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REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

The European Research Area: time for implementation and monitoring progress

{COM(2017) 35 final}

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Introduction

An integrated European Research Area (ERA) leads to '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 basis, their competitiveness and their capacity to collectively address grand challenges.'[1]

The last ERA Progress Report has been issued in 2014. The present report summarises the state of play of ERA and the progress on the implementation of ERA over the period 2014-2016[2]. The accompanying report "Data gathering and information for the 2016 ERA monitoring" by Science-Metrix[3] provides quantitative data on a set of indicators with additional policy relevant qualitative information. This report provides essential and detailed analysis on the basis of the ERA Monitoring Mechanism (EMM) for each of the ERA priorities as well as "Country Profiles". Data and an accompanying analysis for all Member States and Associated Countries that is necessary for the understanding of the current state of play.

In line with the Council conclusions on the ERA Progress report 2014[4] the Commission has further improved the ERA Monitoring Mechanism (EMM) in close cooperation with the Member States and ERA stakeholders' organisations, thereby using as much as possible already existing data, mainly from Eurostat. Almost all of these indicators show considerable progress during the last years, although there are considerable differences between Member States.

Another important milestone for this progress Report 2016 was the launch of the ERA Roadmap 2015-2020[5], a living document to guide Member States in structuring their implementation of ERA at national level by drawing up National Action Plans. The European Research and Innovation Area committee (ERAC) developed also a set of eight core high level indicators for monitoring progress of the ERA Roadmap. These so-called headline indicators form the core of the current ERA Monitoring Mechanism[6].

Recently most Member States have published their National Action Plans 2015-2020. These National Action Plans give a rich insight in all forthcoming ERA-policies and corresponding policy measures in the Member States and Associated Countries.

[1] COM(2012)392 final, page 3

[2] The report has benefited from the analysis and information contained in the JRC Research and Innovation Observatory RIO Reports 2015 and Research Performance Based Funding Systems: a Comparative Assessment, EUR 27477 EN; doi10.2791/134058

[3] (Web reference to be included at the moment of publication). In addition a methodological handbook is provided containing statistical definitions and delineations, computation methods, and sources.

[4] Council Conclusions on the ERA Progress Report 2014, 5 December 2014

[5] Council Conclusions on the ERA Roadmap, 19 May 2015

[6] ERAC Opinion on the ERA roadmap – Core high level indicators for monitoring progress. ERAC 1213/15

The ERA-related groups operating at the EU-level have contributed to the further implementation of ERA. An overview is presented in annex 2.

Finally also the Stakeholders Organisations organized within the ERA Stakeholders Platform have made contributions to the further implementation of ERA. An overview is presented in annex 3.

This report is mainly backward looking focusing on the developments during the last 2 years. For the first time progress on ERA is measured for each priority[7]. Despite being backward looking a first impression of the main policy directions of the National Action Plans is already included. The next ERA Progress Report, which will appear in 2018, will make a full assessment of the actions that are announced in the National Action Plans by comparing the progress on ERA and the related ERA actions identified in the National Action Plans.

[7] The 2014 ERA Progress Report provided static values for a specific year showing the gap between individual country values and the EU average.

Priority 1: More effective national research systems

The focus of this first ERA priority "more effective national research systems" has evolved over time. In the 2012 Communication and the 2014 ERA Progress Report the focus was on open, national level competition as key to deriving maximum value from public investments in research and innovation which involved allocating funding and assessing the quality of research-performing organisations by peer review. Main conclusions were that national innovation systems have become more aligned to ERA priorities, competitive funding occurs in all Member States, although with significant variations. Performance based assessment of institutional funding is implemented by the funding organisations in 16 Member States[8].

In the 2015 ERA roadmap 'Strengthening the evaluation of research and innovation policies and seeking complementarities between, and rationalisation of, instruments at EU and national levels' was identified as the top action with the corresponding headline indicator "*Adjusted Research Excellence Indicator"*.

[8] Performance based assessment of institutional funding is implemented by the funding organisations in 17 Member States : See table 3 in Jonkers, K. & Zacharewicz, T., Research Performance Based Funding Systems: a Comparative Assessment, EUR 27477 EN; doi10.2791/134058

Table 1 Adjusted Research Excellence Indicator (2010-2013)

Country	Weight in GDP	Score (2013)	CAGR (2010-2013)	Lead/Gap to EU-28 CAGR
EU-28		**44.4**	**6.4%**	**N/A**
Cluster 1	32.3%	69.0	6.9%	0.5
Cluster 2	39.4%	46.0	6.4%	0.0
Cluster 3	28.2%	22.0	2.9%	-3.5
Cluster 4	0.1%	13.1	1.8%	-4.6
Cluster 1				
CH	3.6%	97.5	4.2%	-2.1
UK	14.1%	72.5	9.1%	2.7
DK	1.8%	70.2	8.4%	2.0
NL	4.5%	70.1	9.1%	2.8
SE	3.0%	66.6	5.2%	-1.2
IL	:	61.5	2.3%	-4.1
BE	2.7%	57.2	9.5%	3.2
NO	2.7%	56.5	7.1%	0.7
Cluster 2				
FI	1.4%	54.5	5.6%	-0.8
DE	19.4%	49.9	6.0%	-0.3
AT	2.2%	48.6	2.6%	-3.8
IE	1.2%	47.3	7.3%	0.9
FR	14.6%	46.5	6.2%	-0.2
LU	0.3%	44.6	13.6%	7.2
IS	0.1%	40.2	1.2%	-5.1
CY	0.1%	36.6	8.7%	2.3
Cluster 3				
ES	7.1%	33.9	5.9%	-0.5
IT	11.1%	33.0	5.6%	-0.8
HU	0.7%	29.7	5.2%	-1.2
EE	0.1%	29.7	3.8%	-2.6
EL	1.2%	28.7	5.5%	-0.8
PT	1.2%	27.0	4.7%	-1.7
SI	0.2%	26.3	-1.0%	-7.4
CZ	1.1%	23.4	1.9%	-4.5
MT	0.1%	22.8	8.0%	1.6
LV	0.2%	20.1	4.1%	-2.3
SK	0.5%	18.6	4.0%	-2.4
PL	2.7%	18.2	3.6%	-2.8
HR	0.3%	17.8	5.2%	-1.2
TR	:	17.8	0.1%	-6.3
BG	0.3%	17.2	0.6%	-5.8
LT	0.2%	16.4	-0.6%	-7.0
RO	1.0%	15.7	1.3%	-5.1
BA	:	14.6	1.7%	-4.7
MD	:	14.3	-0.2%	-6.6
RS	0.2%	14.3	-1.5%	-7.9
Cluster 4				
MK	0.1%	13.8	0.3%	-6.1
ME	0.0%	13.4	-0.2%	-6.6
UA	:	12.9	0.3%	-6.1
AL	:	12.2	6.8%	0.4

Note: See annex 1

Source: Calculations by European Commission, DG Joint Research Centre, Competence Centre on Composite Indicators and Scoreboards. For details on the methodology, please refer to Vértesy (2015)

The analysis in the Science-Metrix report shows that in 2016 research excellence measured by the headline indicator has increased over the period 2010-2013 for the EU-28 average. Although there are differences in growth percentage all countries but 4 have increased their level of excellence over this period. Almost all countries have National Strategies for Research and Innovation in place, both single overarching strategies (22) as well as multiple strategies by different government bodies (11). Several Member States are redefining their National R&I strategies based on a broad concept of innovation, encompassing education, research and innovation to achieve greater efficiencies. Recommending further policy alignment remains however pertinent. Looking at the GBARD as a proportion of GDP giving an indication about the share of GDP used for investment in R&D, there is a growing divergence between countries, which may be caused by countries reducing research budgets because of the need for fiscal consolidation or increasing budgets with the goal of using this for further economic growth. The headline indicator and the European Innovation Scoreboard summary index are highly correlated which implies that Research Excellence leads to strong innovation performance.

