoral researchers from UK universities; those applying via EU transnational access arrangements; and overseas organisations that have contractual access agreements with the relevant facilities. In addition, applications from overseas (non-EU or without prior contractual access arrangement) are considered.’
Access to RIs can be physical or remote. With the existence of the EC-cofunded high-speed transnational European Research and Education network GEANT and its associated Authorisation and Authentication scheme eduGAIN that interconnects national e-identity systems, remote access is becoming still more common and enables qualified researchers from all European countries to benefit from the facilities located in the physical RIs. Already today several RIs (e.g., the European Southern Observatory in Chile) are accessible remotely, but other instruments are still not accessible this way. The vision of GEANT2020\textsuperscript{41} is to create a joint European Communications Commons which allows access to such facilities for talents even outside the established R&E sector and open up much more also to collaboration with industry.

One important exception is access to RIs which ‘distributed RIs’\textsuperscript{42}. These can be electronic, i.e., e-infrastructures in the form of large databases which provide access via high-speed networks. They may also be traditional physical infrastructures extended through virtual access, which enables new cross-border access. The research information and/or instrumentation that such RIs hold or provide access to does not require physical access and enhanced access can be achieved through the introduction of ‘open access’ policies (see sub-Group report on knowledge circulation). Issues in this area relate to the development of appropriate e-infrastructure, as well as data and facilities sharing agreements. There are examples of access problems which derive also from the fact that certain types of information can be linked back to the identities of living individuals or organisations, particularly in the domains of the humanities, social, economic, and biomedical sciences (notably privacy aspects which may cause such obstacles).

\textbf{3. Main steps and actions to implement identified priorities}

\textbf{3.1 ESFRI and National RI roadmaps}

ESFRI has played and continues to play a key role in creating and promoting a European identity for RIs. By encouraging Member States to develop national roadmaps, by creating and updating a European roadmap, promoting dialogue between countries over funding issues, and encouraging evaluation of the performance of RIs, ESFRI has clearly helped develop a pan-European approach to RI recognition and investment.

National roadmaps present the long-term strategy of national and European RIs in the different domains. As described in OECD Global Science Forum Report on Report on ‘Road-mapping of large research infrastructures’ (2008), there is a wide diversity of roadmaps. In addition, roadmaps tend to be weakly integrated – if at all – with one another and, in some cases, with national research and innovation strategies. While many tend to underline their interest in and support for particular ESFRI

\textsuperscript{41} The report of the GEANT Expert Group “Knowledge without Borders” was published by the EC in 2011

\textsuperscript{42} An Expert Group constituted under the auspices of the OECD Global Science Forum is exploring the special challenges associated with international infrastructures that are distributed geographically, that are often decentralised administratively and financially, and that are usually (but not always) operated on a smaller scale than large single-site research facilities. A report is due shortly.
projects, the status of their commitment is not always clear. This limits the use of roadmaps to a
generic commitment of countries in terms of their research infrastructure plans, but creates a moral
hazard problem and jeopardises European capacity to produce transnational RIs. Additionally, the
relationships between national RI roadmaps and the ESFRI roadmap vary between Member States in
ways which are not always transparent. Some Member State will place RIs on their national roadmap
because they have been positioned on the ESFRI roadmap. Other Member State will develop their
national roadmaps in ways which are essentially independent of the ESFRI roadmap. A total of 21
EU/EAA countries have created roadmaps or have this task in preparation, but despite this
proliferation of roadmaps, little progress has been made in terms of their comparability.

The ESFRI roadmap is constructed in response to scientific demands, reflecting stated needs from the
whole of the scientific community across the ERA. In so doing, it must balance demands from different
disciplines, often with significant differences in the scale and cost of specific RIs. This balance, which
has to be achieved in an equitable manner whilst prioritising research needs, must involve wide
consultation across scientific disciplines and the ERA. However, ESFRI is constituted as a forum – an
organisation which promotes discussion, plans and the exchange of information. It is not empowered
to prioritise the ways in which Member State should support specific RIs, particularly when national
funding is limited.

The political masters of ESFRI, i.e. the national research and innovation ministers gathered in the EU
Competitiveness Council, emphasised recently the need for renewing and adapting the mandate of
ESFRI to address in an adequate manner the existing challenges and to ensure the follow-up of
implementation. This will relate to already on-going ESFRI projects after a comprehensive assessment,
as well as the prioritisation of the projects listed in the ESFRI roadmap. ESFRI has recently presented
a first implementation report in relation to this new task, and has started to work on assessment of
the projects on the ESFRI roadmap.

Funding models for European RIs typically involve ‘variable financial geometry’ –the combination of
national Member State infrastructure funds with Structural Funds, Framework funds, EIB funding,
Innovation Programme Funds etc. – resulting in a wide and complicated range of funding models. The
introduction of the legal status of European Research Infrastructure Consortium (ERIC) appears to be
improving the transparency of this process in that Member State contributions to an ERIC must be
clearly stated. Nonetheless, this complex process could be improved simply by providing more
information to all RIs with pan-European relevance about the variety and applicability of funding
models, ensuring that all Member State and relevant scientific groups are aware of the options
available to them.

43 Council Conclusions on ´A reinforced European Research Area partnership for excellence and growth”, 11 December 2012.
3.2 Commitment to the construction and operation of European RIs
The decision-making process on the funding of the construction of European RIs is as indicated above, a highly complex endeavour, given the high budgets at stake, different budget cycles, the diversity of funding sources and the involvement of national institutions.

However another complication is a lack of information in some countries about the scale and dimension of their commitment to specific ESFRI projects which a country has agreed to construct, participate in and/or operate. Further development of the ESFRI roadmap process could make this information more accessible and easier to contrast. This information would also help emphasise how far the EU is from achieving the target of having 60 per cent of ESFRI projects on previous roadmaps completed or launched by 2015. Greater coordination and clarity on the rules and deadlines for the upgrade of roadmaps will be required in order to solve the current vagueness about national commitments to ESFRI projects.

3.3 Cross-border access to RIs
There is an urgent need to facilitate both physical and remote cross-border access to national RIs as a way to accomplish the objectives of the ERA and to maximize the returns of investment. This would imply the implementation of measures aimed at establishing the mechanisms for a clear and transparent use of RIs, based on peer review where appropriate. These may include:

- The establishment of a series of European guidelines for access to large RIs (a ‘European Charter for RI Access’);
- The inclusion of those guidelines at the national level and within the governance arrangements for each RI of European relevance;
- The establishment of incentives in order to increase pan-European use of RIs and to make this use efficient for all stakeholders involved (which has been proposed in the Horizon 2020 programme which is currently being negotiated);
- The development of legal, financial and technical mechanisms for remote use of RIs;
- A centralised diffusion of information about access to RIs through the development of information portals in order to improve visibility, building on existing experience to date45.

4. Assessment of Operational Feasibility and Measurability
4.1 ERA A1: identification of indicators/measures
4.1.1 Commitment to the ESFRI roadmap
Information on the status of national RI roadmaps is a first indicator to provide information on national RI policy. These roadmaps provide information on the national definition of research infrastructures and on existing and planned (participation in) RIs at national and European level by the country concerned. The ERA Communication asks for more information than is available in national

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45 E.g. MERIL (Mapping of the European Research Infrastructure Landscape) see http://www.esf.org/serving-science/ec-contracts-coordination/meril-mapping-of-the-european-research-infrastructure-landscape.html and EuroRIsNet+ (European network of National Contact Points for Research Infrastructures moving forward) see http://www.euroris-net.eu/
roadmaps and invites countries to provide information on their commitment to the ESFRI roadmap. Indicators could be:

- Number of preparatory phase ESFRI projects in which the country is involved, including the list of acronyms
- Number of implementation phase ESFRI projects in which the country is a partner, including the list of acronyms
- Financial commitments to RIs, categorized as ‘approved’, ‘under review’ and ‘possible’ and by date for expected decisions regarding future funding

### 4.1.2 National procedures associated with ESFRI

ESFRI is not an EU institution, but is ‘owned’ by Member States. Further information about the way each country, via its responsible ministry, relates to ESFRI, its committee and working group structures is essential to help cross-border development of pan-European RIs. Also, national mechanisms to consult the scientific community and wider stakeholders related to the national input to ESFRI, including the update of its roadmap, could be made more transparent.

Given the variety and diversity of national roadmaps, there is a need at European level to set a series of guidelines as to what national roadmaps should include. These guidelines could draw on best practice among Member States. A minimum common denominator should include the establishment of clear rules of engagement by the scientific community in the prioritisation and selection of RIs (e.g. as in the case of Finland and the UK). Other elements of these guidelines would be description of RIs by research domain, including both national and European RIs and a table of existing RI support (as done in France), including if possible financial support (as done in Finland).

A relevant indicator could be, for each RI on the national roadmap, a list of consultations held with relevant scientific communities.

### 4.1.3 Measuring/monitoring cross-border access

Suggestions for possible indicators to be provided by Member States include:

- For each RI, whether based in the Member States or not, information on rules for access for researchers (both incoming and outgoing);
- Confirmation that information on access to national RIs – including external access – has been placed in the public domain (e.g. in the national roadmap, on appropriate websites, etc.);
- List of involvement in I3 activities (e.g. Italy shows this in the national roadmap);
- List of national actions designed generally to enhance cross-border access of scientific researchers.

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46 There may be links between ESFRI with other working structures in the ERA domain, which exist for the coordination of research policies at large (ERAC), electronic infrastructures (e-IRG), human resources (SG HRM), knowledge transfer (ERAC KT WG), joint programming (GPC) and international cooperation (SFIC). The Council has asked not only recently for a renewal of the mandate of ESFRI as indicated above, but also for a review of those ERA related groups including ESFRI by the end of 2014 (Council resolution on the advisory work for the European Research Area, 30 May 2013, see http://register.consilium.europa.eu/pdf/en/10/st10/st10255.en10.pdf.)
5. Good practice examples

Three examples of good practice are included. The first is an example of the way in which a group of local scientific communities and industries across a number of Member States have formed a partnership to provide better research services to all partners than would be available at the national level. This has been achieved through the use of Structural Funds. The second example focusses on national research infrastructure roadmaps, highlighting the useful information that some of these contain about the processes of identification and prioritisation of RIs within the national roadmap. The third example addresses one of the issues raised above in the discussion about access to data via a distributed research infrastructure and the improvements in cross-border access to sensitive data that are being achieved via careful consideration of legal constraints on cross-border data sharing.

5.1 Using structural funds as an element of ‘variable financial geometry’

C-ERIC is a distributed research facility which will operate in the field of advanced materials and biomaterials. It will provide access to nano-level analysis, giving support to a faster alignment of East and West EU Countries in advanced R&D. It will be based mainly on ‘in kind contributions’ by the participating states starting with existing resources, and then integrating and upgrading them in response to international competition in a coordinated way. It will offer free and open access for users at the international level, by quality selection only; a common entry point offering all the available services, for incoming users’ proposals, and a single evaluation system to select them and grant the access to the integrated services; support and logistic services as required. It will also provide joint IPR services as well as industrial, educational, communication and development activities.

The role of the partner facilities of the Consortium will also be to act as a national entry point to outreach different local scientific communities and industries, and to connect with other institutions in the Region, acting also to ensure and increase the local socioeconomic returns of international research connecting the global and local aspects. Partner facilities can be funded using structural funds.

5.2 National roadmaps

Some national roadmaps include much useful information about the processes through which roadmap RIs are identified, and detail the nature of the RIs, their construction costs, and the proposed share of these cost from the Member State concerned. Good examples of such roadmaps include the German roadmap (BMBF 2013) and the UK roadmap (UKRC 2010).

5.3 Improved cross-border access to RIs

A good example of efforts to improve transnational access to and cross-border sharing of social science data held by National Statistical Institutes and Eurostat is the Data without Boundaries. This project supports equal and easy access to official microdata for the European Research Area, within a structured framework where responsibilities and liability are equally shared (see boxed item below).

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See http://www.c-eric.eu/
The Data without Boundaries (www.dwbproject.org) project is designed to support the establishment of a new European data infrastructure for social science (CESSDA-ERIC). It will promote equal and easy access to micro-data for the European Research area which are designated as official statistics, doing so within a structured framework where responsibilities and liability are equally shared. Europe needs a comprehensive and easy-to-access research data infrastructure to be able continuously to produce cutting-edge research and reliable policy evaluations. Among the project’s aims are:

- Improving access to official statistical micro-data – by building a remote access network between existing research data centres;
- Improving resource discovery for official statistics – by ensuring that common standards for metadata are incorporated within official datasets made available for research re-use.

6. Recommendations

6.1 National roadmaps and financial commitments from Member State

1. Greater clarity is needed in the guidelines for the elaboration of national roadmaps. This should involve further technical and administrative support from the Commission, when and where needed;

2. Coordination of access portals by ESFRI would greatly improve information about effective national support for RIs on the ESFRI roadmap. Through its funding of networking activities, the Commission has done much to provide access portals to all national roadmaps. Work done by MERIL48 (initiated by EUROHORCs, ESF, European Commission, ESFRI, European Association of National Research Facilities (ERF), EIROforum, and national Ministries) and EuroRIsNet+49 to provide portals for access to information on RI in the different fields and countries could be continued and improved by providing additional information on the possibilities and conditions for cross-border access and maintaining this information on a regular basis.

3. The financial commitments from Member States for RI construction, renewal and operation are directly linked to the monitoring of progress of the Innovation Union and the ERA partnership. Member States could indicate financial commitments annually in the context of the European Semester (National Reform Programme) and/or dedicated annual national ERA progress reports (especially for Associated Countries);

48 In July 2009 the European Commission issued a Call under FP7 aimed at updating an earlier European Portal on Research Infrastructures’ Services. With the support of key stakeholders, ESF submitted a proposal to the European Commission in December 2009. The MERIL project was subsequently launched in October 2010 for a two-year period with a grant of 800 k€. On 1 January 2013 the Beta Version of the MERIL portal was made publicly available on http://portal.meril.eu.
49 This project relates to the National Contact Points of the RIs. The + indicates that the project is in its second phase. The first was funded by DG research and the second by DG connect. It is coordinated by EKT – the National Documentation Centre for Greece.
4. In the context of ‘variable financial geometry’, the Commission should provide enhanced guidance to countries on the variety of funding mechanisms available to them for RI funding, indicating the appropriateness of certain forms of funding for specific types of RIs and assisting with the potential use of Structural Funds.

6.2 Cross-border access

5. Steps should be taken to promote the development of a ‘European Charter for RI access’. This should include inter alia: eligibility for access by researchers; conditions of access; charging arrangements where and if appropriate; and the responsibilities that access for research purposes place both on researchers seeking to gain access and those who control access.
Priority 3  A more open labour market for researchers.

1. Identification of priorities

1.1 Framework/taxonomy
The European Research Area cannot exist without a European Researcher Area. The following sections address human resources issues. A common understanding of and drive towards a more open labour market for researchers are pre-requisites for implementing the ERA. Greater transparency coupled with an emphasis on merit will ensure that talent and expertise is recognized reducing the waste of expertise associated with all forms of discrimination and ‘closure’.

Introducing genuinely open, transparent, merit and equality-based recruitment and career progression procedures for the research professions may require a change of mindset. This will necessarily take some time. The proposals presented below are designed to expedite and guide this process.

The following operational definitions were adopted in this document:

- **Open recruitment**: a Human Resource Management (HRM) principle implying that entry into and progression within a research system is based on open and transparent processes grounded on merit, in full compliance with the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers. Open recruitment embraces initial entry/access to research systems and progression within them.