Other findings of the Science-Metrix report are that in the case of multiple strategies by various stakeholders' alignment can still be improved to provide a clearer direction and efficient integration. Funding is a big issue and further streamlining of funding application processes would help reduce existing fragmentation, increasing the return on research funding while facilitating collaboration across national borders and across sectors. It was also found that funding is also allocated through increasingly competitive and transparent processes. The criteria and processes for these funding allocation mechanisms would benefit from further fine tuning, with best practices shared across the ERA. A sustained and appropriate balance between competitive and basic funding is important, at both the project and institutional levels. National R&I funding commitments need to be clear and explicit, and be laid out long term, to provide the environment of predictability sought by the private sector, in addition to facilitating clear expectations with respect to collaboration across national borders within the ERA.

In the National Action Plans the following types of actions are intended:

- Improvement of legal frameworks for national research and innovation systems including innovation friendly regulation and public procurement;
- Development of long term national Strategies for Research and Innovation and (in some cases also) Education to improve quality and excellence;
- Development of monitoring and benchmarking mechanisms for better evaluation of Research and Innovation policies in international perspective. New funding mechanisms with competitive elements and complementarities between national and EU funding including public-private partnerships;
- Strengthening the performance of the European Research Area as a whole including widening participation and strengthening excellence;
- Actions increasing valorisation and (societal) impact assessments of publicly funded research.

Comparing the objectives and measures in the national action plans with the recommendations in the Science-Metrix report shows that the national action plans are having more emphasis on developing the strategies, frameworks evaluation mechanisms whereas less attention is paid to the level of and mechanisms for the funding.

Stakeholders Organisations' contribute to the effectiveness of national research systems by a number of activities and events such as on strengthening Europe's Innovation Ecosystems, improving financial and auditing rules and state aid regime to best support and achieve ERA objectives. Moreover campaigns for sustainable, sufficient and simple funding for universities in Europe, position statements about more effective National Research Systems and various initiatives in the field of widening participation and strengthening of excellence.

ERAC itself was also active in the domain of priority 1 and adopted an opinion on Innovation Procurement in 2015. Innovation procurement has over the last decade become an established part of policies in many EU Member States. The principal aim of the opinion is to identify good practices across Europe and propose ways to promote and implement these good practices. Furthermore, the revised EU procurement legislation combined with financing in Horizon 2020 and in structural funds have increased and widened the interest in the innovation procurement in the EU Member States.

Overall Conclusion

The analysis shows that most countries have made progress in the field of research excellence and almost all of them have adopted national strategies for research and innovation. Several Member States are redefining their National R&I strategies further based on a broad concept of innovation, encompassing education, research and innovation to achieve greater efficiencies. A first inventory of the National Action Plans shows that this development into the direction of a more holistic strategic approach for research and innovation will be strengthened in the future. A necessary condition is however more stable funding of government investment in the future.

Priority 2: Optimal transnational cooperation and competition

In the 2012 ERA Communication priority 2 includes both the grand challenges and the research infrastructures. In the 2015 ERA Roadmap it was decided to split priority 2 into two sub-priorities to be able to focus more efficiently on the issues though being closely connected still needs particular attention.

Priority 2A: Optimal transnational cooperation and competition

According to the 2014 ERA Progress Report transnational cooperation at program level between Member States was increasing and forms part of the national strategies of 16 Member States. Joint Programming Initiatives (JPIs) are increasingly helping to align national programs and activities to common agendas at EU level addressing societal challenges. Several Member States have started to develop national plans, roadmaps and strategies in the domain of the JPIs they participate in, with a view to strengthening their commitment to the Strategic Research Agendas of JPIs.

This development was further strengthened by the EU ERA Roadmap 2015, which identified "Improving alignment with and across the Joint Programming Process and the resulting initiatives and speeding up their implementation" as top action priority. The headline indicator is "*GBARD allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE researcher in the public sector*".

Table 2A GBARD (EUR) allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE researcher in the public sector (2010-2014)

Country	Weight in GDP	Score (2014)	CAGR (2010-14)	Lead/Gap to EU-28 CAGR	Trendline (2007-14)
EU-28		**2 507**	**7.8%**	**N/A**	
Cluster 1	25.9%	10 923	5.0%	-2.8	
Cluster 2	36.6%	3 642	5.4%	-2.4	
Cluster 3	36.2%	1 140	15.0%	7.2	
Cluster 4	1.2%	63	-22.8%	-30.6	
Cluster 1					
CH	4.1%	*27 941*	:		
BE	3.1%	9 251	1.0%	-6.8	
IT	12.6%	8 395	*18.1%*	10.3	
AT	2.6%	6 958	3.4%	-4.3	
IS	0.1%	*6 927*	:		
SE	3.4%	6 067	*-2.5%*	-10.3	
Cluster 2					
DE	22.8%	*4 686*	*-1.1%*	-8.9	
NO	3.0%	4 414	-3.9%	-11.7	
NL	5.2%	4 101	10.4%	2.6	
FI	1.6%	3 795	*-0.2%*	-8.0	
LU	0.4%	3 387	35.2%	27.4	
CY	0.1%	3 018	0.7%	-7.1	
IE	1.5%	2 951	5.7%	-2.0	
DK	2.0%	2 787	-3.7%	-11.4	
Cluster 3					
UK	17.6%	2 561	11.0%	3.3	
ES	8.1%	2 385	6.2%	-1.6	
HR	0.3%	1 569	22.5%	14.8	
CZ	1.2%	1 245	-3.4%	-11.1	
RO	1.2%	1 191	*9.5%*	1.7	
EL	1.4%	1 098	*-12.6%*	-20.4	
LV	0.2%	1 030	47.1%	39.4	
SI	0.3%	955	*-18.4%*	-26.2	
EE	0.2%	939	25.7%	18.0	
PT	1.4%	749	1.4%	-6.4	
PL	3.2%	678	76.8%	69.0	
LT	0.3%	220	24.8%	17.1	
HU	0.8%	194	3.8%	-4.0	
Cluster 4					
RS	0.3%	101	:		
BG	0.3%	97	*16.0%*	8.2	
SK	0.6%	52	15.7%	7.9	
MT	0.1%	0	-100.0%	-107.8	

Note: The CAGR is computed on the 2010-14 period but the trendline shows data for the period 2007-2014.
Break in time series: EU-28 (2007, 2008, 2012, 2013); 2012 (BE, LV); 2007 (DK, NO); PT (2008, 2013); 2011 (RO, SI, FI); SE (2013); IS (2011, 2013); RS (2014)
For further notes see annex 1.
Source: Computed by Science-Metrix using Eurostat data (online data codes: gba_tncoor and gba_nabsfin07)

The findings in the Science-Metrix report show that this priority, together with the headline indicator for priority 3, has one of the highest growth rates among all 8 ERA headline indicators with an annual growth rate of 7.8. While this result is an indication of the increasing internationalization of science in general, it also underlines the increasing importance that national governments in Europe attribute to transnational and joint programming, which is stronger policy driven as the measured internationalization of science by means of international co-publications.

This interpretation is reinforced by the additional EMM indicators, notably the Member States participation in public-to-public collaborations within the EU R&D policy framework per FTE researcher in the public sector. This additional ERA indicator showed at large the highest growth rate of all ERA indicators with an annual growth rate of 42.1 % in the years 2012-2014. Clearly, the provision of a common policy framework on EU level as well as the provision of additional financial resources (for Art 185 initiatives and ERA-NET CoFunds) acted as a catalyst for joint action among Member States and underlines the importance of EU policies for the implementation of the ERA. As this additional ERA-indicator is statistically one part of the headline indicator for this priority, it can be argued that the common EU policy framework and the additional resources provided by the EU R&D framework programs led to a significant leverage effect at national level for participating in Joint Programming – notably as the growth rate for the additional indicator is about four times as high as for the headline indicator.

The second additional EMM indicator for this priority, the co-publications with ERA partners, showed a clear growth of 3.6% in the years 2005-2014 also, however significantly lower than the other indicators of this ERA priority. In 2015, about 40% of publications produced by ERA researchers were co-published with a partner in another ERA country, a figure that has been increasing steadily over the last decade.

The main challenges indicated in the Science-Metrix report are that national and international funding arrangements would benefit from further harmonisation, which can also facilitate international researcher mobility. In addition, Joint Programming Initiatives (JPIs) addressing grand challenges could benefit from being more explicitly linked to the smart specialization strategies of the partners involved, and vice versa. The assessment of the societal benefits of research need to be more robust to facilitate improved research management as well as to better communicate the value of research to the public, demonstrating return on investment.

National Action Plans present a broad range of measures and activities of Member States and Associated countries to strengthen their participation in Joint Programming and to better align national and Europe-wide R&D programming. These include the following type of measures:

- Communication and information measures include better information of R&D actors concerning the opportunities and added value from participating in Joint Programming;

- Governance and coordination measures are introduced by a number of Member States. Dedicated funding measures are introduced by a number of Member States for the participation in Joint Programming;
- Harmonisation of funding rules is introduced by several Member States aiming at facilitating the national participation in the JPI's;
- Outreach measures towards smart specialization strategies and sectorial policies, especially focusing on a better articulation between the European Structural funds (ESIF), notably the regional smart specialization strategies, and the SRIA's of the JPI's.

Comparing the objectives and measures identified in the National Action Plans with the main challenges stated in the Science-Metrix report it is clear that the national action plans are responding to the main challenges identified.

Stakeholders organisations have contributed by an EARTO position on 'The Role and Future of Joint Programming' in 2015 and more general actions regarding funding transnational research.

The High Level Group for Joint Programming (GPC) has taken several actions, among others exploring ways on how to best contribute to foster the Joint Programming Projects and established new working methods in order to become more operational. In particular, there is focus on the long term strategy of the Joint Programming, the relationship between the GPC and the JPI and focus on monitoring and evaluation. These result in an evaluation exercise, a mutual learning exercise and a development of a future vision.

GPC was also involved in the Lund Declaration 2015 which resulted from a high level conference, 'Lund Revisited: Tackling Societal Challenges'.

Overall Conclusion

The analysis shows substantial progress in most Member States concerning their participation in the JPI's over the last years. Referring to past trends and measures implemented and/or planned in the National Action Plans, it can be assumed that volume, quality and impact of Joint Programming will continue to grow substantially, notably when an EU policy framework and additional financial means from EU budgets continue to act as a catalyst for Member State action.

Priority 2B Research Infrastructures

At the moment of the ERA Progress Report 2014, 22 Member States had adopted National Research Infrastructure roadmaps of which 5 had been updated since 2013. These national roadmaps did not consistently indicate the links with the ESFRI roadmap and the financial commitments to the development of Research Infrastructures identified by ESFRI and other world-class Research Infrastructures.

In the 2015 ERA Roadmap "Making optimal use of public investments in Research Infrastructures compatible with the ESFRI priorities and criteria taking full account of long

term sustainability" was identified as top priority. Achieving this goal will accelerate the development of state-of-the-art services needed by European and global scientific communities and create a more efficient European Research landscape. The headline indicator is "*Availability of national roadmaps with identified ESFRI projects and corresponding investment needs*".

Table 2B Availability of national roadmaps with identified ESFRI projects and corresponding investment needs

Country	Weight in GDP	Roadmap year	ID'd ESFRI projects	ID'd funding requirements
RO	1.0%	2008	Yes	Yes
BG	0.3%	2010	Yes	Yes
SI	0.2%	2011	Yes	Yes
SE	2.9%	2011	Yes	Yes
DE	19.5%	2013	Yes	Yes
NL	4.4%	2013	Yes	Yes
EE	0.1%	2014	Yes	Yes
HR	0.3%	2014	Yes	Yes
FI	1.4%	2014	Yes	Yes
DK	1.7%	2015	Yes	Yes
CH	3.5%	2015	Yes	Yes
FR	14.3%	2016	Yes	Yes
IT	10.8%	2011	Yes	
IL	:	2013	Yes	
EL	1.2%	2014	Yes	
AT	2.2%	2014	Yes	
PL	2.8%	2014	Yes	
PT	1.2%	2014	Yes	
LT	0.2%	2015	Yes	
CZ	1.0%	2015	Yes	
NO	2.5%	2016	Yes	
IE	1.3%	2007		
HU	0.7%	2012		
ES	7.0%	2013		
BE	2.7%	*No roadmap*		
CY	0.1%	*No roadmap*		
LV	0.2%	*No roadmap*		
LU	0.3%	*No roadmap*		
MT	0.1%	*No roadmap*		
UK	15.1%	*No roadmap*		
SK	0.5%	*No roadmap*		
IS	0.1%	*No roadmap*		
ME	0.0%	*No roadmap*		
MK	0.1%	*No roadmap*		
AL	:	*No roadmap*		
RS	0.2%	*No roadmap*		
TR	:	*No roadmap*		
MD	:	*No roadmap*		
UA	:	*No roadmap*		

Note: References to a 'Latvian Roadmap of National Level Research Centres' may be found online (see e.g. http://connection.ebscohost.com/c/articles/77424776/latvian-roadmap-national-level-research-centres), which describe it as a 'long-term planning instrument that lists research infrastructures on national importance, either new or in need of upgrading' but the roadmap per se is not available.

Source: National roadmaps for research infrastructures: https://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-national-roadmaps

Currently 21 Member States and 3 Associated Countries have adopted national roadmaps of which 13 have been introduced or updated since 2014. There are 12 countries that have national roadmaps in place with both ESFRI projects and funding needs identified. Additionally another 9 countries have roadmaps identifying ESFRI projects but no funding requirements. The evolution of national roadmaps in the last years suggests a greater alignment of national processes with the European priority setting. This trend is underpinned by the large number of national roadmap updates since 2014 and in the frequent use at national level of the methodology consistent with the ESFRI Roadmap.