- **Career profiles**: as defined in the document “Towards a European Framework for Research Careers”, namely
  - “R1 First Stage Researcher (up to the point of PhD)
  - R2 Recognised Researcher (PhD holders or equivalent who are not yet fully independent)
  - R3 Established Researcher (researchers who have developed a level of independence.)
  - R4 Leading Researcher (researchers leading their research area or field)”

- **Structured doctoral programmes**: those applying the Principles for Innovative Doctoral Training.

- **Transferable skills**: “are skills learned in one context (for example research) that are useful in another (for example future employment whether that is in research, business etc). They enable subject- and research-related skills to be applied and developed effectively. Transferable skills may be acquired through training or through work experience.”

1.2. Rationale
The creation of a single, open and transparent labour market for researchers in Europe is a precondition for the achievement of a European Research Area.

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The economic crisis affecting large areas of the Union has progressively slowed down a process of convergence between the Member States that had previously shown an encouraging trend. 2012 saw a dramatic growth of divergence in the innovation performance among the Member States (The Innovation Union Scoreboard 2013).

**Box 1: Sigma- and beta-convergence**

The overall process of catching up can be shown using two types of convergence commonly used in growth studies: sigma-convergence and beta-convergence.

<table>
<thead>
<tr>
<th>Year</th>
<th>Sigma-convergence</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>0.360</td>
</tr>
<tr>
<td>2009</td>
<td>0.355</td>
</tr>
<tr>
<td>2010</td>
<td>0.345</td>
</tr>
<tr>
<td>2011</td>
<td>0.335</td>
</tr>
<tr>
<td>2012</td>
<td>0.325</td>
</tr>
</tbody>
</table>

Sigma-convergence occurs when the spread in innovation performance across a group of economies falls over time. This spread in convergence is measured by the ratio of the standard deviation and the average performance of all EU27 Member States. As shown in the graph, this spread has been reduced up until last year confirming sigma-convergence but the rate of convergence has been slowing down and has even reversed into divergence in 2012: differences in countries’ innovation performance have started to increase.

**Why systematically open recruitment and career progression?**

In the environment described above, a co-ordinated effort by all Member State to adopt systematically open and merit-based recruitment and career progression becomes all the more important, to create the conditions for more balanced growth across Europe, extending the spread of excellence whilst contributing to gender equality (cf. Priority 4) and equal opportunities in general. Where the allocation of research income within national systems is based on aggregates of individual performance improved open recruitment will have multiplier benefits for the research system.

Open and merit-based recruitment ensures that research systems are able to select from the widest possible pool of talents. A co-ordinated effort by all Member State to adopt merit-based and transparent procedures for recruitment AND for career progression may effectively counteract a growing evidence of concentration of the best talents in a few ‘oases’ and an ensuing ‘desertification’ in research landscapes of large European areas, which promises to waste talent, to reduce opportunities for innovation and to hamper any advancement toward an authentic ERA.

**Why Innovative Doctoral Training?**

The number of researcher full time equivalents in Europe, as a share of the labour force, is more than 50% lower than in the US and even less than in Japan. This difference is mainly due to a much lower share of researchers in the business sector: 46% of total researchers in the EU against 68% in Japan and 79% in US. Despite this, in several Member States researchers (especially early career stage) are facing long periods of unemployment, underemployment and insecurity.

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This apparent paradox may be interpreted as the result of a mismatch between the demand for research by society and the supply of researchers from higher education institutions. Reducing this mismatch demands capacity building involving improved training and skills of first stage researchers (R1). Thus, an agreed set of Principles for Innovative Doctoral Training has been developed and needs to be implemented across Europe to improve the employment prospects of R1 researchers and to accelerate the achievement of the ERA by a common understanding of doctoral training programmes, which could be substantiated by a ‘graduated in Europe’ brand.

1.3. Selected priorities
The sub-group focused on two linked priorities:

i) Create an enabling framework for the implementation of a Human Resources Strategy for Researchers incorporating the Charter and Code, with an emphasis on the removal of legal and other barriers to the application of an open, transparent and merit based recruitment and career progression.

ii) Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.

1.4. Interdependence
The two selected priorities are interconnected, as the Human Resources Strategy for Researchers applies equally to the recruitment, training and working conditions of doctoral candidates.

2. Main steps and actions to implement priorities

2.1. Clarifications
For the purposes of the ERA Communication, the concern with access to the research system commences at doctoral level (R1). Given the time delimited nature of a doctorate and moves to increase the element of structured doctoral training (according to the ‘Bologna Process’, a doctorate is conceived as the ultimate stage of higher education, or ‘training for research through research’), it may be appropriate to create fixed-term positions at this career stage. However, in keeping with the Charter and Code, the fixed-term quality of such positions should not imply inferior employment rights. This is enshrined in EU Law: the ‘non-discrimination principle’ embodied in the Directive on Fixed Term Work aims at improving the ‘quality’ of all fixed-term positions.

The Expert Group regards the doctorate as a research position, notwithstanding the acknowledged diversity in the quality and characteristics of doctoral positions across Europe. Given the critical importance of the doctorate in terms of accessing a research career, it should be subject to the same

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59 For a short report on accessing a doctorate in the UK see Ackers and Coey, 2013 EUA ‘Doctoral Bulletin’
Human Resources Management principles as other (more senior) positions. Given the critical importance of the doctorate in terms of accessing a research career, it should be subject to the same Human Resources Management principles as other (more senior) positions. It should also have the same e-identity authorizations as more senior positions, ensuring that an early career researcher can access the same digital library resources, research databases and other e-infrastructure facilities as the more senior researcher.

Career progression typically involves ‘moves’ between employing organisations, either within a country or internationally. Many doctoral programs presuppose a guest semester at another university. Here it is also important that all European universities cooperate via their national e-identity federation in a global scheme that automatically ensures the young researcher access to the relevant facilities at the host institution.

The open recruitment principle should apply across the board (a priori), subject to known and objectively justified derogations. The most important derogation, from the perspective of EU law, concerns nationality. EU employment law ensures an open labour market for all citizens of the European Union (Articles 20, 21 and 45 TFEU). These measures are designed to prevent discrimination on grounds of nationality and give EU nationals privileged employment rights over and above those of non-EU nationals. This is subject to some modification by the Scientific Visa Package for Third Country Nationals.

Career progression typically involves ‘moves’ between employing organisations, either within a country or internationally. The principles of open recruitment apply to all positions whatever the level and whether or not the ‘move’ takes place between organisations or within an organisation (such as a university or a company, for example). Derogations for certain forms of internal progression and promotion must be objectively justified and applied in a transparent fashion. ‘Re-deployment’ measures, used e.g. in the UK, to offer greater security to researchers on fixed-term contracts, who are in effect moving between funded projects and streams of work, rather than between jobs, are an example of a derogation in the UK.

In other contexts, derogation from the principle of strict procedural equality may be justified to support positive action, e.g. in the pursuit of substantive gender equality or the respect of the rights of equal opportunity for any under-represented group.

Adherence to full transparency ensures that such derogations can be objectively justified within open recruitment principles.

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60 We are aware that significant diversity exists between Member States and RPOs in terms of Human Resource Management (HRM) capacity. Where HR departments exist these are expected to play a major role as intermediaries responsible for policy implementation. Where they do not exist it is important that RPOs identify HRM within the role specification of one of the organisation’s senior staff.

61 ec.europa.eu/euraxess/index.cfm/services/scientificVisa

Careful attention must be paid to identifying and eliminating forces within research systems that distort the open recruitment principles, generating forms of ‘closure’ and internal labour markets. Subtle or covert forms of discrimination and closure should be mapped and avoided. A requirement for someone to attend an interview in person may, for example, constitute a form of indirect discrimination restricting the ability of applicants from abroad and/or with more limited access to resources to apply. Smart and wise use of ICT can effectively safeguard these aspects. The often invoked cost-and-time problems related to the inclusion of international panel members can be solved again by making proper use of ICT tools.

Notwithstanding the importance of language competency to effective working, it is important that language does not become a form of covert discrimination in the job application process. Equally, language should not be used as an excuse to resist the involvement of international reviewers in peer review processes.

The Charter and Code clearly state that all attempts should be made to ensure optimal awareness of and familiarity with opportunities to access research systems.

The growing use of the EURAXESS Jobs Portal to advertise positions in research performing organisations across the EU represents a substantial step forward. However, adherence to the principles of open recruitment extends far beyond the right to know about and apply for positions.

2.2. Caveats

Achieving excellence is a relational process; it defies simple, mechanical metrics. Relationships are critical to the creation of knowledge and innovation. Recognition of this has led to the emergence of often implicit ‘process’ indicators. These play a very influential role in recruitment and progression decision-making. The association of international mobility with excellence is a case in point. Evidence of social capital or ‘know-who’ often influences decisions irrespective of any association with individual’s potential/performance. Networking in itself risks becoming a metric. This may manifest itself in the citation of references from prestigious individuals or institutions creating a ‘reputation-by-association’. Mobility capital (where you go) and social capital (who you know) are processes and should not be used as proxy indicators for performance/potential, especially, as they may discriminate women (cf. Priority 4, chapter 1.4).

The peer review process, critical to decision-making of appointments panels, grant-awarding committees and editorial boards may inherit this implicit approach capturing process rather than research outcomes. It is essential that all of the components of research systems recognise these risks and work to generate mechanisms to ensure objective and performance- & potential-oriented decision-making.

‘Small’ research systems (either at national or discipline/field level) may need to cast a wider net, beyond the academy or national boundaries, in order to ensure independence and objectivity.

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2.3. Measures and actions
In the following paragraphs, two ‘evaluation frameworks’ are proposed for i) open recruitment and ii) doctoral training, respectively, which require a full-scale monitoring/assessment exercise and result in some kind of reward (or absence of reward, in case of underperformance).

The Expert Group proposes that these assessment/evaluation exercises do not represent ‘new’ separate initiatives for these two areas, but rather should be incorporated, for the relevant parts, into a future certification exercise of the Human Resources Strategies at work in European research performing/funding organisations.

Bearing in mind that ‘one size does not fit all’ and the importance of respecting the proportionality principle, in the context of significant cultural, social, economic diversity, the Expert Group proposes a flexible approach to monitoring and evaluation. Rather than propose an evaluation framework characterised by a rigid matrix based on quantitative indicators, the Expert Group advocates a more nuanced approach respecting i) the subsidiarity principle and ii) the relative autonomy of national/regional research systems and of individual research performing/funding organisations.

2.2.1. Promote, support and incentivise open, transparent and merit-based recruitment
The Expert Group proposes a short list of good practice elements to pave the way towards an ‘open recruitment-and-career progression praxis’ within EU research performing organisations (RPO)\textsuperscript{64} and research funding organisations (RFO). The individual elements are kept as general as possible, so that all the research careers’ profiles (from R1 to R4) are concerned, although each element can be modulated according to the relevant profile. Furthermore, each element can be scored on a semi-quantitative scale (from ‘fully compliant’ to ‘not at all compliant’, passing through ‘satisfactorily compliant’ and ‘modestly compliant’), producing, at the end of the monitoring/evaluation process, an overall score applicable both, to individual RPO and to whole national research systems. Two alternative approaches are presented here.

A more cautious approach might involve a pilot phase, with a limited number of RPOs in several Member States (and Associated Countries) volunteering for participation, in order to test effectiveness and identify possible implementation problems and/or unintended consequences.

A more ‘courageous’ and accelerated approach would apply the proposed ‘evaluation framework’ to all RPOs. The outcomes could then be monitored and evaluated over a 3 year period. Publication of the results linked to specific ‘rewards’ to high performing RPOs would help to embed the process.

2.2.1.a. Composition of selection panels. Norms and policies prescribing open, transparent and merit-based recruitment exist in all Member State (including a goal of at least 40% representation of the under-represented gender, cf. Priority 4, chapter 2.3). Nevertheless, the perception of insufficient openness of recruitment persists\textsuperscript{65} and the experiences of researchers seeking entry and progression within the system indicates a marked gap between policy and practice. This can generally be ascribed

\textsuperscript{64} This term is always used in this document as INCLUDING universities
to mind-set related problems within the selection panels, rather than to non-existent or insufficient norms or policies. Implementation and enforcement remains the key challenge.

In that context, the involvement of external, independent panellist(s) promises to produce remarkable results in a relatively short time. The involvement of international members may be of particular benefit to smaller research systems, as seen in several examples traceable in Europe and beyond66.

2.2.1.b. Publication of selection panels. The publication of positions on the EURAXESS Jobs Portal is increasingly practiced (and should be further encouraged) by European research performing organisation. Indeed, it is mandatory in some Member States67.

The Expert Group proposes that the composition of the selection panels is published in the same Portal to facilitate transparent monitoring of the proportion of external/international panel composition and gender balance.

2.2.1.c. Characteristics of the ‘vacancy’ announcement. The time interval from the publication of the ‘vacancy’ announcement and the deadline for potential candidates to apply should be long enough to allow for the widest possible participation. Sixty days is generally adequate. The announcement must include:

   i) the job profile,
   ii) the required skills and competencies,
   iii) the eligibility/exclusion criteria,
   iv) information pertaining to economic, social security, maternity/parental leave and pension rights.

When the vacancy announcement derogates from the general principles of open recruitment, e.g. being reserved to some ‘categories’ or individuals, as in the case of re-deployment procedures, this has to be clearly specified and objectively justified.

Even when full advertisement does not take place, the positions should be advertised on the EURAXESS Portal, for the sake of transparency and awareness. The rationale for the elements of ‘closure’ should explicitly be stated.

2.2.1.d. Feedback information and redress rights. The reasons for success and, most important, failure of the applications have to be unequivocally expressed, specifying whether the decision was unanimous within the panel, and made known to at least all the short-listed applicants, upon request. The undertaking of a redress procedure as well as its results have to be advertised using the same channels as the original call.

2.2.2. Promote, support and incentivise the build-up of structured doctoral programmes/schools based on the Principles for Innovative Doctoral Training

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67 E.g. in Austria and Italy
68 Here the term is used sensu lato. Therefore it includes not only announcement of truly ‘free’ and open permanent or long term positions, but also e.g. doctoral training positions and also positions the application to which is ‘reserved’ to special categories or to individuals with very specific characteristics, see text.
The Expert Group proposes here, on the basis of the *Principles for Innovative Doctoral Training*, a list of elements which may lead to a substantial improvement in the array of skills and competence gained by doctoral candidates, thus reducing the mismatch between the demand for research and the supply of researchers which is currently affecting large areas of Europe. This may ultimately result in better employment opportunities, especially for R1 and R2 researchers in Europe, provided that the pathway to a research and knowledge intensive society is decidedly undertaken by all Member States.

Most of the elements can be scored on a semi-quantitative scale (from ‘fully compliant’ to ‘not at all compliant’, passing through ‘satisfactorily compliant’ and ‘modestly compliant’), producing an overall score applicable both, to individual doctoral programmes/schools, to individual RPO, and to whole national research systems as well.

A pilot could be launched for Doctoral Programmes/Schools volunteering to adopt the full ‘evaluation framework’, which could then be subject to external evaluation over a stated time period. If the exercise provides good results, the framework could serve as a benchmark and the compliant institutions could be entitled to award a ‘*graduated in Europe*’ brand-degree.

2.2.2.a. *Research excellence*, or, better, *Research quality and impact* (as the term excellence has been somewhat overstretched in the past).