Also according to the Science-Metrix report many countries have developed and implemented national roadmaps for research infrastructures aligned with the overall ESFRI roadmap. However, these national-level roadmaps would benefit from more clearly and consistently outlining the financial needs associated with the development of prioritised research infrastructures. Furthermore, their long-term sustainability, including prospects for stable funding of operational costs should be considered from the inception phase of the project. National funding mechanisms and decision making processes should also be further coordinated to speed up the infrastructure development.

In addition the main findings for further policy discussions in the Science-Metrix report point out that national roadmaps, in place in most countries, would benefit from more explicitly outlining the financial requirements to reach the operational phase, and to sustain the operational phase once initiated. Tackling regional disparities in research capacity should be to a certain extent addressed through the selection of locations for research infrastructures. In addition, smaller-scale research infrastructures could benefit from similar strategies that have been successfully applied to larger installations: comprehensive national inventories to promote awareness, and time-sharing arrangements to promote efficient usage. Finally, including the private sector in the conception, development and operation of research infrastructures could help to catalyse private-sector involvement in R&I more broadly. A similar approach could be taken with third-country partners to increase international collaboration.

Also in the National Roadmaps a lot of attention is paid to concrete actions fostering the coordinated development of research infrastructures at European level. These include:

- Support actions to strengthen national involvement in pan-European research infrastructures and foster participation in Horizon 2020 activities funded under the 'Research Infrastructures, including e-Infrastructures' part;
- Funding research infrastructures that are included in the national roadmaps;
- Fostering communication and strengthening collaboration of academic and business communities as well as highlighting to the general public the importance of research infrastructures;
- Monitoring of implementation of national research infrastructure roadmaps;
- Periodic revision and update of national roadmaps following strategic priority setting;
- Stimulating use of and aligning activities with structural funds;

- Information gathering about the use of infrastructural resources for better alignment of investment policies;
- Facilitation of use by researchers from other Member States which are not in a position to invest in large scale infrastructures themselves.

Comparing the objectives and measures chosen in the national roadmaps with the main challenges found in the Science-Metrix report shows that they do pay attention to the funding though in a smaller scale than is indicated to be necessary by the report. The national roadmaps also often emphasise the need to evaluate the current situation for an optimal implementation. Some roadmaps also include planning at national level on e-infrastructures, the horizontal elements that enable networking, processing, data management and open access.

In 2014, ESFRI published a prioritisation report, identifying a limited number of projects from the ESFRI roadmap, which were mature enough to be under implementation by 2015-2016 and were considered essential to extend the frontiers of knowledge in the fields concerned. This report led to the revision of the ESFRI Roadmap methodology and structure for the 2016 update. The ESFRI Roadmap 2016 was launched in Amsterdam and consists of three Parts. Part 1 provides the outline of the ESFRI strategic considerations in the development of research infrastructures in Europe as well as gives an overview of projects included in the Roadmap, the methodology, lessons learnt and the outlook into the future.

The Roadmap contains 21 ESFRI Projects and 29 ESFRI Landmarks, whose detailed descriptions are included in Part 2.

The Landscape analysis contained in Part 3 of the Roadmap document provides the current context, in each domain, of the ecosystem of national and international research infrastructures open to European scientists and technology developers.

The ERA stakeholder's organisations contributed together with ESFRI and e-IRG to the "Charter for Access to Research Infrastructures" (RI) that was released in March 2016. The charter followed the 2012 ERA Communication and set out principles and guidelines for access to Research Infrastructures.

Overall Conclusion

The analysis of national roadmaps for research infrastructures demonstrates a significant progress in aligning priority setting at national level with the European strategy for research infrastructures developed in the framework of ESFRI. This growing alignment increases the coherence of the European research infrastructure ecosystem and fosters the competitiveness of the European Research Area. However, in order to further strengthen the effectiveness of public investments in research infrastructures, a strategy on long-term sustainability of research infrastructures should be agreed between the Member States.

Priority 3: An open labour market for researchers

Priority 3 focuses on Open and attractive labour markets for researchers where the main goal is to improve the attractiveness of researchers careers by removing or alleviate barriers to their mobility, ensure an open, transparent and merit based recruitment (OTM) and improve innovative doctoral training.

The ERA Progress Report of 2014 highlighted that implementing open, transparent and merit-based recruitment practices is an important element for having an open research system which will allow competition, hence attracting the best researchers. The report also stresses that open research systems perform better in terms of innovation and that mobile researchers tend to have a greater research impact than their non-mobile colleagues. In this context a tool such as EURAXESS facilitates geographical mobility by helping matching job supply and demand for researchers, and ensuring equal OTM practices across Europe. Additional findings are the lack of skills for doctoral candidates in the private sector that do not receive adequate intellectual property management training.

In the 2015 ERA roadmap the top action priority was identified as 'Using open, transparent and merit based recruitment practices with regard to research positions' with as corresponding headline indicator "*the number of researcher job postings from a given country that are advertised through the EURAXESS job portal, per 1 000 researchers in the public sector". With 7.8% compound annual growth rate in the period 2012-2014 in the EU-28. This indicator reached 47 % in 2014.*

Table 3 Number of researcher postings advertised through the EURAXESS job portal, per 1 000 researchers in the public sector (2012-2014)

Country	Weight in GDP	Score (2014)	CAGR (2012-14)	Lead/Gap to EU-28 CAGR	Trendline (2012-14)
EU-28		**47.0**	**7.8%**	**N/A**	
Cluster 1	11.6%	180.5	70.2%	62.4	
Cluster 2	38.6%	64.7	1.4%	-6.4	
Cluster 3	49.8%	9.6	12.7%	4.8	
Cluster 4	N/A	N/A	N/A	N/A	
Cluster 1					
HR	0.3%	362.0	308.2%	300.4	
SE	2.9%	156.1	17.0%	9.1	
PL	2.8%	146.7	-4.7%	-12.5	
IE	1.3%	139.1	17.2%	9.4	
NL	4.4%	98.7	13.4%	5.6	
Cluster 2					
CY	0.1%	81.7	-1.4%	-9.2	
EL	1.2%	78.8	-8.8%	-16.6	
LU	0.3%	73.7	-26.0%	-33.8	
AT	2.2%	71.3	14.0%	6.2	
NO	2.5%	69.1	11.2%	3.4	
UK	15.1%	63.8	4.9%	-2.9	
BE	2.7%	51.9	0.8%	-7.0	
FR	14.3%	49.8	16.7%	8.8	
IS	0.1%	42.6	:		
Cluster 3					
SI	0.3%	28.0	21.2%	13.4	
IT	10.8%	26.4	10.7%	2.9	
EE	0.1%	21.8	13.7%	5.9	
DK	1.7%	17.8	3.0%	-4.9	
RO	1.0%	17.0	-34.8%	-42.6	
CH	3.5%	*16.1*	:		
ES	7.0%	13.0	21.3%	13.5	
CZ	1.0%	11.4	-39.1%	-46.9	
PT	1.2%	7.3	31.0%	23.2	
DE	19.6%	5.5	8.5%	0.7	
FI	1.4%	5.4	-29.4%	-37.2	
ME	0.0%	3.1	:		
LV	0.2%	2.7	72.3%	64.5	
LT	0.2%	1.7	-19.2%	-27.0	
SK	0.5%	1.4	111.8%	104.0	
BG	0.3%	1.4	33.1%	25.3	
HU	0.7%	1.0	-29.4%	-37.2	
TR	:	0.7	52.4%	44.6	
RS	0.2%	0.6	-12.1%	-19.9	