The concept of research excellence/quality should be specified clearly to encompass the diverse range of attributes and skills. To implement this principle, standards for admission, supervision and final evaluation of doctoral candidates should be set via a peer review process.

2.2.2.b. *Transferable/professional skills training* should be included within the more general concept of establishing a European Framework for Researchers’ Professional Development. In the particular case of doctoral candidates, the provision of transferable/professional skills is considered a very effective preparation for different kinds of labour markets, thus promoting the necessary matching between demand and supply, which is an urgent need. A structured programme for the provision of transferable professional skills for doctoral candidates should be designed, implemented and evaluated. At the conclusion of the programme, the candidates should receive a certification of the transferable professional skills training as a ‘diploma supplement’.

2.2.2.c. An *attractive institutional environment* is crucial for empowering doctoral candidates to become independent researchers, taking responsibility from an early stage for the scope, direction and progress of their project. A component of the institutional attractiveness is the provision of career development opportunities, in line with the European Charter for Researchers. Obviously, an attractive institutional environment is key to being able to conduct high quality research as well as to being prepared for different labour markets. These institutions will also act as magnets attracting applicants from outside, an indicator which is easily quantifiable.

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69 See, e.g., European Science Foundation Member Organisation Forum ‘European Alliance on Research Career Development’: Research Careers In and Beyond Europe: Enabling – Observing – Guiding and Going Global, Strasbourg 2012

70 including e.g. communication, teamwork, entrepreneurship, project management, intellectual property rights, exposure to potential employment sectors
2.2.2.d. *International networking* and international exposure are specifically important during the R1 and doctoral training phase.\(^{71}\) Thus, this should be a distinctive feature of the doctoral programmes, in view of the fact that international mobility is much easier at this stage, rather than at the R2 to R4 positions. All opportunities to enhance international networking and relationships should be supported taking into account the new concepts of mobility outlined in the ESF policy briefing on ‘New Concepts of Researcher Mobility’\(^{72}\) to ensure that optimal mobility is achieved according to the contextualized needs of the research and the researcher. Virtual mobility should consistently be practiced and cross-border networks of doctoral programmes should be fostered.\(^{73}\)

2.2.2.e. *Interdisciplinary and inter-sectoral research options* together with *exposure to industry and other potential employment sectors* are inherent components of the professional development strategy of doctoral candidates, although resistance and reluctance to considering interdisciplinary as well as inter-sectoral training as an added value are still widespread in the academic community. Doctoral *curricula* should include a strong interdisciplinary component and, where appropriate, engage with non-academic entities. Consideration should also be given to more flexible forms of Doctoral positions encompassing part-time and placement-based options to increase opportunities to gain exposure to other research environments.\(^{74}\)

2.2.2.f. *Focus on results rather than processes.* A dedicated Quality Assurance system of doctoral programmes is indispensable. It should aim at enhancing the quality of the research environment, as well as promoting transparent and accountable procedures for topics such as admission, supervision, awarding the doctorate degree and career development. An integral component of the QA process is an efficient mechanism for tracking researchers’ careers\(^{75}\). The QA system should also assess the outcomes associated with international and inter-sectoral mobility (in terms of independence, openness, knowledge transfer, employability, language skills...).

### 3. Good practice examples

#### 3.1. Open, transparent and merit based recruitment

3.1.a. *Vacancy announcements:* Austria and Italy have developed a legal framework, making the international announcement of vacancies obligatory. Since 2009, Austrian university laws (revision of/amendment to the original 2002 laws, *Bundesgesetzes BGBl. I Nr. 81/2009*) require public research...
institutions to advertise for research positions internationally. In Italy, this obligation has been included into the University Reform Law n. 240/2010. However, in both countries, it is up to autonomous research institutions whether they publish job vacancies in English, systematically establish selection panels, establish clear and transparent rules for the composition of selection panels etc.

3.1.b. Openness and fairness of recruitment procedures: In Poland, an important step in the direction of an open labour market for researchers was taken through the Act on Higher Education (including amendments from 2011), that strengthened the autonomy of universities, introducing independent recruitment processes, but at the same time elaborating general principles, which promote the openness and competitiveness of recruitment. Job offers at the public higher education institutes have to be published online on websites of the university, of the Ministry of Science and Higher Education and on "websites maintained by European Commission – European portal for mobile researchers, dedicated for the publication of job offers for researchers". Recruitment procedures should be based on a formal procedure, adopted by the university in its statute, which is to be issued with the involvement of trade unions. In addition, the Act prohibits employment of relatives as direct subordinates and introduced the requirement of filling all positions in higher education institutions through open competitions.

3.1.c. Career progression of researchers: The Dutch NWO's Talent Scheme Veni – Vidi – Vici has been in place since the year 2000. It offers researchers of different career stages the opportunity to advance their career to the next career stage by means of carrying out independent research projects (Veni: towards R2, Vidi: towards R3, Vici: towards R4). In the case of mobility, the remainder of a Talent grant may be transferred to the new institute upon approval of the funding organisation, which decides on a case-by-case basis. As a general rule, the right to respond to peer review applies to all peer review procedures in NWO, meaning that applicants receive the respective peer review reports and within one week they can provide additional information requested by the reviewers, or refute any misconceptions and differences in the reviewers’ statements.

3.1.d. External/international involvement in selection committees: At least 3 German RPO (Helmholtz, Max Planck and Fraunhofer) have programmes in place to select junior research group leaders and R3/R4 researchers on a competitive basis, with external/international peer review. Some calls are explicitly dedicated to the aim of recruiting more women to top level positions, e.g. the Max Planck Minerva Programme or the Helmholtz Professorships. Fraunhofer provides the Attract Programme, geared to support junior research groups, preferably at the inter-sectorial border. These organisations usually have annual open calls.

3.2. Innovative Doctoral Training

3.2.a. Professional skills development: University College Cork (UCC), Ireland, has developed an array of modules to develop transferable professional skills of doctoral students, from induction to research to career planning, from commercialisation of research to development of communication skills, from scientific writing and publishing to competitions and events where students are challenged to present their work to a non-specialist audience. These initiatives are integrated into structured doctoral training models within UCC’s Graduate School system, which range from highly structured to more
flexible arrangements, where the courses taken are tailored to the individual researcher and project area.

3.2.b. Cross-border collaboration in doctoral education: The French University of Pau and the University of the Basque Country, Spain, have developed an original model of international near-border cooperation representing a way forward in career development of a multicultural and multidisciplinary team of doctoral candidates. Specifically, the 2 Universities organise the ‘Doctorials’: one week residential seminars that help the doctoral candidates to build, during the development of their thesis, a professional project that encourages innovation taking into account the perspective of their cultural, social and economic environment.

3.2.c. Exposure to industry and public private cooperation in research training: An interesting example of getting out of the purely academic perimeter is offered by the consortium constituted by 5 Portuguese Universities (Aveiro, Coimbra, Nova de Lisboa, Porto, Técnica de Lisboa) with the Industrial Association of Refining, Petrochemical and Chemical Companies with the objectives of diversifying the offer of doctoral programmes to the students, diversifying the profile of doctoral degree holders in the working market, involving enterprises on the joint development of doctoral programmes with universities. The research projects are proposed by the companies, the funding is defined on a case-by-case basis (85% by the companies, 15% by the National Science Foundation). For each proposal, 2 universities are associated. Doctoral candidates are selected on the basis of a pre-evaluation of the CV plus individual interview with companies and universities. All selected students are awarded a grant, supported fifty-fifty by the NSF and by the company involved.

3.2.d. Exposure to industry and public private cooperation in research training: A somewhat similar initiative has been recently developed in Italy, the main difference being the financial participation of a Regional Administration. The Region Marche launched the EUREKA Doctoral Programme, in which the SME operating in the regional territory were invited to submit research projects on a defined list of priority subjects, jointly with one of the 4 universities of the Region. A joint committee, involving representatives of the Region, the enterprises’ association and the universities, selected 80 projects to be co-funded (1/3 the Region, 1/3 the company and 1/3 the university involved) in 2012. The programme has been renewed for 2013 and 101 projects have been funded.

3.2.e. Funding of doctoral candidates at national level: In 2010, the UK Economic and Social Research Council (ESRC) established a network of 21 Doctoral Training Centres (DTCs) through which it now delivers all research council (national) studentship funding (UK Research Council Policy for DTCs76). The DTCs cover the full disciplinary range of the social sciences as well as areas of interdisciplinary research and were accredited as ESRC training providers following a competitive peer review process. They have provided evidence of the highest quality in their training provision. Full-time ESRC (research council funded) doctoral candidates are eligible to apply for financial support for overseas institutional visits (OIVs) during the period of the award. This additional funding provides the candidates with the opportunity to go to overseas universities or esteemed research organisations to:

- establish research networks;

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• disseminate early research findings;
• participate in seminars and other academic activities that are directly relevant to your research;
• undertake specialist research training that is not available within the UK.

3.2.f. Learning from good practice in research training: The German Excellence Initiative, especially in its dedicated Graduate Schools Programme, has depicted examples of good practice in doctoral education, based in high profile research institutions. In total, 45 Graduate Schools are currently being funded, with the aim to develop internationally competitive centres of top-level research and scientific excellence in Germany and/or further increase the recognition and prestige of existing ones. These structured doctoral programmes also serve as instrument of quality assurance. They are not limited to doctoral education (R1), but may also include the pre-doc phase as well as R2 qualification; while PIs are usually R3 and R4 level researchers.

4. Recommendations
1. The Expert Group recommends the adoption of two ‘evaluation frameworks’ for i) open recruitment and ii) doctoral training, the elements of which are individually reported in the following recommendations, which could be incorporated into a certification exercise of the Human Resources Strategies at work in European research performing/funding organisations.
2. Selection and evaluation panels (for recruitment and career progression, respectively) should be composed of independent and gender balanced panellists, some of whom are external; the involvement of international members is recommended in particular for smaller research systems.
3. The composition of the selection panels should be published in the EURAXESS Jobs Portal, to facilitate transparent monitoring of the panel composition and gender balance.
4. The time interval from the publication of the ‘vacancy’ announcement and the deadline for potential candidates to apply should allow for the widest possible participation and must include i) the job profile, ii) the required skills and competencies, iii) the eligibility/exclusion criteria, iv) information on economic, social security, maternity/parental leave and pension rights. Even when calls for positions justifiably derogate from the principle of open recruitment, the positions should be advertised on the EURAXESS Portal and the rationale for the elements of ‘closure’ should explicitly be stated.
5. The reasons for success and, most important, failure of the applications should be unequivocally expressed, specifying whether the decision was unanimous within the panel, and made known to at least all the short-listed applicants, upon request. The undertaking of a redress procedure as well as its results should be advertised, where feasible using the same channels as the original call.
6. The concept of research quality and impact as a pre-requisite for successful doctoral training should be specified clearly by research funding and performing institutions, to encompass the diverse range of attributes and skills. To implement this recommendation, standards for admission, supervision and final evaluation of doctoral candidates should involve a peer review process.
7. A structured programme for the provision of transferable/professional skills to doctoral candidates should be designed, implemented and evaluated by research performing organisations. At the conclusion of the programme, the candidates should receive a certification of the transferable professional skills training as a ‘diploma supplement’.

8. The empowerment of doctoral candidates to become independent researchers should actively be pursued by the hosting institutions, by offering them the opportunity to take responsibility from an early stage for the scope, direction and progress of their project.

9. International networking and international exposure should be a distinctive feature of the doctoral programmes; taking into account the new concepts of mobility, virtual mobility should consistently be practiced and cross-border networks of doctoral programmes should be fostered.

10. Doctoral curricula should include a strong interdisciplinary component and, where appropriate, engage with non-academic entities. Examples include business, cultural bodies and public sector organisations.

11. EC should assist Member States in the implementation process by continuing to exert its policy making role and by strengthening its role in monitoring and evaluation through the open method of coordination among other instruments.

12. The financial instruments - Horizon 2020, but also European Structural and Investment Funds (ESIF) - should be used systematically to incentivise the implementation of the ERA principles; where there is evidence of a failure to implement the letter and spirit of these principles, funding should be withdrawn and any future funding made conditional upon effective remedy.

13. A European College of Peer Reviewers should be developed and support provided for additional costs related to the activity of international peer review and a European Research (Career) Observatory should be established.
Priority 4  Gender equality and gender mainstreaming in research

1. Identification of Priorities

The ERA Communication priorities related to gender equality and gender mainstreaming in research include:

1. Create a legal and policy environment and provide incentives to:
   a. Remove legal and other barriers to the recruitment, retention and career progression of female researchers while fully complying with EU law on gender quality
   b. Address gender imbalances in decision making processes
   c. Strengthen the gender dimension in research programmes
2. Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender – charters, performance agreements and awards.
3. Ensure that at least 40% of the under-represented sex participate in recruitment/career progression and in establishing and evaluating research programmes.

1.1 Statistical background

Women’s academic careers remain markedly characterised by strong vertical segregation, with only 20% of grade A academic staff being women. *She Figures 2012* reports that 59% of EU graduate students in 2010 were female, the share of women graduating at PhD level in Europe stands at 46%, but women account for only 33% of researchers in the EU. The glass ceiling index stood at 1.8 in the EU-27 in 2010, pointing towards slow progress since 2004 when the index stood at 1.9 (the higher the score, the thicker the ceiling). In 2010, on average throughout the EU-27, 15.5% of institutions in the Higher Education Sector were headed by women, and just 10% of universities had a female rector. (2013: 6) *She Figures 2012* concludes: “Although the situation appears more favourable for the youngest generations of female academics in a subset of countries, the gender gap is still disproportionately high compared with the increase in the proportion of women students and thus casts doubt on the hypothesis that women will automatically ‘catch up’ to their male counterparts. Proactive policies are thus essential to significantly reduce these gaps.” (2013: 6)

1.2 Rationale

The rationale for addressing the issue of gender equality and gender mainstreaming in research and innovation revolves around the principles of non-discrimination, justice and equality, efficiency and competitiveness, prevention of waste of highly educated women, increasing innovation potential and ensuring the conduct of socially responsible and accountable research and innovation through the integration of sex/gender analysis. The Gender Global Gap 2012 identifies strong correlation between a country’s gender gap and its national competitiveness. “Closing gender gaps is thus not only a matter

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of human rights and equity; it is also one of efficiency.”

Moreover, research shows that teams with more women demonstrate greater collective intelligence compared to teams containing fewer women. Furthermore, integration of the gender dimension creates new ideas and opportunities for innovation. Thus, gender diversity and consideration of the gender dimension in research content has a direct effect on improving scientific quality and social responsibility and robustness of research and innovation.

1.3 Interrelation of priorities
The three priorities are interrelated; action in one may be expected to impact the other two. Political commitment, reflected in balanced representation of women and men in policy steering and a programme for cultural and institutional change (including the integration of the gender dimension in R&I policy design through gender mainstreaming) will have a direct impact at the institutional level.

1.4 Structural discrimination and growing precarity
Globally, the research environment is undergoing important changes. One is the increasing volume of R&I funding distributed on a competitive basis as opposed to institutional or block funding, with the policy goal to steer national research systems, R&I institutions and individual researchers toward increased efficiency and competitiveness. At the individual level, this results in increasing precarity and work-related stress, especially in the early career stages (postdoctoral level). The resulting increase in contract research has a more negative impact on women as a result of career breaks related to parenthood, gender bias in research evaluation, and barriers to women’s integration into social networks in research. Furthermore, research shows that women’s discrimination is structural and follows the logic of accumulation, from slight disadvantages in the early stages into major differentials in career outcomes at the end of the careers. Given the shift toward increasing levels of competitive funding, it becomes particularly crucial to ensure that gender is taken into account in individual assessment, as gender bias in peer review, gender stereotypes, homosocial behaviour, the culture of competitiveness, the impact of parenting and the overall institutional conditions combine to exclude

women from the research profession. Particular attention needs to be paid to the construction of evaluation criteria, especially the gendered impact of career breaks and assessment of international mobility (cf. Priority 3, chapter 2.2).

1.5 Institutional and cultural change: A definition
Institutional and cultural change is a strategy to promote gender equality within Research Performing Organizations (RPOs) and Research Funding Organizations (RFOs), which aims to amend their organizational structures and practices. It spurs RPOs and RFOs to (a) remove cultural and institutional barriers that generate direct and indirect discrimination against women in scientific careers and decision-making; (b) integrate a gender dimension in research content. The strategy entails the use of innovative and systemic approaches such as gender equality plans. Member States can help achieve Institutional Change in RPOs and RFOs by creating conducive legal and political environment and by providing incentives for change (e.g. enact relevant legislation/policies; benchmarking; engage in partnership with funding agencies etc.).

2. Measures and Actions
The situation across Member States is heterogeneous. Different types of government and institutional measures are in place: 1) measures to improve women researchers’ access to research funding at various career stages, 2) activities and instruments to facilitate women’s access to top-level positions and ultimately raise their chances of appointments and promotions to top-level research jobs. Less attention is given by Member States to the integration of the gender dimension in research and innovation content.

The 2008 Benchmarking Report already suggested that innovation success at national level is closely associated with the extent of mainstreaming policies, with innovation leaders and followers usually fully committed to gender mainstreaming, catching-up countries having some degree of implementation, and trailing countries usually with no policies (2008: 36). There is a geographic dimension, as New Member States report fewer and softer actions. In none of the new Member States is there a dedicated policy, action or programme aimed at achieving structural change or to address women’s under-representation in research, decision-making and evaluation bodies. Rather, new Member States appear to recognize barriers related to parenthood and tend to address issues related to work-life balance.

- Supra-national action needed

Research today is a highly internationalized environment with a great degree of mobility. For successful implementation of gender equality policies in the European Research Area, action is needed at supra-national level. This pertains particularly to RFOs and RPOs in developing actions to eliminate gender bias from research evaluation and peer review, build common guidelines for assessing non-

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83 This term covers both public research institutions and universities.
linear careers and “academic age”, types of mobility experience and parenthood provisions, to assess the inclusion of the gender dimension in research and balanced representation in evaluation panels.

2.1 Creating a legal and policy environment
Political will and commitment together with regular monitoring and assessment are crucial prerequisites for successful policy implementation. The 2008 Benchmarking Report and the 2012 Structural Change Report\(^{85}\) indicate that equal treatment legislation is in place in all Member State and that 26 out of 38 countries have gender mainstreaming officially in place; however, gender mainstreaming procedures are in many countries purely formal and gender mainstreaming of R&I policy is rare.\(^{86}\) Sex-disaggregated statistics are, overall, also in place. Collection of sex-disaggregated data and statistical evidence of gender disparities in research, however, do not in themselves warrant action in Member States. Only a few Member States address the issue of gender equality specifically in their research and innovation legislation and policies; the implementation of such legislation is subject to political change.

- Gender research for evidence-based policy design

Over the past decade in particular, research into gender in R&I has produced a wealth of information and findings relevant for policy and institutional change. Where such knowledge does not exist in the system, state administration as well as RPOs and RFOs should commit to regularly collect baseline data and perform state-of-the-art analyses, as a basis for designing national gender equality policy in R&I. Where national gender equality in R&I structures do not exist, Member States should cooperate with external gender experts and research institutions.

2.2 Engagement in partnerships to foster cultural and institutional change
According to the Structural Change Report, vital components of structural and cultural change are: 1) knowing the situation, 2) securing top level support, 3) generating effective management practices (2012: 27-28). Similarly, the 2012 LERU report\(^{87}\) addresses four areas: 1) commitment at the top, 2) fit-for-purpose HR management and implementation measures, 3) conditions to ensure successful implementation and 4) the gender dimension of science. While some RPOs and RFOs do address gender issues, there is a potential for improvement among most, considering the low percentage of women in Grade A and in decision-making positions.

The HE sector has undergone/is undergoing a reform process, often with the goal of increasing HE autonomy while, at the same time, various performance indicators govern distribution of funding through performance contracts (e.g., DE, AT, CH, FI, DK). In some countries ministries demand RPOs to have gender action plans - in practice a prerequisite for funding (NO). Thus, ministries are in a position

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\(^{86}\) There is a study being conducted at the moment, “Review of the Institutional Capacity and Effective Methods, Tools and Good Practices for Mainstreaming Gender Equality within the European Commission, the EU Member States and Croatia”, by Yellow Widow for EIGE. The study addresses two selected policy areas, one of them being Research and Innovation. This study will thus provide further insight into gender mainstreaming in European research and innovation.

to negotiate with RPOs. However, the goal of increasing HE autonomy may be creating new obstacles to fostering gender equality. Systematic ‘cultural and institutional change’ initiatives in the form of national-level policies and programmes are lacking in most countries.

- **Gender in research evaluation**

  There is a growing body of research showing gender bias in peer-review\(^8^8\), which creates obstacles for career progression of women and leads to inefficiencies in the system. The issue of gender bias in evaluation takes two forms: one is related to the systematic undervaluation of women’s work and performance by panel members, the second is related to the accepted indicators of merit related to publication lists, the culture of long working hours, a high degree of international mobility etc. There is a need to address this issue at supra-national level (e.g., EUA, EARTO, LERU, Science Europe and NORDFORSK). RPOs and RFOs need to analyse mechanisms of potential gender bias (composition of panels, gender/age stereotypes, parenthood and academic age, homosocial behaviour etc.) and take concrete measures to eliminate gender bias from research assessment in career promotion and grant evaluation.

- **Defining tailor-made goals**

  Member State should encourage RPOs to carry out institutional gender audits where these do not exist, and building on this, should develop, in consultation with institutional stakeholders, unions and women researchers, tailor-made, measurable goals, including support for leadership development, work-life balance and transparent recruitment/promotion policies.

- **Implementation and monitoring**

  For an efficient implementation of cultural and institutional change, stakeholders need to adopt regular assessment and monitoring mechanisms, including indicators to measure progress, also to be able to compare their situation with other institutions nationally or at the European level.

- **Gender dimension in research**

  Building on work already done\(^8^9\), the integration of a gender dimension in research and innovation where relevant, is of major importance in order to prevent financial, health and social losses due to adverse effects. With or without legislative backing, RFOs should encourage applicants to address the gender dimension in project design and introduce the gender dimension as an evaluation criterion in

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project assessment. In line with the genSET Consensus Report\(^{90}\), Member State should be encouraged to provide gender training to research staff on the integration of the gender dimension in research and PhD training curricula and develop guidelines on integrating gender aspects. Here a supranational approach would be appropriate to pool existing European resources. The presence of experts on gender issues in a particular research field may be advisable as an instrument to properly address the gender dimension in the research content.

### 2.3 Achieving 40 % representation of the under-represented sex in recruitment and evaluation committees

Some Member States have measures in place to ensure balanced representation of men and women in various types of panels and committees. This should particularly apply to bodies responsible for designing public policies in R&I (creating the legal and policy environment) and evaluation committees in RFOs and RPOs. This action is closely related to efforts to eliminate gender bias from evaluation. In line with Recommendation 12 of the genSET Consensus Report\(^{91}\), Member State should be encouraged to develop performance agreements or similar steering instruments which will include the indicator of 40% representation on evaluation and decision-making panels, thus tying funding to gender performance of the organization (cf. Priority 3, chapter 2.2.1).

### 3. Feasibility and measurability

Building on the policy truism that without data there is no visibility, without visibility there is no priority, systematic data collection is a crucial prerequisite for taking action. Furthermore, provision of sex-disaggregated statistics and reporting on measures affecting performance form an integral part of the accountability mechanism of state administration and public institutions.

#### 3.1 Proposed indicators

**3.1.1 Creating a legal and policy environment**

- Share of female PHD graduates, researchers (grade A), senior level and in top research positions (Member States)

Regular, annual collection of sex-disaggregated statistics in the national research and innovation system is a crucial prerequisite for understanding changes in the national and European research landscape. Supporting the recommendation made by the Steering Group on Human Resources and Mobility and the 2012 Gender Summit, *the Expert Group calls for the integration of “Women in Grade A position” as the Gender Indicator in the Innovation Union Scoreboard*. Women in Grade A position has been reported in She Figures since 2003 and is available in Member State.

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• Assessment of the degree of implementation of legal and policy initiatives and incentives related to female researchers' recruitment, retention and career progression, gender imbalances in decision making processes and the gender dimension in research.

To measure progress in the degree of implementation of policy initiatives and incentives, the Expert Group recommends including in research and innovation reporting at Member State level the following:

• A specific, dedicated gender equality in research and innovation policy/strategy/programme (in place YES/NO) with indicators and progress reporting (in place Y/N)

• Gender mainstreaming of research and innovation policies and strategies at national level (in place Y/N)

• Integration of the gender dimension in research evaluation in the main RFOs (in place Y/N)

• National Contact Points or similar responsible body/personnel providing training and advice on the cultural and institutional change (in place Y/N)

3.1.2 Cultural and institutional change

• Share of institutions engaged in putting measures in place to foster cultural and institutional change on gender and related financial commitment if relevant (Member States)

The Expert Group maintains that financial commitment is a crucial indicator of political will to implement cultural and institutional change, and as such should be a self-standing indicator:

• Funding committed to cultural and institutional change as % of total R&I budget

Furthermore, in line with Recommendation 10 and 13 of the genSET Consensus Report the Expert Group deems that specific indicators be developed to monitor situation in RPOs and RFOs to be applicable in Member State in order to be able to monitor and measure progress at institutional level. Such indicators and monitoring may, inter alia, include the following:

• RPOs:
  o Assurance of fair and transparent selection and promotion procedures (cf. Priority 3, chapter 2.2.1)
  o Availability of flexible working arrangements, provisions for work-life balance (in place Y/N)
  o Actions to counteract gender bias in research assessment for promotion (in place Y/N)

• RFOs:

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- Collection and publication of sex-disaggregated statistics (application vs. success rate, composition of management and evaluation panels, share of female PIs, composition of research teams by sex and research career stage)
- Assurance of fair and transparent selection and promotion procedures (cf. Priority 3, chapter 2.2.1)
- Provisions for parenthood / work-life balance in relation to grant implementation (grant interruption, postponement of start date, especially in individual grant schemes) (in place Y/N)
- Integration among evaluation criteria, the gender dimension in research content where relevant (in place Y/N)
- Integration among evaluation criteria, project’s actions for gender equality (in place Y/N)
- Existence of a dedicated programme for gender research (in place Y/N)

**Achieving 40% representation of the under-represented sex in recruitment and evaluation committees**

- Share of under-represented sex participating in committees involved in establishing and evaluating research programmes (stakeholders organisations)
- Share of institutions with rules and practices with regard to the female representation in recruitment, career progression and evaluation of research programmes (stakeholder organisations)
- Share of under-represented sex participating in committees (target: at least 40%) involved in recruitment/career progression (stakeholders organisations)

These statistics are already reported, sometimes on an *ad hoc* basis. Member State must be strongly urged to collect and report sex-disaggregated statistics in leadership and decision-making positions on a regular, annual basis, as part of the national research and innovation statistical reporting.

Member States are in different stages of implementing gender mainstreaming and in different stages of achieving gender equality. If *targets* are to be set, this must be done to reflect the situation in the Member States and be *motivational, rather than prohibitive*.

**4. Good practice examples**

As already the Benchmarking Report (2008) makes clear there is a gap among Member States in terms of the attention paid to addressing gender inequalities in the R&I system. Whereas a majority of examples listed here come from countries with a history of gender equality work, effort has been made to identify new measures and support systems in Member States where the gender equality in research and innovation agenda is only recently garnering policy support.

**4.1 Creating a legal and policy environment**

- The Spanish Law of Science, Technology and Innovation No. 14/2011⁹³ (Ley de la Ciencia, la Tecnología y la Innovación, LCTI) provides for the inclusion of the gender dimension in research

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programmes, adoption of gender action plans by public research bodies within 2 years and 40-60% of under-represented sex in committees involved in recruitment/career progression and in project/program evaluation.

- **HORIZON 2020 ITALIA**[^1] adopted in 2013 contains a section on 4.4 Gender in Science: *Donne nella ricerca*, which contains a call for gender balanced peer-review evaluation teams and implementation of institutional change. The document also calls for integration of the gender dimension and consideration of gender in excellence.

- Based on the 2002 Austrian Universities Act, autonomous universities formulate gender equality targets and strategic measures to fulfil these targets in order to strengthen gender mainstreaming. The Austrian Federal Ministry of Science and Research will, based on the three years’ performance agreement (a public law contract between universities and the Austrian Federal Ministry of Research and Science), monitor the progress of these targets through performance reports every year. The performance reports consist of a series of indicators, which reflect the status quo and the development of gender equality in research. In concrete terms, the gender monitoring indicators consist of the presence of women in different university positions and hierarchy levels; promotion prospects (glass ceiling index); the gender pay gap, gender-related choice of study and the presence of women in recruitment hearings.

- In France the National Assembly is currently debating an amendment to the Act on Research and HE, which imposes annual reports and 40% representation of under-represented sex in all committees. The bill also contained provision for equality officers in RPO.[^2]

### 4.2 Cultural and institutional change

**Research Funding Organizations**

- **Age limits, academic time and parenthood**
  Hungarian[^3], Slovenian[^4] and Czech[^5] national research agencies adopted over the last several years measures to reflect parental breaks in age bars. Age bars are typically introduced in grants for early career researchers (doctoral and postdoctoral grants); the age bar is generally increased by one year per child or extended by the period spent on the parental leave. The Slovenian Research Agency amended its evaluation rules. Evaluation of applicants spans previous five years. This time window can be extended by the time spent on a parental leave.[^6] The Austrian Science Fund has adopted Equal opportunities in research funding - Gender equality standards. One example is the revision of the FWF's application requirements for grants and fellowships, as age limits have been eliminated, parental leave is now recognised in the calculation of a researcher's "academic age".[^7]

[^3]: [http://mta.hu/news_and_views/has-officials-for-researcher-mothers-74811/](http://mta.hu/news_and_views/has-officials-for-researcher-mothers-74811/)
• **Returners’ grants**

Poland has introduced special returners’ grants for parents returning after a career break, to establish their own team and conduct new, original research. The BRIDGE (POMOST)\(^{101}\) programme offers two types of support, one for returning parents and the other for women performing research during pregnancy. Applications may be filed by women with a child up to age 4 as well as by men who have taken leave or interrupted their work in connection with having such a child for an uninterrupted period of at least 6 months.

• **Gender equality policy / standards**

The Austrian Science Fund (FWF) has adopted Equal opportunities in research funding - Gender equality standards, covering proposal evaluation, decision-making structures and gender mainstreaming of programmes.\(^{102}\) The Research Council of Norway\(^{103}\) adopted a 2007-2012 gender equality policy whereby gender perspectives are to be integrated into all research activity funded by the Research Council. The Council seeks to create a framework for increasing the recruitment of women to subjects with a low percentage of women, develop initiatives to boost the proportion of women in tenured academic positions and to integrate the gender perspective in research.