Note: Break in time series: EU-28 (2012, 2013); BE (2012); 2013 (PT, SE, IS); RS (2014)
For further notes see annex 1
Source: Computed by Science-Metrix from EURAXESS historical data and from Eurostat data (online data code: rd_p_persocc)

The complementary indicator *share of doctoral candidates with a citizenship of another EU Member State* shows that only few countries are below the EU average. The third complementary indicator is the *share of researchers expressing satisfaction that the hiring procedures in their institution are Open, Transparent and Merit-based* for which figures show a well-balanced performance distribution of countries across clusters. Globally the use of the EURAXESS portal seems to be growing strongly in a handful of countries, while only starting up in others. Meanwhile, roughly one out of every dozen PhD candidates in the ERA comes from another European country, and about half of all researchers expressed satisfaction in the hiring processes in their home institutions.

Main findings from Science-Metrix study show the growth of EURAXESS usage varies remarkably across Member States and Associated Countries, depending partially on the availability of alternative vacancies advertising and other factors such as the mandatory requirement to use the EURAXESS portal. It is shown that the benefits of open, transparent and merit-based recruitment policies implementation seem to have more impact on early career stage compared to later career stages where other criteria seem to have more influence toward hiring and promotion decisions. Data highlights that further policy efforts aiming at increasing the portability of grants ("Money Follows Researcher" model) and increasing the degree of openness of national grant programmes to foreign researchers can contribute remarkably to a further improvement of researchers' international mobility.

It is also worth mentioning that heterogeneity in social security coverage remains and discourages mobility from countries with more protective systems. Another finding is that a broader conception of human resourcing is urged in order to improve recruitment as well as working conditions. Pension right transferability and language competency for teaching requirements are flagged as two salient topics here. To address the first issue the Commission put in place a pan-European supplementary pension funds for researchers called Retirement Savings Vehicle for European Research Institutions (RESAVER). This consolidated pension arrangement was launched in 2015 and important steps have been taken to set up the legal structure for the pension vehicle to be running by the end of 2016. Progressive roll out across the European Economic Area will continue.

Regarding the second issue legal barriers seem to have been removed in most countries and the major remaining issue for recruiting established foreign researchers seems to be the national language requirement for teaching. The most attractive systems, such as Switzerland, the United Kingdom and Ireland, do not present this language barrier.

Heterogeneity on how countries faced the 2008 economic crisis, working conditions and salary levels must be considered when discussing mobility. Differences in levels of salary can remarkably hinder mobility to low paying countries for example; foreign researchers must currently be paid local salaries when recruited with Horizon 2020 funds. At the same time, incentives for collaboration within Europe usually reinforce the north-western European nexus.

Another finding is that legal barriers seem to have been removed in most countries and the major remaining issue for recruiting established international researchers seems to be the

national language requirement for teaching. The most attractive systems, such as Switzerland, the United Kingdom and Ireland, do not present this language barrier.

In the National Action Plans the following types of actions are intended:

- Intensify the usage of EURAXESS network for increasing researchers' mobility and ensure compliance with OTM practices across Europe. Therefore the majority of countries have foreseen to increase the number of researchers' position in the field of higher education and research institutions as well as enterprises;
- Foster geographical and intersectoral mobility of researchers by addressing a broader spectrum of social security issues and promote innovative doctoral training to make them more open internationally and to the non-academic sector;
- Promote the Human Resource Strategy for Researchers and aim at acquiring the "Human Resource excellence" award;
- Increase the number of tenure track positions and where necessary implement a new legal basis to facilitate tenure track careers.

Comparing the objectives and measures in the national action plans and the findings of the Science-Metrix report shows that the national action plans are putting adequate attention to the open ad transparent recruitment procedures and are paying attention to the challenges in relation to the social security.

The ERA Stakeholders Organisations have contributed to the effectiveness of national research systems by a number of activities and events such as participating to the Steering Group on Human Resources and Mobility (SGHRM), organising parallel taskforces, common support to the Human Resource Strategy for Researchers trough promotion activities and also monitoring activities such as the survey on "career development for researchers" and "leadership training for researchers" led by CESAER. LERU gathered facts and figures on tenure-track positions at LERU universities (2014). EUA’s Council for Doctoral Education (EUA-CDE) hosted the Third Global Strategic Forum on Doctoral Education in May 2015 and held its ninth annual meeting in June 2016.

ERAC related groups and especially the Steering Group on Human Resources and Mobility can list several achievements, namely the strengthened HRS4R implementation procedure to obtain the 'HR excellence in research' award now incorporates elements of earlier internationalization, open recruitment, international peer review and reinforced monitoring. The SGHRM also produced reports on Doctoral Training and Professional Development of Researchers as well as establishing a working group tasked to elaborate sound recommendations easily usable for Open, Transparent and Merit-Based Recruitment of Researchers which lead the OTM-R toolkit to be translated in institutions. For 2016 the SGRHM sets itself the goals of creating two working groups focus on 'intersectoral mobility, asymmetric mobility and skills' and 'welcoming culture for non-EU researchers',thus supporting the Open science agenda.

Overall Conclusion

The analysis shows that more attention is paid to open, transparent and merit-based recruitment as the use of EURAXESS has increased. Also the national action plans are emphasising the importance of the open and transparent recruitment and are focusing on increasing the use of EURAXESS.
Potential measures to further facilitate researchers international mobility, are ensuring equal access to national granting programmes for foreign researchers and increasing the portability of research funds granted. Of other measures could be a broader conception of human resourcing to improve recruitment as well as working conditions. Pension right transferability and language competency for teaching requirements are equally important topics.

Priority 4: Gender equality and gender mainstreaming in research

In the 2012 ERA Communication three main objectives were identified for priority 4:

1. remove legal and other barriers to the recruitment, retention and career progression of female researchers
2. address gender imbalances in decision making processes
3. strengthen the gender dimension in research programmes.

The ERA Progress report 2014 noted the progressive policy switch towards institutional change in research organisations, including universities, with longer-term structural effects. However the pace of change was too slow and there were still many disparities among countries. The report called for more joint efforts and systematic strategies.

The 2015 ERA Roadmap called for translating national equality legislation into effective action to address gender imbalances in research institutions, and decision-making bodies and to integrate better the gender dimension into R&D policies, programmes and projects as its topaction prioriy. In addition, the Council Conclusions of 1st December 2015 on "Advancing gender equality in the European Research Area" reinforced the message of the Roadmap.