• **Balanced representation in evaluation panels**

The Swedish Research Council\(^{104}\) and the Research Council of Norway\(^{105}\) have a gender equality strategy which includes provisions to ensure balanced representation in evaluation panels (SE) and in all committees, advisory bodies etc. (NO).

• **Gender in research content**

The Research Council of Norway adopted a 2007-2012 strategy\(^{106}\) which contained the requirement that new programmes and initiatives reflect the gender dimension. The gender dimension must also be incorporated into the evaluations.

**Research Performing Organizations**

• **The Swiss Federal Equal Opportunity at Universities Program**\(^{107}\) promotes gender equality at Swiss universities since 2000. For the years 2013-16, the Swiss federal government has dedicated CHF 101


9.8 million for the universities’ gender equality actions. For the years 2013-16 the federal government only provides funding for gender equality actions on the basis of the universities’ individual action plans, which must address the issue of gender equality on a structural level in all key areas of activity: teaching, research and community service.

- In January 2013, the French Rectors’ Conference (CPU) signed the *Charter for Equality between men and women*\(^\text{108}\) with the Minister of Higher Education and the Minister for Women’s Rights. It aims at the equal representation of men and women in all university posts and inclusion of the gender dimension. The Minister announced there would be financial impact if measures contained in contract between the Ministry and an institution fail to be implemented.

- Launched in June 2005, the *UK Athena Swan Charter for Women in Science*\(^\text{109}\) assembles institutions committed to the advancement and promotion of the careers of women in STEMM in higher education and research. Following the April 2012 round of awards, there are 124 award holders. Managed by ECU, the Charter is funded by ECU, the Royal Society, the Biochemical Society and the Department of Health. Athena SWAN received a major boost in 2011, when the Chief Medical Officer announced that the National Institute for Health Research would only expect to shortlist medical schools for biomedical research centre and unit funding if the school holds a Silver Athena SWAN award.

40 % of under-represented sex

- The *German Federal Ministry of Education and Research*\(^\text{110}\) and the Länder initiated its Program for Women Professors in 2007; in 2012 the Programme was confirmed to continue. 260 professorships were financed in the first round, with a total budget of EUR 150 mil. Until 2017 additional EUR 150 mil. is committed to the Program.

- For the years 2013-16, the *Swiss Federal Equal Opportunity at Universities Program* has dedicated CHF 9.8 million for the universities’ gender equality actions, with the aim to achieve 25% women professors at Swiss universities, with 40% at the level of assistant professorships, as well as an increased proportion of women in leading academic positions/bodies at universities and related institutions.

- The *Research Council of Norway*\(^\text{111}\) launched in 2013 the Initiative on Gender Balance in Senior Positions and Research Management (Balanse) programme; the programme will run for 5 years, with planned budget of 7,340,000 EUR. The goal of the programme is to increase the number of women in top-leave and research management positions. Applications can be submitted by research organizations and research-intensive industry.

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\(^{109}\) [http://www.athenaswan.org.uk/content/charter](http://www.athenaswan.org.uk/content/charter).


• Slovenian Research Agency\textsuperscript{112} has introduced rules for the composition of permanent and temporary evaluation committees. Article 11(5) stipulates that every committee must be composed of at least one third of each gender; the only exception is committee for technical sciences with one-fifth representation.

• Under the Polish Act on Higher Education, nominations for the Main Council of Science and Higher Education, an advisory body for the Minister of Science and Higher Education, should take into consideration “the attempts to balance the share of women and men in the work of the Council”. Based on the same 2011 amendment, the Minister of Science and Higher Education appoints members of the Polish Accreditation Committee, ensuring that at least 30% of the Committee members are women.\textsuperscript{113}

5. Recommendations

5.1 Recommendations on how the EC could assist Member States

1. The Expert Group welcomes the inclusion of the Helsinki Group on Gender in Research and Innovation\textsuperscript{114} among ERA-related groups as a vital step in integrating the gender dimension in the implementation of the ERA. The Expert Group calls on the EC to cooperate with the HG with a view to ensure gender mainstreaming in the ERAC and ERA-related groups.

2. There should be systematic gender mainstreaming of research and innovation policies in the ERA and maintenance of dedicated gender-specific policies and structures, particularly the Gender and Ethics Unit. This is in line with the recent position of the Helsinki Group presented to the ERAC.

3. The Commission should continue to act as a platform for exchange and sharing best practices and experience through the work of the Helsinki Group as well as specifically dedicated projects (the Gender-Net ERA-NET, structural change projects, gender in research portal).

4. The Commission should continue to cooperate with EUA, EARTO, LERU, Science Europe and NORDFORSK and other relevant supra-national European stakeholders on addressing gender equality in research and innovation.

5. To remedy the lack of a gender indicator in the Innovation Scoreboard, the share of Women Researchers in Grade A position should be included.

5.2 Recommendations to Member States

6. Member States, through the national statistics offices and other relevant bodies, should continue to enhance the availability and harmonization of sex-disaggregated statistics in research and innovation as a tool to gain a greater insight, in particular where time series are available (see also recommendations in the Benchmarking Report 2008: 38). While gender equality cannot be reduced to statistical data, statistical information is a major indicator of social realities.

7. Member States should make effort to systematically implement gender mainstreaming of R&I policies, programmes, strategies, in cooperation with relevant external experts and

\textsuperscript{112} \url{http://www.arrs.gov.si/sl/akti/prav-telesa-RD-maj13.asp},


\textsuperscript{114} HG, formerly the Helsinki Group on Women and Science, established in 1999
stakeholders, and should adopt a dedicated gender equality strategy in R&I and report on mainstreaming gender in R&I. Gender mainstreaming is in place in many Member States as an adopted approach to foster gender equality. To this end, Member States need to build capacities by providing gender training to responsible staff. For this, Member States can rely on domestic expertise as well as the growing pan-European capacities (EU funded projects, COST Action genderSTE etc.)

8. **Gender in research teams and content should be included as a criterion for funding in performance agreements with RPOs and RFOs or where state administrations provide institutional funding on a competitive basis** (e.g., an indicator in the form of 40% representation in evaluation and decision-making positions, % of women professors, measures to promote institutional and cultural change, inclusion of gender in content of research/curricula).

9. **Particular attention needs to be dedicated to the elimination of gender bias from assessment.** Multifaceted action is needed, spanning gender balance in evaluation committees, clearly defined evaluation criteria, reconsideration of evaluation criteria (especially in relation to mobility requirements, publication lists and career breaks) and gender training for evaluators to recognize the risk of gender bias in the different ways women and men are attributed merit.

10. **The gender dimension must be integrated in research and innovation and in higher education curricula** in order to ensure research quality, long-term sustainability of research and innovation findings and social robustness of research as well as to avoid economic losses. To achieve this, training of research staff and peers at RFOs is necessary.

11. **Member States should implement and/or continue a dedicated structural change programme at national level for all relevant stakeholders (RPO, RFO), possibly in cooperation with the European Social Fund – Structural Funds, aimed at institutional, tailor-made projects to launch a change process.**

12. **Initiatives aimed at cultural and institutional change should not be solely focused on STEM disciplines.** While the situation in the natural sciences and engineering is particularly dire in terms of gender equality, the position of women in the social sciences and humanities, especially as regards top and decision-making positions, is equally poor.

13. **The gender equality agenda must be integrated into the RFO and FPO administration and management practices.** For successful equality work, Member States need to build capacities. Gender training should be provided to responsible HR and administrative staff.
Priority area 5  Optimal circulation, access to and transfer of scientific knowledge, including via digital ERA.

1. Identification of priorities

1.1 Priorities
This part proposes addresses the implementation of the following three actions that the European Commission invites Member States to work on for the optimal circulation, access to and transfer of scientific knowledge:\footnote{Open innovation, the second action Member States are invited to work on in within this ERA priority and closely related to the actions under discussion, is dealt with separately by another expert group.}

1) the \textit{definition and coordination of Member States policies} on access to and preservation of scientific information,

2) the \textit{harmonization of access and usage policies} for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners,

3) the \textit{adoption and implementation of national strategies} for electronic identity for researchers giving them transnational access to digital research services.

1.2 Framework
The European Research Area is about enabling the free circulation of researchers, scientific knowledge and technology, increasingly through e-infrastructures that provide the digital research services to enable e-science. The ability of the Union to overcome fragmentation in the access to and transfer of scientific knowledge is crucial in completing the ERA. This section provides the contextual framework for each of the three actions discussed and for which recommendations to Member States and the European Commission are offered below. The first action refers to the opening up of content stemming from publicly funded research. The second and third refer to the process of harmonizing access to e-infrastructures by assuming common standards for access and usage policies, and developing researcher federations at the European level, thus enabling researchers from the public and private sector throughout Europe to have access to e-infrastructures and digital research services anywhere in Europe.

The first action largely refers to what is known as open access. Open access to scientific information is the free access via the internet to scientific publications (journal articles and monographs), as well as to the research data, especially data underlying publications, through specific licensing, so that they can be further used and exploited by researchers, by the industry, and by citizens. Open access contributes to the intensification of research and innovation and remedies the problem of access to research and its side-effects, caused in part by the continuously increasing subscription prices set by publishers and also the change in the paradigm of scholarly publication resulting from the internet.\footnote{The problem is discussed in depth with references to relevant studies in the Recommendation on access to and preservation of scientific information Impact Assessment http://eur-
Open access to scientific publications (articles and books) can be achieved either through the author’s archiving of the final post-refereed author or publisher version of a publication (a process known as self-archiving) in institutional and other appropriate (subject-based) repositories (overall known as the ‘green road’) or by directly publishing in open access journals or open access monographs (also known as the ‘gold road’). In the latter case, when journals are operated by commercial publishers Author Processing Charges are usually required (APCs). These expenses are usually assumed by the author’s institution or are covered by the funding agency (in cases of grants, e.g. in FP7 projects covered by the pilot to open access). The benefits of open access to innovation by making freely available cutting edge research to researchers, businesses and the wider public are now widely accepted, and studies also demonstrate its economic benefits. At the same time, recent developments underscore the significance of open access to research data through archiving in subject-based data repositories; open access to scientific data intensifies research, facilitates data-driven science and research result control, and also presents clear economic benefits. For EU 27, it has been estimated that the economic benefit from open access to scientific information will be €1.8 billion a year for the publicly funded research, and €6 billion a year combined with private research.

Open access has gradually gained ground among researchers, policymakers and research funders throughout the world. Universities, research funders, and states are developing policies for open access to research, with a special emphasis on publicly funded research. The European Commission has steadily increased its support for open access to the research it funds and recommended to Member States to adopt coordinated national policies on this matter. The latest in a series of policy measures is the “Recommendation on access to and preservation of scientific information”, which was issued alongside the ERA Recommendation in July 2012, as well as the “Communication Towards better access to scientific information: Boosting the benefits of public investments in research”. The Recommendation addresses in detail this first priority set by the EC in implementing the optimal circulation of scientific knowledge within ERA that is the definition of national policies regarding the access to and preservation of research, indicating specific actions to be followed for the successful development and implementation of national policies. The Communication sets as target that by 2016 the share of publicly funded articles will have increased from 20% to 60% and that relevant policies will have been implemented by all Member States by 2014. It is significant that open access will be required for all publications funded by Horizon 2020 and a pilot will be implemented on open access to

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119 ec.europa.eu/information_society/policy/psi/docs/pdfs/opendata2012/reports/Vickery.docx
research data underpinning publications. While national and funder policies are on the rise, current data and a study of the country fiches on the ERA indicate that more needs to be done on the policy front to secure access to publicly funded research\textsuperscript{120}. National, funder and institutional open access policies are necessary to secure open access to research: a recent study finds that where relevant policies are not mandated, open access deposit rates reach only around 20\%. On the other hand in institutions with mandatory open access policies, deposit rates are close to 60\% within two years of implementation\textsuperscript{121}. Finally, research data and long-term preservation are domains where policies are underdeveloped at the level of the Member States, as well as at that of the research funders.

In an increasingly networked world, e-infrastructures provide the means for the access to, circulation of and transfer of knowledge, by storing and providing access to scientific content (e.g. publications, datasets etc) and by providing advanced digital services for researchers that enable e-science. Thus, e-infrastructures provide access to content and services which lead to “a seamless and open European space for online research”,\textsuperscript{122} or Digital ERA.\textsuperscript{123} Beyond measures for opening access to publicly funded scientific output/content through the e-infrastructures, integrated advanced research services and harmonized access to such e-infrastructures are far from present. Current problems have been identified to include, among others, insufficient coordination, collaboration and integration of existing e-infrastructures; legal and other policy issues that limit access; lack of ‘visibility’ of services and lack of business models based on secure and sustainable funding schemes.\textsuperscript{124} The second action point addresses the lack of common standards within and between Member States for access to and use of publicly funded e-infrastructures and in particular transnational access and access by public-private consortia. Significant in this is the existence of Acceptable Usage Policies (AUPs) at the national level and a desideratum is their harmonization at the Union level.

\textit{National strategies for researcher identities} will also significantly contribute to a seamless access of researchers to e-infrastructures and their services at the national and the European level and maximize the resources available for researchers. Currently, the degree of identity federation –i.e., institutions with agreed set of policies for exchanging information about users and resources to enable access to the latter- varies among Member States and more coordination is necessary so that the

\textsuperscript{120}The rise in mandates for open access can be clearly seen in the chart in http://roarmap.eprints.org/.
\textsuperscript{122}\url{http://www.plosone.org/article/info:doi/10.1371/journal.pone.0013636}
\textsuperscript{123}http://eprints.ecs.soton.ac.uk/18493/
\textsuperscript{124}Ibid. e-IRG Roadmap p. 11 and ibid \textit{Research Data e-Infrastructures}, p. 3 and entire document for a framework of action in integrating European data e-infrastructures.
available and future research resources can be available to all researchers in Europe. Significant in this, is the ability of institutions to participate in the European inter-federation eduGain.

1.3 Rationale and interdependence
All three actions are included as priorities for the optimal circulation, access to and transfer of scientific knowledge as interconnected, yet distinct and indispensable aspects of the process. The economic and social benefits of broadening access (through open access policies) to scientific content have been well-documented, the support for this process among Member States is gradually yet visibly increasing and the EC has expressed its political commitment. Significant developments on the policy front are thus expected in the coming two years. Further, ensuring that each Member State allocates funds and other resources for research and education e-infrastructures is another essential component towards optimizing knowledge circulation and transfer and is the essential facilitator of creating new knowledge, i.e. implementing e-science today. Harmonized access policies to publicly funded e-infrastructures for research and education and national researcher identities are major enabling factors in increasing researcher collaboration, efficiency and capitalizing on public resources and facilitating innovation.

2. Main steps and actions to implement priorities-Recommendations for Member States
The suggested measures are considered essential for Member States to implement each of the three action points that will enable the optimal circulation, access to and transfer of scientific knowledge. While intense work is taking place in all Member States to provide open access to scientific information and build robust e-infrastructures for research and education, a lot more work is necessary in order to enable the development of coordinated policies at the national and the European level, such that enable seamless access to scientific information and advanced e-infrastructure services.

2.1 Definition and coordination of national policies on open access to and preservation of scientific information.
It is necessary that Member States adopt national strategies regarding access to and preservation of scientific information. To this end, consensus between major stakeholders (funders, universities, research centers, memory institutions etc) is necessary and should lead to shared policy principles aligned with EC recommendations and internationally accepted standards, and ultimately to a regulation. Additionally, a national strategy should address funding and sustainability issues regarding open access to and preservation of publicly funded research and delegate responsibilities at the national level, significantly regarding the e-infrastructure for scientific information and regarding deposit in electronic format and selection of materials for Digital Preservation. The Digital Preservation policy should require the use of persistent identifiers for digital and not digital objects, aiming at the maximum interoperability with other systems to support its sustainability and maximize accessibility of

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The national strategy should lead to clear and aligned policies among the public funders and research performing organizations. Relevant policies should be included in the organizational governance of all research performing organizations.

The nature of the open access policies that research funders and research performing organizations adopt determines their efficiency: Self-archiving in repositories should be mandatory and immediate upon acceptance for publication. Open access should be mandatory and immediate upon acceptance for publication. Prior arrangements with publishers should be respected if they do not impose embargoes of more than 6 months (12 months for SSH). Deposit should be tied to professional development in research performing organizations and should be enforced as a particular clause in research grants in the relevant policies by research funders. Focusing policies on peer-reviewed publications (certainly articles, but also monographs) as opposed to other types of publications is essential, since open access to cutting edge research is of primary importance in stimulating innovation. It is recommended that emphasis be placed on providing open access through repositories; significant investments have already been committed by Member States to these e-infrastructures which empower institutions and Member States to manage their own intellectual output for the present and the future.

Open access to research data emerges as an important new aspect of access to research and open access policies should make provisions for open access to research data, minimally to research data underpinning publications. Policies on open access to research data should be addressed separately or as a separate clause, respecting privacy, trade secrets, national security etc, according to subject-specific standards. Member States should encourage the exploration of new Open Access publishing models for research data that will foster the development of a culture of data sharing and will stimulate the development of new data professionals. Research performing organizations should develop institutional data management policies and research funders should request data management plans contingent upon funding. Research performing organizations and research funders should explore incentives for researchers to make research data available.

The ability for re-use of scientific information is of the essence. The free online access to scientific information is not enough to allow and favor its reuse. From the legal point of view, appropriate licensing schemes favouring the re-use of information (e.g. Creative Commons licenses, specially CC-by and CC-zero), principles regarding formats of deposit that enable computational analysis and text and data mining (TDM) should be included in policies, as well as efforts should be systematized to enable linking data and publications. From the technical support point of view, a public infrastructure that allows access and re-use of information in innovative ways is of essence. From the human resources point of view, training of professionals (data scientists, data librarians, etc) that maximize the use and re-use of scientific information is also a key issue. Institutional repositories should make an effort in making clear the re-use policies at the article level, to avoid uncertainties when it comes to innovative re-use of scientific information.
Research funders and research performing organizations should actively participate in the international dialogue to further explore coordinated policy development, new ways of measuring research performance beyond the current practices (e.g. different ways of measuring impact and different types of research outputs beyond publications, such as code, datasets, etc), incentives for developing a culture of sharing of research results among researchers, developing curricula that will produce skilled new data and preservation professionals.

Member States should encourage and allocate funding for the (further) development of institutional and subject-based publication and data repositories, as well as related digital services that stimulate the deposit and the re-use of information. All research performing institutions should have access to repository functionality, where publications are to be deposited, dedicating the necessary resources and developing the relevant institutional structures (e.g. a repository office). Repositories should be developed on open standards and in such way that they are interoperable. Best practices should be implemented maximizing integration of these e-infrastructures into a national e-infrastructure, as well as to other European and international ones (e.g. they should be OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting) and OpenAIRE (www.openaire.eu) compliant). Interoperability is a key issue to pave the way to efficient use of information, including text and data mining. Research data repositories in specific areas should be developed where this is deemed necessary, to address the preservation of and access to the ever-increasing volumes of research data and the ability to reuse it.

2.2 Harmonization of access and usage policies for research and education-related public e-infrastructures and for associated digital services enabling consortia of different types of public and private partners

Member States should define a national strategy and a roadmap for the national research and education e-infrastructures and related digital services that sets the principles regarding the terms of access and use. Publicly funded e-infrastructures for research and education should be as openly accessible as possible in order to stimulate innovation, and minimally accessible to qualified researchers and/or groups of researchers from the public and/or private sector inside the Member States. The current discourse taking place at European and international fora such as the e-IRG (e-infrastructure Reflection Group), e-IPF (e-infrastructure Policy Forum) and ESFRI (European Strategy Forum on Research Infrastructures) should be taken into account. Where Acceptable Usage Policies (AUPs) do not exist at the national level, these should be developed. A national task force that will help develop and implement those policies along internationally accepted standards should be established.

Member States should participate in European-level dialogue in an effort to establish harmonization of AUPs at the European level. Member States should intensively engage in European dialogue, facilitated by the European Commission, and participate in the relevant fora that will lead to the adoption of common standards for national AUPs. Close examination of case-studies in such fora will reveal good practice cases and will foster coordination of the relevant policies among Member States.
2.3 Adoption and implementation of national strategies for electronic identity for researchers for transnational access to digital research services

All Member States should develop national strategies regarding researcher identification that ensure that RPOs establish e-identities for researchers with the perspective of entering into a joint national and, subsequently, into a European identity federation. They should allocate the necessary funds for a national scheme for the provision of a national identity federation. National identity federations can then “inter-federate” with other national identity federations, so the e-identity of a researcher from his or her home institution can be used also to access resources in other countries.

All research performing organizations within Member States should belong to the national researcher identity federation, while Member States should provide the means (technical and organizational support) for all RPOs to join, such that all RPOs are thereby governed by the same explicit policies, and that researchers and public-private research consortia are able to have transnational access.

Member States and national stakeholders (mainly research performing organizations) should participate in international dialogue and promote within the Member States current knowledge regarding the existing standards in federated access control technologies for network, service and applications. They should also provide national opportunities to discuss the benefits of national researcher identity federations, organizational and policy aspects etc.

3. Assessment of operational feasibility and measurability

3.1 Proposed indicators

The following sections present suggested indicators to measure the progress in each of the three actions discussed above, respectively. Member States should collect the relevant data from the institutions involved in the relevant indicators, mostly research performing organizations, research funding organizations, NRENs and HPC centre and other publicly funded research and education e-infrastructures.

3.1.1 Open access to and preservation of research

A sizeable set of indicators for the assessment of the degree of definition and implementation of open access and preservation policies among Member States are already presented in the “Commission staff working document accompanying the Recommendation on access to and preservation of scientific information (Impact Assessment)” (p. 63), while a tender has been granted to further develop them in detail. The Expert Group places an emphasis, initially, on a few indicators that can be easily measured by Member States.

- Existence of national policy on open access to and preservation of scientific information
- Number and share of national research performing organizations with mandatory policies for open access to and preservation of scientific information
• Number and share of research performing organizations with interoperable and federated repositories;
• Existence of national federated infrastructure for access to and preservation of scientific information
• Number and share of research funders and research performing organizations with obligatory data management plans;
• Share of open access publications over output of Member States
• Training programmes on data professionals in place

3.1.2 Harmonized access and usage policies of research and education e-infrastructures

- Number and share of organizations with publicly funded e-infrastructures that have signed document assuming common principles for the access to and usage of their e-infrastructures
- Number and share of publicly funded e-infrastructures for research and education with shared (harmonized) usage and access policies
- Development through time of number and share of consortia of public and private partners able to use public e-infrastructures

3.1.3 National Identity Federations

- Existence of national identity federation
- Share of research performing organizations with advanced electronic identity systems
- Share of participation of research and higher education institutions and research labs in the national federation
- Participation of the national identity federation in EduGAIN
- Share of institutions with EduROAM

4. Good practice examples

The following good practice examples include cases that are demonstrably effective and operational, as well as recent work in progress and recent developments from various Member States in Europe

4.1 Definition and coordination of Member State policies on access to and preservation of scientific information

National/research funder policies on open access

*Denmark* has effectively gone through the process from the consensus of policymakers and research performing organizations to a common research funder policy for the five Danish research councils. This policy, effective since 2012, is a mandatory green open access policy that requires recipients of funding to deposit their publications in repositories (mandatory green open access policy). The policy has been embedded in grant contracts and reporting. It will be reviewed in two years time. Further to this, the Ministry of Science, Innovation and Higher Education is expanding to explore open access to
research data in support of the concept of open science, and is thus starting a relevant consultation with major national stakeholders (e.g. universities). This is a good practice because it covers the major funders, as well as provisions as stakeholder consultation process, through which consensus and impact is achieved. In the near future the results (e.g compliance) of the policy should become visible. http://fivu.dk/en/research-and-innovation/cooperation-between-research-and-innovation/open-science

Ireland announced its national policy on open access in 2012. It calls for self-archiving and encourages gold open access as well. The document of the policy is the result of a consultation of research funding and performing organizations in the country and addresses the main principles that individual organizations should follow to develop their own policies. This document is the result of deliberations and a consensus to which the main research actors of the country reached. The major Irish funders already have open access policies for a few years. This policy is expected to stimulate the development of aligned policies among the remaining actors in the country. http://www.tcd.ie/Library/assets/pdf/National%20Principles%20on%20Open%20Access%20Policy%20Statement%2028FINAL%2023%20Oct%202012%20v1%203.pdf

Research performing organizations with effective policies on open access

The University of Liege adopted a mandatory green open access policy to all research publications since 2007. Researchers are obliged to deposit all publications with the institutional repository Orbi and this practice is connected to the researcher evaluation process. Publication lists for promotion are generated through Orbi (http://orbi.ulg.ac.be/). Open access is rendered to all articles not covered by publisher contracts or other commitments. The University of Liege policy is highly successful because it is obligatory and it is connected to research performance evaluation within the university. http://roarmap.eprints.org/56/

The University of Minho has an institutional policy since 2005. It was recently revised in 2010. The new policy requires researchers to deposit a copy of their articles in the institutional repository immediately upon publication and to include a link to the version deposited in the repository in all official lists of publications. The policy has an approximate 60% of compliance and has been embraced from the beginning by the university administration.

Research and education e-Infrastructures at the national and European level

National e-Infrastructure for scientific information Narcis (The Netherlands) is the main national portal providing access to scientific information, including (open access) publications from the repositories of all the Dutch universities, and a number of research institutes, datasets from some data archives as well as descriptions of research projects, researchers and research institutes. They have developed national digital persistent identifiers. http://www.narcis.nl/
**Funding of national projects to promote research data infrastructures.** UK and Germany fund projects that involve researchers and ICT specialists in defining subject-specific standards for the development of research data repositories: *Research data management infrastructure projects (JISC, UK).* The projects are first identifying requirements to manage data created by researchers within an institution, or across a group of institutions, and then piloting research data management infrastructures at institutional, departmental or research group level, to address these requirements.

*Information infrastructures for research data (DFG, Germany).* The programme is designed to help identify and implement specific and needs-oriented requirements for future structures, or structures undergoing further development, for the improved handling of research data and research data repositories.

*European e-infrastructure*

In a joint collaboration between 43 European countries the National Research and Education Networks (NRENs) are now interconnected at very high speed and also connected to the rest of the world at very high speeds, see [www.geant.net](http://www.geant.net) . This collaboration is co-funded by the EC through the project GN3 and GN3plus and is also the home for the development of the interfederation activity eduGAIN .

*National network e-infrastructure*

The Spanish National Research and Education Network redIRIS has recently been substantially upgraded using structural funds. [http://www.rediris.es/](http://www.rediris.es/)

*National policies on the preservation of scientific information*

*Legal deposit in UK (Legal deposit Libraries (non-print) regulations 2013)* covers e-books, e-journals and other types of electronic publication, plus other material that is made available to the public in the UK on handheld media such as CD-ROMs and microfilm, on the web (including websites) and by download from a website.

*National Policies Enabling re-use*

*UK government* has endorsed the recommendations on the Hargreaves’ report on the Intellectual property law in UK. The report establishes that “In addition, there should be a change in rules to enable scientific and other researchers to use modern text and data mining techniques, which copyright prohibits”.

### 4.2 Harmonization of access and usage policies for research and education-related public e-infrastructures and for associated consortia of different types of public and private partners

In Denmark the Danish e-Infrastructure Cooperation (DeIC) has an acceptable usage policy that allows for access for all research institutions, both public and private, as long as the usage is purely for research. The text in Danish can be found at [http://www.deic.dk/sites/default/files/uploads/Tilslutningsvilkar_Forskningsnettet_2008.pdf](http://www.deic.dk/sites/default/files/uploads/Tilslutningsvilkar_Forskningsnettet_2008.pdf).
4.3 Adoption and implementation of national strategies for electronic identity for researchers giving them transnational access to digital research services

Croatia has had an operational national identity federation AAI@EduHr, see www.aaiedu.hr, since 2006 and have very mature monitoring, statistics etc. This federation is a full member of the European inter-federation eduGAIN and active in advanced developments. Croatia is also very active and leading in the pan-European university roaming system eduroam.

Denmark has established the well-functioning identity federation WAYF (Where Are You From) that early on joined eduGAIN and has contracted with Estonia (TAAT, see taat.edu.ee/main/about/lang=en) to set up a Hub & Spoke Federation. This has made Estonia able to be in control of their own decisions for their service but able to bootstrap from the overall experience of WAYF.

5. Recommendations

1. Contribute to coordinated national, research funders and research performing organization policy-development on open access through the designated national contact points and expert advocacy organizations
2. Lead the European debate about a research friendly copyright framework, which assures maximum circulation, access; transfer and re-use of scientific knowledge (with a special emphasis on text and data mining) while protecting intellectual property rights of authors.
3. Assist Member States in coordinated development of national digital preservation policies, and adopt common lines on legal and technical issues of relevance through funding.
4. Support the funding of projects that help unify resources, such as national e-infrastructures (in technical, as well as policy terms)
5. Funding European research data infrastructures, ensure the building of a Research Data e-Infrastructure Interoperability at the European and Global level and coordinate efforts with global initiatives such as the Research Data Alliance
6. Facilitate the further development of a common EU policy and trust framework for Identity Management that involves National Identity Federations, e-Research communities, libraries and data centres), the European inter-federation eduGAIN and global collaboration at the inter-federation level.
7. Facilitate the further development of Europe’s joint Research and Education network infrastructure GÉANT to enable researchers all over Europe to gain remote access to the RIs in their fields of study, as recommended by the GÉANT Expert Group.
8. Recommend that Member States adopt a common AUP for e-infrastructures that allows transnational collaboration and private-public collaboration in research and development and facilitate coordination through funding.
Part III Cross-cutting issues, conclusions and recommendations

The ERA is a holistic entity in which the effective flows of people, knowledge, finance and services are critical if the European Union is to have a research and innovation ecosystem that is fit to meet the challenges and expectations of political leaders and wider stakeholders and the people of Europe. While the sub-groups here have focused upon their particular areas of expertise to identify opportunities for action, it is also clear that many issues transcend individual priorities and that almost all interact to be complementary or even contradictory. It is unrealistic to expect that a simple formula can be found for a ‘policy mix’ that manages these trade-offs and synergies in an optimal way but nonetheless we call attention to several key points that have recurred throughout this report. We also stress that the ERA needs to be underpinned by a commitment to values of openness, equality, transparency and academic freedom.