The Science-Metrix report shows progress in the headline indicator *"share of women in Grade A positions in the Higher Education Sector", with 3.4% compound annual growth rate in the period 2007-2014 in the EU-28. This indicator reached 23.5 % for the EU-28 in 2014. Progress is observed in almost all Member States.*

Table 4 Share of women in Grade A positions in the Higher Education Sector (2007-2014)

Country	Weight in GDP	Score (2014)	CAGR (2007-14)	Lead/Gap to EU-28 CAGR
EU-28		**23.5%**	**3.4%**	**N/A**
Cluster 1	1.1%	41.7%	12.3%	9.0
Cluster 2	11.4%	26.4%	4.7%	1.3
Cluster 3	83.3%	20.1%	3.0%	-0.3
Cluster 4	4.2%	15.0%	5.3%	2.0
Cluster 1				
MK	0.1%	*66.7%*	:	
MT	0.1%	44.5%	*34.6%*	31.3
HR	0.3%	38.0%	*6.4%*	3.0
LV	0.2%	*34.4%*	*2.8%*	-0.5
BG	0.3%	34.2%	5.5%	2.1
LT	0.2%	32.6%	12.3%	9.0
Cluster 2				
RO	1.0%	*29.7%*	*-1.1%*	-4.4
IE	1.2%	*28.2%*	*12.7%*	9.3
FI	1.4%	27.9%	2.5%	-0.9
TR	:	*27.8%*	:	
IS	0.1%	*26.3%*	*7.1%*	3.8
NO	2.7%	26.2%	5.4%	2.1
SK	0.5%	25.3%	3.3%	-0.1
PT	1.2%	*25.0%*	*2.0%*	-1.3
SI	0.2%	25.0%	6.0%	2.6
SE	3.0%	24.3%	4.3%	1.0
Cluster 3				
EE	0.1%	23.5%	3.2%	-0.2
FR	14.6%	22.9%	*2.5%*	-0.9
PL	2.7%	22.7%	1.6%	-1.7
AT	2.2%	*21.5%*	*6.0%*	2.6
IT	11.1%	21.4%	2.1%	-1.3
ES	7.1%	21.0%	1.9%	-1.5
EL	1.2%	20.4%	4.3%	1.0
CH	3.6%	*19.3%*	*-1.9%*	-5.3
DK	1.8%	18.1%	*5.4%*	2.0
HU	0.7%	17.9%	-0.7%	-4.1
DE	19.5%	17.9%	5.9%	2.6
UK	14.1%	*17.5%*	:	
NL	4.5%	17.0%	6.3%	2.9
Cluster 4				
LU	0.3%	*16.5%*	*8.6%*	5.3
BE	2.7%	*15.6%*	*6.4%*	3.1
CZ	1.1%	14.3%	1.7%	-1.7
CY	0.1%	13.6%	*4.6%*	1.2
IL	:	*12.7%*	:	

Note: Trend column not presented due to sparse time-series.
For further notes see annex 1
Source: Women in Science database, DG Research and Innovation

The share of female PhD graduates, considered as an input indicator, increased by 1.2% between 2005 and 2012 reaching, 47.3% in the EU-28. This comforts the potential pool for the early phase of researchers' career.

The proportion of published scientific papers that have included the gender dimension in research content can give a very preliminary proxy related to objective 3. For the period 2011-

2014 it ranges from 0.34% to 2.88% within the EU-28. A slight decrease of 0.5% in the growth rate of the EU-28 was registered in the period 2011-2014 compared to the period 2005-2008.

The analysis in the Science-Metrix report shows that one of the main challenges the countries are facing in this area remains the glass ceiling impeding women to reach higher positions. This is reflected in the fact that one third of the researchers are women and at higher level positions the shares of women drop below one fourth. Although data show that a catch up process is ongoing, its pace remains slow.

Concerning the national policies, the National Action Plans show a significant improvement from the state of play reported in the 2014 ERA Progress Report with regard to adopting a systemic strategy and covering the three objectives with specific measures.

The National Action Plans show also that the monitoring of the implementation of gender equality is ongoing or planned, which indicates the growing interest and commitment at national level towards the achievement of gender equality in their research and higher education system.

In the National Action Plans the following types of actions are identified:

- A large number of Plans highlight the development of national strategies including binding laws specific for the research and higher education sector. The implementation includes identifying the causes of existing imbalances and drawing up action to promote equality;
- In relation to objective 1, some Plans include targets for women in professor positions and initiatives promoting work-life balance, raising awareness on unconscious gender bias and attracting young women into science, technologies, engineering and mathematics;
- In relation to objective 2, several Plans include targets for gender balance in executive board and/or board level positions, as well as in recruitment committees and/or evaluation panels in universities and research institutions;
- In relation to the objective 3, some Plans focus on integrating the gender dimension in research and innovation programmes and projects. Grant applicants will be required to consider gender analysis in their research whenever relevant;
- Concerning monitoring, some Plans introduce indicators in addition to the headline one, e.g. the share of universities and public research organisations adopting Gender Equality Plans or the percentage of funds in R&I projects that include gender dimension as a cross cutting issue.

Globally in the National Action Plans the Member States and Associated Countries are paying high attention to gender equality in their implementation of the ERA Roadmap. The extent and quality of ongoing and/or planned actions for gender equality vary a lot. The integration of the gender dimension in research programmes (objective 3) remain a challenge in many Member States.

Almost all ERA Stakeholders Organisations have made contributions and regularly reported their activity. Notably, CESAER launched a survey, EARTO Human Resources working group discussed gender balance, EUA performed data analysis on the gender composition of university leadership and top management, LERU published various

articles on gender and EU-life organized various gender related project including training activities.

Overall Conclusion

The analysis show that the majority of Member States have made progress in setting up or planning more systemic strategies for gender equality in research, including the gender dimension in research programmes. Considering the measures described in the National Plans, it can be assumed that the ERA policy based on institutional change through gender equality plans continues to act as a catalyst for Member States' action. The three objectives remain unevenly covered across Member States. The high number of planned measures creates expectations of significant progress in the coming years. The actual improvement will depend on the capacity of the Member States to maintain and reinforce on a longer term the institutional change strategies adopted so far. In this perspective, the mobilisation of Member States for a proper monitoring mechanism is most valued.

Priority 5: Optimal circulation, access to and transfer of scientific knowledge.

In the 2012 Communication the priority 5 focused on optimal circulation, access to and transfer of scientific knowledge including digital ERA. In the ERA Roadmap it was decided to split the priority into two sub-priorities; knowledge circulation and open access to be able to pay adequate attention to the two subjects individually.

Priority 5a: Knowledge circulation

The aim of the priority 5a is to foster the potential for knowledge transfer and open innovation between the public and private sectors across all ERA countries.

In the 2014 Progress Report it was found that there is a strong support in most countries to knowledge transfer but that in half of the countries there is no frequent financial support. The support to knowledge transfer was mostly seen through: improved recognition and professionalisation of knowledge transfer activities, a strengthened role for knowledge transfer offices and through measures to facilitate interaction and development of strategic partnering and joint research agendas between academia and industry, including small and medium sized enterprises. This would enable a better uptake of research results in the market.

In 2014 75% of the surveyed Research Producing Organisations (RPOs) in EU answered that they have a structure for knowledge transfer and for 66.3% they have staff employed to deal with knowledge transfer activities whereas only 6.8% of the RPOs' budget was financed with private funds.