The Expert Group has made multiple recommendations in each of the areas addressed by this report – these are summarised by theme at the end of this section. They are addressed to the European Commission, to Member States (recalling that here we also include Associated Countries) and to research funding and performing organisations within the Member States. Many require action at multiple levels. The recommendations fall into five main categories of action:

vi) Harmonisation: There are many instances where common principles for action or common approaches may be beneficially applied, or where synchronisation of decision cycles would facilitate joint working;

vii) Monitoring and evaluation: While many measures have been proposed to assess the progress of the ERA, several recommendations identify further data needs. Beyond the data there is a regular call for evaluation of existing practices and further mutual learning between actors in the ERA;

viii) Information sharing: related to the call for mutual learning a group of recommendations identify a need for greater and more effective sharing of information about national and organisational initiatives and for infrastructure to support this;

ix) Use of funding or other incentives to change behaviour: Many of the actions needed to progress the ERA require funding to proceed while in other cases existing funding sources could be linked to compliance with core ERA principles;

x) Governance and regulation: While regulation should normally be a last resort in the context of research, the ERA includes areas where progress can only be brought about through agreed mandates. In other cases goals may be achieved through promulgation of key principles in Charters and Codes for good practice.

In terms of specific issues four topics recur in different parts of the report:
Peer review: Quality of research and the means to achieve and assess it have been manifested in the central role that peer review plays in so many of the recommendations. It is seen as the crux of competition in research systems, while trust and mutual recognition of others’ reviews is core to joint programmes. International peer review is seen as an instrument of fairness in research careers but in accordance with the principle of equality our recommendations stress that it is a process which needs to be made free from gender bias. The role of peer review in publication remains a constant as open access transforms the flows of knowledge. With this pivotal role it is an underpinning priority for the ERA to ensure that all parts of the European system have access to the best peers through structures that operate with fairness and transparency. At the same time we need to be aware of the limitations of peer review and not take it as a panacea at the expense of addressing other underlying issues.

Inequalities: Most statistics on research show a highly skewed distribution of resources and output. It is essential that differential performance should result only from talent and not from the lack of a level playing field providing equality of opportunity. At a macro-level the most striking inequality is the growing gap between those countries that can afford to, or choose to, prioritise research in their public funding priorities and those in which deep cuts or even a failure to invest in the first place create an environment that is often not fit for purpose. Joint activities can become unrealistic or result in uneven benefits in these circumstances. Member States need to recognise that while we need to use the ERA to be as efficient and effective as possible, in each field there is a minimum critical investment for their systems to be viable and a failure to meet that threshold will disadvantage not only their researchers but also their populations’ economic and social prospects.

Inequality in institutional structures and practices is felt primarily at the level of the individual. This has been made highly visible by the gender and research labour market groups who have been assiduous in identifying the almost ubiquitous barriers that need to be addressed and the need in some cases to address the content of research by inclusion of the gender dimension. While legislation and regulation provide a framework this is one task that the research system itself must address not only through institutional reform but also through fundamental cultural change.

Knowledge flows: the free flow of knowledge is well-known as a foundation of the ERA but the sub-group reports have indicated that we have impediments to this flow not only in the outputs of research as evidenced by the work on knowledge circulation but also in the knowledge that is needed for the research system to function effectively. Hence we see the development of infrastructures hampered by lack of information on national roadmaps and existing research infrastructures, we see insufficiency still in the statistics that would allow effective monitoring of gender and research career issues, symptomatic of a more general deficit in evaluation which has yet to catch up with a period of innovation in research policy. A cross-cutting theme has also been the need for more investment in e-infrastructures to facilitate these flows. In addition, the digital ERA also has a strong role to play, in making remote access to expensive equipment possible through e-infrastructures.

European Structural Funds: The synergies created by the Common Strategic Framework open new opportunities for the ERA to operate for mutual benefit with the goals and mechanisms of the
European Structural Funds. An effective ERA will enhance the functioning smart specialisation and other key drivers of regional development. In turn resources from Structural Funds should play a critical role in building the level of capacity that is needed to take full advantage of the ERA.

In concluding this report the Expert Group would to express its appreciation for the efforts which have been made by the Commission, Member States and key stakeholders in taking the ERA from an aspiration to a matter of concrete implementation. Nonetheless this report comes at the start of the journey not its conclusion. Continuing and redoubled effort will be needed to bring about a European research system that can meet the high expectations placed upon it by Europe’s leaders and citizens as well as by researchers themselves.

**Summary of recommendations**

The Expert Group recommends that the following actions should be undertaken. Full versions of each recommendation are in the sub-group reports:

*Priority 1: Effectiveness of National Research Systems*

1. External and internal incentives should be used to help RFOs to improve their governance models and to build up their competence in handling competitive and selection processes.
2. National funding agencies with the help of the Commission should consider drawing-up common funding principles for project-based and block funding of research.
3. No Member State should remain below the current EU average of 40% of funding allocated competitively through grant funding.
4. Institutional funding should be subject to periodic evaluation. To avoid shocks to the system the proportion of resources allocated via such assessments should in the first round of evaluation be partial.
5. Structural funds could be a way to: a) allow less favoured players to build capacities and redress concentration of competitive funds and b) to improve the balance between cohesion and excellence.
6. The normal practice of peer review should give weight to individual circumstances such that judgements of track record in particular take full account of career breaks, illness and disability.
7. The Commission should work with Science Europe, Academia Europaea, European Science Foundation and other Research Funding Organisations to develop a European College of Peer Reviewers.
8. The possibility of a fund to encourage internationalisation of peer review by contributing to the cost should be explored.

*Priority 2a: Optimal transnational co-operation and competition: Jointly addressing grand challenges*
9. Existing platforms for sharing of information of initiatives on national level should be used much more broadly.

10. Alignment of activities of research performing organisations should be supported, mobilising the in-kind contribution of RFOs and building on good practice lessons from successful ERA-Net schemes.

11. Cross-border cooperation at macro-regional level should be supported with CSA and national or regional funding.

12. National procedures, budgetary cycles, rules and sometimes regulations should be further synchronised and harmonised.

13. More quantitative data on the benefits of addressing the challenges jointly is needed.

14. Joint ex post evaluation should follow joint calls.

15. The formation of Lead Agency agreements could be incentivised by providing top-up mobility funds from, for example, the COFUND instrument.

Priority 2B. Optimal Transnational co-operation and competition: Effective investment in and use of Research Infrastructures.

16. Greater clarity is needed in the guidelines for the elaboration of national roadmaps.

17. Coordination of access portals by ESFRI would greatly improve information about effective national support for RIs on the ESFRI roadmap.

18. Member States could indicate financial commitments annually in the context of the European Semester.

19. The Commission should provide enhanced guidance to countries on the variety of funding mechanisms available to them for RI funding.

20. Steps should be taken to promote the development of a ‘European Charter for RI access’.

Priority 3: A more open labour market for researchers.

21. The Expert Group recommends the adoption of two ‘evaluation frameworks’ for i) open recruitment and ii) doctoral training which could be incorporated into a certification exercise of the Human Resources Strategies at work in European research performing/funding organisations.

22. Selection and evaluation panels (for recruitment and career progression, respectively) should be composed of independent and gender balanced panellists, some of whom are external; the involvement of international members is recommended in particular for smaller research systems.

23. The composition of the selection panels should be published in the EURAXESS Jobs Portal.

24. The time interval from the publication of the ‘vacancy’ announcement and the deadline for potential candidates to apply should allow for the widest possible participation and must include i) the job profile, ii) the required skills and competencies, iii) the eligibility/exclusion criteria, iv) information on economic, social security, maternity/parental leave and pension rights.
25. The reasons for success and, most important, failure of the applications should be unequivocally expressed, specifying whether the decision was unanimous within the panel, and made known to at least all the short-listed applicants, upon request.

26. The concept of research quality and impact as a pre-requisite for successful doctoral training should be specified clearly, to encompass the diverse range of attributes and skills.

27. A structured programme for the provision of transferable/professional skills to doctoral candidates should be designed, implemented and evaluated by research performing organisations.

28. The empowerment of doctoral candidates to become independent researchers should actively be pursued by the hosting institutions.

29. International networking and international exposure should be a distinctive feature of the doctoral programmes.

30. Doctoral curricula should include a strong interdisciplinary component and, where appropriate, engage with non-academic entities.

31. EC should assist Member States in the implementation process by continuing to exert its policy making role and by strengthening its role in monitoring and evaluation through the open method of coordination among other instruments.

32. The financial instruments - Horizon 2020, but also European Structural and Investment Funds (ESIF) - should be used systematically to incentivise the implementation of the ERA principles.

33. A European College of Peer Reviewers should be developed and support provided for additional costs related to the activity of international peer review and a European Research (Career) Observatory should be established.

Priority 4: Gender equality and gender mainstreaming in research

34. The Expert Group welcomes the inclusion of the Helsinki Group on Gender in Research and Innovation\(^\text{126}\) among ERA-related groups as a vital step in integrating the gender dimension in the implementation of the ERA.

35. There should be systematic gender mainstreaming of research and innovation policies in the ERA and maintenance of dedicated gender-specific policies and structures, particularly the Gender and Ethics Unit.

36. The Commission should continue to act as a platform for exchange and sharing best practices and experience.

37. The Commission should cooperate with EUA, EARTO, LERU, Science Europe and NORDFORSK and other relevant supra-national European stakeholders on addressing gender equality in research and innovation.

38. To remedy gender blindness of the Innovation Scoreboard, the gender indicator of the share of Women Researchers in Grade A position should be included.

\(^{126}\) HG, formerly the Helsinki Group on Women and Science, established in 1999
39. Member States should continue to enhance the availability and harmonization of sex-disaggregated statistics in research and innovation with a view to design appropriate gender equality policies.

40. Member States should make effort to systematically implement gender mainstreaming of R&I policies, programmes, strategies, in cooperation with relevant external experts and stakeholders.

41. Gender should be included as a criterion for funding in performance agreements with RPOs and RFOs or where state administrations provide institutional funding on a competitive basis.

42. Particular attention needs to be dedicated to the elimination of gender bias from assessment.

43. Member States should implement and/or continue a dedicated structural change programme at national level for all relevant stakeholders (RPO, RFO), possibly in cooperation with the European Social Fund.

44. Integration of the gender dimension in research and innovation and in higher education curricula is necessary to ensure research quality, long-term sustainability of research and innovation findings and social robustness of research as well as to avoid economic losses.

45. Initiatives aimed at structural and cultural change should not be solely focused on STEM disciplines.

46. The gender equality agenda must be integrated into the RFO and FPO administration and management practices.

Priority area 5: Optimal circulation, access to and transfer of scientific knowledge via digital ERA.

47. Contribute to coordinated national, research funders and research performing organization policy development on open access through the designated national contact points and expert advocacy organizations.

48. Lead the European debate about a research friendly copyright framework, which assures maximum circulation, access; transfer and re-use of scientific knowledge.

49. Assist Member States in coordinated development of national digital preservation policies, and adopt common lines on legal and technical issues of relevance through funding.

50. Support the funding of projects that help unify resources, such as national e-infrastructures.

51. Funding European research data infrastructures, ensure the building of a Research Data e-Infrastructure Interoperability at the European and Global level and coordinate efforts with global initiatives such as the Research Data Alliance.

52. Facilitate the further development of a common EU policy and trust framework for Identity Management.

53. Facilitate the further development of Europe’s joint Research and Education network infrastructure GÉANT to enable researchers all over Europe to gain remote access to the RIs in their fields of study.

54. Recommend that Member States adopt a common AUP for e-infrastructures that allows transnational collaboration and private-public collaboration in research and development and facilitate coordination through funding.
## Annex 1   Affiliations and Roles of Members of the Expert Group

<table>
<thead>
<tr>
<th>Name</th>
<th>Role and Affiliations</th>
</tr>
</thead>
</table>
| **Luke Georghiou (UK)** | Chair (also Rapporteur Priority 1)  
  Vice-President for Research and Innovation, University of Manchester  
  Professor of S&T Policy and Management, Manchester Institute of Innovation Research, Manchester Business School |
| **Jerzy Langer (PL)** | Professor of Physics, Polish Academy of Sciences, Warsaw, Poland  
  Chairman of the Board, Wroclaw Research Centre EIT+, Wroclaw, Poland  
  Member of the Board and Foreign Secretary of Academia Europaea |
| **Montserrat Torné (SP)** | Director, Institute of Earth Sciences, Spanish Council for Scientific Research – CSIC |
| **Jana Kolar (SLO)** | Rapporteur  
  EIT Governing Board Member  
  President of the board of Slovenian Technology Agency  
  Head of Research / Founder Morana rtd |
| **Jakob Edler (DE)** | Professor of Innovation Policy and Strategy, University of Manchester  
  Executive Director at the MBS Manchester Institute of Innovation Research  
  Coordinator of study to develop a Compon 'the Compendium on the Effectiveness of innovation policy' for NESTA |
| **Jerzy Langer (PL)** | Professor of Physics, Polish Academy of Sciences  
  Advisor to the City Mayor of Wroclaw on research policy  
  Fellow of the American Physical Society  
  Honorary Vice President of Euroscience |
| **Alberto Silvani (IT)** | Research Director at CNR – National Research Council of Italy  
  Director General of the University of Milan |
| **Peter Elias (UK)** | Rapporteur  
  Professor at Institute for Employment Research, University of Warwick  
  Strategic Advisor for Data Resources to the UK Economic and Social Research Council (ESRC)  
  Current research project: Statistics and Indicators to Monitor VET and Lifelong Learning in European Countries |
| **Sylvie Joussaume (FR)** | Director of the National Institute of Sciences of the Universe (INSU /CNRS)  
  Director of the Department of Sciences of the Universe  
  Director GIS Climate, French Consortium Climate-Environment-Society |
| **Andrés Rodríguez-Pose (ES)** | Professor of Economic Geography, London School of Economics |
### Priority 3: A More Open Labour Market for Researchers

<table>
<thead>
<tr>
<th>Rapporteur</th>
<th>Details</th>
</tr>
</thead>
</table>
| Fulvio Esposito (IT) | • Professor of Parasitology at Camerino University (UNICAM)  
• Chair of ‘Steering Group on Human Resources and Mobility’  
• Member of High level group on Joint Programming of European Research GPC |
| Louise Ackers (UK) | • Professor of Law, University of Liverpool, Sociology, Department of Social Policy and Criminology  
• Grants : Mapping the population, careers, mobility and impacts of advanced research degree graduates in the social sciences and humanities (POCARIM); Researching Inequality through Science and Technology (ResIST) |
| Beate Scholz (DE) | • Director Scholz: consulting, training, coaching  
• Focus on: on supporting universities and research organisations in designing, implementing and evaluating institutional concepts and strategies to promote research career development  
• Former member of German Research Foundation (DFG), head of the Research Careers Unit |

### Priority 4: Gender Equality and Gender Mainstreaming in Research

<table>
<thead>
<tr>
<th>Details</th>
</tr>
</thead>
</table>
| Marcela Linkova (CZ) | • Researcher at the Institute of Sociology of the Academy of Sciences of the Czech Republic  
• Director of the Czech National Contact Centre for Women and Science  
• Member of the European Commission’s Helsinki Group on Gender in Research and Innovation  
• Member of Working Group of the ERA Committee on the Development of Human Resources and Gender Equality in Research and Innovation, Ministry of Education, Youth and Sports, Czech Republic  
• Management Committee, Cost Action TA1201, Gender, Science, Technology, and Environment (genderSTE) |
| Hans M. Borchgrevink (NO) | • Chair WG Monitoring and Indicators under ERA SGHRM, and delegate  
• Chair WG Mobility under ESF MO Forum EARCD (researcher careers), and delegate  
• EU Gender Expert Group on Impact Assessment (delegate)  
• In informal Gender Network with Task Force input on WG Gender and Diversity under Science Europe  
• In FP7 GenSET; chair/speaker EU Gender Summit 2011+2012; ERA-Net GENDERNET |