The ERA Roadmap, as a direct follow up to the 2014 ERA Progress Report, focuses on the top action for ERA countries to "Fully implementing knowledge transfer policies at national level in order to maximize the dissemination, uptake and exploitation of scientific results. RPOs and Research Financing Organisations (RFOs) should make knowledge transfer second

nature by integrating it in their everyday work." The agreed headline indicator , *"the share of product and/or process innovative firms cooperating with public or private research institutions*[9]*"* , is a proxy which is measuring the private sector's willingness to collaborate with public research and higher education institutions.

The analysis carried out by Science-Metrix shows that substantial economic benefits can be derived from the transfer, uptake and actual use of the results of research. It can even be seen as a fundamental step to address grand challenges (priority 2a) and enhancing the social prosperity. Despite these obvious benefit of knowledge circulation, Europe is not yet ready to tapping into the potential to capitalise on the investments in research and the potential these have for growth.

This indicates that there is a large scope for improvements in this area. Studies show that better cooperation and connection between the RPOs and medium sized enterprises and enhancing of funding schemes for collaboration and knowledge transfer are efficient measures. Besides it would be also necessary to focus on the legal side and the educational issues. The main obstacles seem to be missing mutual trust, the lack of entrepreneurial orientation of the RPOs and their private sector partners and issues with the language. The issue is that efficient knowledge transfer and circulation includes also broader range of processes and stakeholders that are involved in Research and Innovation.

The agreed headline indicator, *the share of product and/or process innovative firms cooperating with public or private research*, is a proxy which is measuring *the private sector's willingness to collaborate with public research and higher education institutions*. The average annual growth rate is 3.5% over the period 2008-2012 for innovative firms cooperating with public or private research institutions and 1.3% for innovative firms cooperating with higher education institutions.

[9] Two indicators are used to show the development in the knowledge circulation for the headline indicator as no consolidated data exist on the two categories together. Therefore the following two indicators are used: 1) share of product or process innovative firms cooperating with research institutions (table 5A1) and 2) the share of product or process innovative firms cooperating with higher education institutions (table 5 A2).

Table 5A1 Share of product or process innovative firms cooperating with public or private research institutions (2008-2012)

Country	Weight in GDP	Score (2012)	CAGR (2008-12)	Lead/Gap to EU-28 CAGR	Trendline (2008-12)
EU-28		**7.3%**	**3.5%**	**N/A**	
Cluster 1	8.7%	16.0%	0.4%	-3.1	
Cluster 2	30.1%	10.7%	5.1%	1.5	
Cluster 3	48.9%	6.3%	1.3%	-2.3	
Cluster 4	12.2%	1.7%	0.8%	-2.8	
Cluster 1					
FI	1.4%	23.0%	-0.1%	-3.6	
EL	1.4%	15.7%	:		
SI	0.3%	*14.3%*	:		
NO	2.9%	13.8%	0.8%	-2.7	
BE	2.8%	13.3%	0.4%	-3.1	
Cluster 2					
AT	2.3%	12.6%	14.7%	11.2	
DK	1.8%	10.9%	-7.2%	-10.7	
SE	3.1%	10.8%	8.9%	5.4	
LT	0.2%	10.7%	2.9%	-0.6	
ES	7.5%	10.6%	13.1%	9.6	
HR	0.3%	10.1%	-2.2%	-5.7	
UK	14.8%	10.0%	:		
IS	0.1%	*9.7%*	:		
Cluster 3					
FR	15.0%	8.0%	-1.6%	-5.2	
PL	2.8%	7.8%	-3.8%	-7.3	
LU	0.3%	7.7%	-12.0%	-15.5	
IE	1.3%	*7.1%*	:		
RO	1.0%	6.9%	22.9%	19.4	
LV	0.2%	6.8%	0.1%	-3.4	
NL	4.7%	*6.6%*	:		
PT	1.2%	6.5%	3.5%	-0.1	
DE	19.9%	*5.9%*	:		
HU	0.7%	5.9%	-2.6%	-6.1	
CZ	1.2%	5.7%	-2.3%	-5.8	
TR	:	5.4%	:		
SK	0.5%	5.3%	-11.5%	-15.0	
CY	0.1%	4.7%	11.2%	7.7	
EE	0.1%	4.4%	10.0%	6.5	
Cluster 4					
IT	11.6%	2.8%	12.2%	8.7	
BG	0.3%	2.6%	-9.3%	-12.8	
MT	0.1%	1.5%	-0.6%	-4.1	
RS	0.2%	*0.0%*	:		

Note: Definition differs (added by Science-Metrix): 2012 (EU-28, BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK, NO, RS, TR)
For further notes see annex 1

Source: Computed by Science-Metrix using Eurostat data (online data codes: inn_cis6_coop, inn_cis7_coop, inn_cis8_coop, inn_cis6_type, inn_cis7_type, inn_cis8_type)

Table 5A2 Share of product or process innovative firms cooperating with higher education institutions (2008-2012)

Country	Weight in GDP	Score (2012)	CAGR (2008-12)	Lead/Gap to EU-28 CAGR	Trendline (2008-12)
EU-28		**12.0%**	**1.3%**	**N/A**	
Cluster 1	8.4%	20.7%	2.1%	0.8	
Cluster 2	45.1%	14.7%	0.0%	-1.3	
Cluster 3	33.2%	8.8%	-0.9%	-2.2	
Cluster 4	13.3%	3.8%	-0.9%	-2.1	
Cluster 1					
FI	1.4%	26.2%	-1.5%	-2.8	
SI	0.3%	*22.0%*	:		
AT	2.3%	20.9%	1.7%	0.4	
EL	1.4%	18.6%	:		
LT	0.2%	18.1%	9.3%	8.0	
BE	2.8%	18.1%	-1.2%	-2.5	
Cluster 2					
SE	3.1%	17.1%	4.2%	3.0	
HU	0.7%	17.0%	-2.3%	-3.6	
UK	14.8%	15.9%	:		
DK	1.8%	14.7%	-4.6%	-5.9	
HR	0.3%	14.4%	-0.1%	-1.4	
CZ	1.2%	14.3%	2.3%	1.0	
DE	19.9%	*13.9%*	:		
NO	2.9%	12.8%	0.3%	-1.0	
SK	0.5%	12.6%	0.1%	-1.2	
Cluster 3					
FR	15.0%	11.0%	-2.9%	-4.2	
EE	0.1%	9.9%	8.8%	7.5	
IE	1.3%	*9.8%*	:		
PL	2.8%	9.4%	-3.0%	-4.3	
PT	1.2%	9.3%	1.2%	-0.1	
ES	7.5%	9.2%	11.9%	10.6	
IS	0.1%	*8.4%*	:		
NL	4.7%	*8.3%*	:		
LU	0.3%	7.0%	-12.3%	-13.6	
LV	0.2%	7.0%	-9.8%	-11.1	
TR	:	6.8%	:		
Cluster 4					
IT	11.6%	5.3%	0.2%	-1.1	
CY	0.1%	4.7%	-6.5%	-7.8	
BG	0.3%	4.4%	-1.7%	-3.0	
RO	1.0%	4.3%	-4.0%	-5.3	
MT	0.1%	4.1%	7.6%	6.4	
RS	0.2%	*0.0%*	:		

Note: Provisional: 2008 (EU-28, DK)
For further notes see annex 1

Source: Computed by Science-Metrix using Eurostat data (online data codes: inn_cis6_coop, inn_cis7_coop, inn_cis8_coop, inn_cis6_type, inn_cis7_type, inn_cis8_type)

According to the Science-Metrix study approximately 1 in 9 innovative firms collaborates with academia and about 1 in 12 have partnership with research institutes (private or public) but both indicators are increasing.