### Priority 5: Optimal Circulation, Access to and Transfer of Scientific Knowledge via Digital ERA

<table>
<thead>
<tr>
<th>Rapporteur</th>
<th>Details</th>
</tr>
</thead>
</table>
| Victoria Tsoukala (GR) | • Department of Strategic Planning and Development, National Documentation Centre/NHRF  
• Coordinator, Mediterranean Open Access Network (www.medoanet.eu) |
| Izascun Lacunza (SP, NL) | • Executive Director of LIBER, Association of European Research Libraries |
| **Wim Liebrand (NL)** | • Head of Unit, Scientific Production and Open Access Promotion at FECYT (Spanish Foundation for Science and Technology).  
• Member of OpenAir plus project  
• Director SURF, Dutch higher education and research partnership for network services and information and communication technology  
• Member of Netherlands eScience centre governance board |
| **Dorte Olesen (DK)** | • Executive advisor at Danish Technical University  
• Chair of the GÉANT Assembly  
• Member of the GÉANT Expert Group (DG INFSO 2010-11)  
• Former Director General for UNI-C, Th Danish ICT Centre for Research and Education, 1989-2011. |
**Annex 2 List of Acronyms**

AAA: American Academy Association  
AE: Academia Europaea  
ANR: Agence National de la Recherche  
APC: Author Processing Charges  
BMBF: Bundesministerium für Bildung und Forschung. Federal Ministry of Education and Research  
CERIC: Distributed Research Facility operating in the field of advanced materials and biomaterials.  
CONCERT-Japan: Connecting and Coordinating European Research and Technology Development with Japan  
COFUND: Co-funding Programme – Marie Curie Actions  
CSA: Coordination and Support Actions  
CSF: Community Structural Funds  
CV: Curriculum Vitae  
DFG: Deutsche Forschungsgemeinschaft – German Research Foundation  
DTC: Doctoral Training Centers Unit  
ECU: Equality Challenge  
EduGAIN: Interconnecting Federations to link Services and Users Worldwide  
EduROAM: Education Roaming  
EEA: European Economic Area  
E-IPF: e-Infrastructure Policy Forum  
E-IRG: e-Infrastructure Reflection Group  
EIROforum: Partnership of Europe’s largest intergovernmental scientific organizations that are responsible for infrastructures and laboratories.  
ERA: European Research Area  
ERAC: European Research Advisory Committee  
ERA-LEARN:  
ERA-Net: European Research Area – Network  
ERAwatch: European Commission’s information Platform on European, national and regional research and innovation systems and policies.  
ERC: European Research Council  
ERDF: European Regional Development Fund  
ERIC: European Research Infrastructure Consortium  
ESF: European Science Foundation  
ESFR: European Strategy Forum on Research Infrastructures  
ESRC-UK: Economic and Social Research Council – United Kingdom  
EU: European Union  
EURAXESS: European Initiative to provide access to information and support services to researchers.  
EUREKA: European Platform for R&D-performing entrepreneurs in Europe and beyond  
EUROHORCS: European Hades of Research Councils
EuroRisNet: European Network of National Contact Points for Research Infrastructures
FASTR: Fair Access to Science and Technology Research Act
FWF: Austrian Science Foundation
GBAORD: Government Budget Appropriations or Outlays for Research and Development
GEANT: pan-European data network for the research and education community
GOVERD: Government Intramural Expenditure on Research and Development
GPC: High Level Group of Joint Programming
HE: Higher Education
HG: Helsinki Group
HR: Human Resources
HRM: Human Resource Management
HRS: Human Research Strategy
iMERA+: Implementing Metrology in the European Research Area
IAF: International Opportunities Fund
ICT: Information and Communication Technologies
IP: Innovation Partnership
I3: Integrated Infrastructure Initiative
JPI: Joint Programming Initiatives
JOREP: Investments on Joint and Open R&D programs and analysis of their economic impact
LERU: League of European Research Universities
MERIL 10: Mapping of the European Research Infrastructure Landscape
MS: Member States
NETWATCH: European Commission’s information platform on transnational R&D programme collaboration.
NCoE: Nordic Centers of Excellence
NGO: Non-Governmental Organization
NORDFORSK: Organization under the Nordic Council of Ministers to provide funding for Nordic Research cooperation and advice and input on Nordic research policy
NRP: National Reform Programme
NWO: Netherlands Organization for Scientific Research
OAI-PMH: Open Archive Initiative-Protocol Metadata Harvesting
OECD: Organization for Economic Co-operation and Development
OIV: Overseas Institutional Visits
ORA: Open Research Area
PhD: Doctor of Philosophy
REF: Research Excellence Framework
REI: Research, Education and Innovation
RFO: Research Funding Organization
RI: Research Infrastructure
RPO: Research Performing Organization
R&D: Research and Development
R&I: Research and Innovation
SET Plan: European Strategic Energy Technology Plan
SME: Small and Medium Enterprise
SRA: Strategic Research Agenda
SSH: Secure SHell
STEMM: Science, Technology, Engineering, Mathematics, and Medicine
TDM: Text and Data Mining
TRI: Top level Research Initiative
TUBITAK: Turkish Research Council
UCC: University College Cork
UK: United Kingdom
UKRC: United Kingdom Research Councils
USA: United States of America
### Annex 3. Good practice examples

<table>
<thead>
<tr>
<th>Priority</th>
<th>Country</th>
<th>Best Practices</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effectiveness</strong></td>
<td>Sweden</td>
<td><em>Swedish funding reforms</em></td>
<td>In Sweden the national Research &amp; Innovation bill is up-dated every 4 years. The new R&amp;I bill from 2012 addresses the Council Country Specific Recommendation to Sweden (in the context of the European semester governance cycle 2012) with the objective of improving excellence in research. While the overall level of the research system is good, it is considered that Sweden does not have a sufficient presence in the very top echelon. Specific measures in the bill include increased direct funding to universities. This is both to allow increased risk-taking in research and to increase the permanent employment of researchers. Overall competitive funding for universities accounts for 43% of total funding. 20% of the funding is being redistributed to provide more incentives for universities to specialise. Internal evaluation is done to influence the distribution of direct funding locally. A future allocation system, including peer-review is due to start in 2018. This will also take into account relations with society and industry. The current system of allocation, based on a formula using research grant income and publications is thought to lead to less risk taking and is vulnerable to different traditions of publications across disciplines.</td>
</tr>
<tr>
<td><strong>Competitive vs Institutional funding</strong></td>
<td>Germany</td>
<td><em>German excellence initiative</em></td>
<td>The German Excellence Initiative was launched in 2005 to promote outstanding research projects and institutions in Germany’s universities. The aim was to strengthen cutting-edge research and to make German science and research more visible in the scientific community. A competition was organised to select outstanding projects in three areas: 39 Graduate Schools to promote young scientists and researchers 37 Clusters of Excellence to promote cutting edge research, and 9 Institutional Strategies on projects to promote top-level research. The competition was run by the Deutsche</td>
</tr>
</tbody>
</table>
Forschungsgemeinschaft (German Research Foundation, DFG) and the German Council of Science and Humanities. A total of 1.9 billion euros was made available by the Federal and State Governments to fund the selected projects. The aim was very explicit: “a departure from a long-cherished – and fatally wrong – conception that all universities are equal and hence should be treated equally. Instead, the Excellence Initiative pursued a path of inequality and of funding elites.”

The exercise is seen as highly successful, not only in academic terms but against wider indicators such as creation of jobs.

<table>
<thead>
<tr>
<th>Country</th>
<th>Law/Act Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithuania</td>
<td>Law on Higher Education and Research (adopted 2009)</td>
<td>The new Law on Higher Education and Research and accompanying bylaws led to considerable increase in the share funds that are allocated through competitive procedures</td>
</tr>
<tr>
<td>Portugal</td>
<td>Act on principles of science financing (2010)</td>
<td>The Act on principles of science financing strengthened the importance of open and formalized competitions for R&amp;D funding, with commitments to distribute at least 50% of the science budgets through competitive calls.</td>
</tr>
</tbody>
</table>

**Cross-border Cooperation**  
Nordic countries  
Top-level Research Initiative (TRI)  
TRI was initiated in December 2007 and launched in 2008 as the largest and most ambitious joint Nordic research and innovation initiative, to be ended in 2013. It involves Denmark, Finland, Iceland, Norway and Sweden and, in some cases, some autonomous Nordic areas (in particular Greenland and Faroe Islands). TRI focuses on climate change issues and aims to develop reliable climate models to predict future climate change, including societal aspects dealing with the impacts of climate change.

TRI adopts a shared common fund, instead of national budgets and/or European money. It was established by governmental institutions, Nordic Innovation Centre, Nordic Energy Agency. Six sub-programmes, each with its own managerial body and related to the specific thematic priority addressed, imply a more decentralised governance model. Nevertheless TRI is considered a highly strategic initiative for Nordic countries, meeting national priorities but also international and European ones. It clearly emerges as a
political initiative, based on a collaborative policy rationale: strengthening collaborations among Nordic countries on challenging and big research allows bringing together competencies in a scientific field perceived as strategic and with a relevant added value and not easy to split within national boundaries. This implies a top-down design and could strengthen Nordic teams in relation to European programmes competition, reinforcing the cooperation mainly with Eastern Europe.

<table>
<thead>
<tr>
<th>Research Infrastructures</th>
<th>France</th>
<th>National Roadmap</th>
<th>National roadmap provides a table of existing RI support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>National Roadmap</td>
<td>National roadmap establishes clear rules of engagement by the scientific community in the prioritisation and selection of RIs (the case also for UK) and provides a table of existing RI support, including financial support.</td>
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<tr>
<th>Researchers</th>
<th>tbd</th>
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<tr>
<th>Gender</th>
<th>Spain</th>
<th>Gender equality in National research and innovation system legislation</th>
<th>Law of Science, Technology and Innovation (LCTI) provides for the inclusion of the gender dimension in research programmes, adoption of gender action plans by public research bodies within 2 years and 40-60% of under-represented sex in committees involved in recruitment/career progression and in project/program evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>Gender equality in National research and innovation system legislation</td>
<td>Peer review selection panels should be gender balanced (Horizon 2020 Italy HIT2020 Research &amp; Innovation &amp; Law 215/2012)</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Partnership to foster institutional change</th>
<th>Switzerland</th>
<th>Structural change</th>
<th>Swiss Federal Equal Opportunity Programme 2000-2011/12 Promotion of young female talent, primarily doctoral students and post-docs and Measures for conciliation of academic career and family life. (To be followed by Swiss University Conference Programme 2013-2016 Action Plans and Integration of Gender Studies in knowledge transfer and synergies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>Structural Change</td>
<td>HEIs and PROs draw up and implement equality plans under the Equality Law</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Structural Change</td>
<td>Description</td>
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<td></td>
</tr>
<tr>
<td>France</td>
<td>Structural Change</td>
<td>Charter for gender equality between Ministry of Research and Conference of rectors and head of schools of engineers.</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>Structural Change</td>
<td>Athena Swan Charter for Women in Science.</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>40 % representation</td>
<td>Programme for Women Professors (BMBF)</td>
<td></td>
</tr>
<tr>
<td>The Netherlands</td>
<td>40 % representation</td>
<td>NOW Aspasia programme</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>40 % representation</td>
<td>Research Council of Norway - Balanse programme</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>40 % representation</td>
<td>Vinnova VINNMER programme (to be followed by Mobility for Growth programme): Vinnmer was intended for the underrepresented gender in the scientific field of the application and towards researchers who have a PhD and who have completed their Post Doc qualification. It resulted in increasing the number of women research leaders by granting 50% of wages for women who built their career by moving to other research institution (cofounded by Marie Curie Action).</td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>40 % representation</td>
<td>Swiss University Conference Programme 2013-2016 - cooperation and innovation projects to increase the number of women professors</td>
<td></td>
</tr>
</tbody>
</table>

**Knowledge circulation**

<table>
<thead>
<tr>
<th>Country</th>
<th>National policies on open access (+RFO)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>National policies on open access (+RFO)</td>
<td>Denmark has effectively gone through the process from the consensus of policymakers and RPOS to a common RFO policy for the five Danish research councils, since 2012 a mandatory green open access policy (publications in repositories, with embargo period; policy excludes scientific data)</td>
</tr>
<tr>
<td>Belgium</td>
<td>RPO policy on open access</td>
<td>The University of Liege adopted a mandatory green open access policy to all research publications. High deposit and open access rates owed to connection of deposit with researcher evaluation process.</td>
</tr>
<tr>
<td>Portugal</td>
<td>RPO policy on open access</td>
<td>The University of Minho adopted a mandatory green open access policy to research publications in 2005, barring conflict of rights of third parties. It revised its policy in 2010. It has approximately a 60% compliance rate.</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>National e-Infrastructure</td>
<td>National e-Infrastructure: <strong>Narcis</strong> is the main national portal providing access to scientific information, including (open access) publications from the</td>
</tr>
</tbody>
</table>
repositories of all the Dutch universities, and a number of research institutes, datasets from some data archives as well as descriptions of research projects, researchers and research institutes. They have developed national digital persistent identifiers.

<table>
<thead>
<tr>
<th>UK</th>
<th>e-Infrastructures: Research data management infrastructure projects</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Research data management infrastructure projects (JISC,). The projects are first identifying requirements to manage data created by researchers within an institution, or across a group of institutions, and then piloting research data management infrastructures at institutional, departmental or research group level, to address these requirements</td>
</tr>
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<table>
<thead>
<tr>
<th>Germany</th>
<th>Information infrastructures for research data</th>
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<tbody>
<tr>
<td></td>
<td>Information infrastructures for research data (DFG)The programme is designed to help identify and implement specific and needs-oriented requirements for future structures, or structures undergoing further development, for the improved handling of research data and research data repositories</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UK</th>
<th>National policies on the preservation of scientific information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Legal deposit in UK (Legal deposit Libraries (non-print) regulations 2013) covers e-books, e-journals and other types of electronic publication, plus other material that is made available to the public in the UK on handheld media such as CD-ROMs and microfilm, on the web (including websites) and by download from a website</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UK</th>
<th>National Policies Enabling re-use</th>
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<tbody>
<tr>
<td></td>
<td>UK government has endorsed the recommendations on the Hargreaves’ report on the Intellectual property law in UK. The report establishes that “In addition, there should be a change in rules to enable scientific and other researchers to use modern text and data mining techniques, which copyright prohibits”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Denmark</th>
<th>Harmonization of access and usage policies of public research and education e-infrastructures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In Denmark the Danish e-Infrastructure Cooperation (DeIC) has an acceptable usage policy that allows for access for all research institutions, both public and private, as long as the usage is purely for research.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Croatia</th>
<th>National Strategies for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Croatia has had an operational national identity federation AAI@EduHr since</td>
</tr>
<tr>
<td>Electronic identity of researchers</td>
<td>2006. It is a full member of the European inter-federation eduGAIN</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Denmark</td>
<td>Denmark has established the identity federation WAYF (Where Are You From) that early on joined eduGAIN and has contracted with Estonia to set up a Hub &amp; Spoke Federation.</td>
</tr>
</tbody>
</table>