The data shows that for the innovative firms' cooperating with research institutes more than 50% of the countries have a performance below the ERA average. The EU average is in addition relatively low at 7.3%. For the second indicator measuring the innovative firms' cooperation with higher education institutions the distribution is more even with approximately 50% of the countries either above or below the EU average. The EU level is in this case 12%.

The general obstacle to the knowledge transfer is the lack of support to the market uptake of research outcome. This issue remains underdeveloped both at EU and national government level. One main obstacle is among others that the private sector employs very few researchers and that the researchers have little experience outside academia. This is particularly true for young researchers.

Efforts are being done in many countries and it has been found that technology and innovation centres are very important in a process to ensure that knowledge is circulated optimally. The core businesses of these centres are to match industry needs with research activities and support the commercialisation of research.

The National Action Plans contain many actions in the field of knowledge transfer, including:

- Legislation for intellectual property management of exploiting the research results of public-private cooperation;
- Establishment of Technology Transfer Offices and their further professionalization;
- Training Programmes in entrepreneurship and corporate culture;
- Development of online tools for IPR issues for public-private cooperation;
- Development of more different career paths that emphasise education and valorisation in addition to research qualities.

Comparing the objectives and measures chosen in the national action plans with the findings in the Science-Metrix report shows that the plans are paying attention to the main challenges of public-private cooperation, entrepreneurship and career development.

The Stakeholders Organisations CESAER has a Task Force Knowledge Transfer (TFKT) which selected 12 universities for a survey on technology transfer. The results will be presented in October 2016.

ERAC has set up a working group on Open Science and Innovation in 2016 that will cover the issues of knowledge transfer under the umbrella of Open Science and Innovation. The work in the group will start in the autumn 2016.

Overall Conclusion

The analysis shows that knowledge transfer is extremely diverse in Europe. There is a need to consider how to integrate the funding into each interlink of the knowledge chain and ensure that the research will more often be brought to the market. The survey carried out by Science-Metrix came up with several proposals like joint industry-academic events, joint industry-RPO calls for application and training and career development initiatives integrating doctoral students with private industry to boost the trust and intensify public-private collaboration and promote intersectoral mobility

Priority 5B: Open Access

Open access has made strong progress since 2014. In the 2014 ERA Progress Report it was observed that open access to research results was backed by a growing number of universities, research centres and funding agencies across Europe. By that time 20 Member States had taken measures to support open access to scientific publications but only 5 had taken measures to have specific provisions on open access to research data. Also the stakeholder organisations had been very active through the ERA Stakeholders Platform set-up in response to the 2012 Communication on ERA. However, despite general support to open access, most policies, initiatives and measures were still fragmented and some did not properly reflect the EU definition of open access.

In the 2015 ERA Roadmap the objective of "Promoting Open Access to scientific publications" was given again a top priority status, while fostering open access to research data was identified as another important priority. The headline indicator is *"The share of publications available in Open Access"*.

Table 5B Share of publications available in Open Access (2014)

Country	Weight in GDP	Total OA	Gold OA	Green OA
EU-28		**52.2%**	**21.0%**	**44.7%**
Cluster 1	0.9%	61.5%	32.8%	43.6%
Cluster 2	51.0%	57.6%	24.7%	48.4%
Cluster 3	28.4%	53.5%	21.4%	45.1%
Cluster 4	19.8%	47.4%	18.1%	39.2%
Cluster 1				
ME	0.0%	65.1%	43.2%	35.5%
LU	0.3%	61.0%	20.6%	57.2%
HR	0.3%	60.4%	34.6%	41.3%
RS	0.2%	59.7%	32.6%	40.3%
Cluster 2				
HU	0.7%	59.2%	25.8%	51.1%
BA	:	59.2%	37.3%	36.1%
PT	1.2%	59.0%	19.6%	52.4%
BG	0.3%	59.0%	19.2%	50.0%
FO	:	58.7%	:	:
NL	4.4%	58.7%	25.3%	51.8%
MK	0.1%	58.5%	28.5%	45.0%
CH	3.5%	58.0%	25.0%	50.6%
BE	2.7%	57.9%	22.5%	51.3%
EE	0.1%	57.7%	22.5%	51.7%
LT	0.2%	57.6%	24.3%	47.4%
NO	2.5%	57.4%	26.2%	50.0%
SE	2.9%	57.0%	25.6%	50.4%
IS	0.1%	56.4%	21.7%	51.7%
CY	0.1%	56.4%	20.9%	48.3%
UK	15.1%	56.4%	26.7%	48.5%
RO	1.0%	56.0%	29.3%	36.6%
DK	1.7%	55.9%	26.5%	47.2%
FR	14.3%	55.8%	18.0%	50.3%
Cluster 3				
PL	2.8%	55.1%	26.8%	40.6%
IE	1.3%	54.6%	22.0%	48.5%
FI	1.4%	54.1%	22.0%	47.1%
IT	10.8%	53.5%	18.7%	47.3%
IL	:	53.4%	19.7%	46.6%
AT	2.2%	53.3%	23.6%	45.9%
SI	0.2%	53.2%	23.7%	43.0%
SK	0.5%	53.2%	20.6%	42.5%
CZ	1.0%	53.2%	21.2%	43.8%
ES	7.0%	53.0%	19.6%	46.4%
EL	1.2%	52.0%	17.8%	44.6%
Cluster 4				
LV	0.2%	50.0%	16.7%	43.2%
DE	19.5%	49.8%	20.5%	43.0%
MD	:	47.3%	15.4%	39.7%
TR	:	47.2%	19.9%	35.1%
MT	0.1%	46.6%	19.5%	40.3%
UA	:	46.5%	10.8%	41.3%
AL	:	44.6%	23.6%	32.0%

Note: The clusters are based on total OA
(:) = missing data
Source: Computed by Science-Metrix using 1science data

According to the Science-Metrix report 24 Member States have adopted policies in support of open access. The majority of these measures have been adopted since 2012, and some countries that were among the early adopters have since complemented their policy with further measures. The open access movement has evolved very rapidly, from a predominantly subscription based model to articles available in open access, passing the 50% 'tipping point' in recent years. For the publication year 2014 approximately 52% of EU-28 publications were available in open access, approximately 45% through the Green route[10] and 21% through the Gold route[1112]. However, open access policies and practices are very diverse and can vary both between countries and Research Funding Organisations. To reach full open access there is a need to further develop publishing models and reward systems, as well as federate infrastructures to share and reuse research data.

Following up on the 2012 Commission's Recommendation on access to and preservation of scientific information[13] each EU Member State nominated a National Point of Reference (NPR), with the task of reporting on the implementation of open access at national level. Most Member States reported a national preference for one of the two routes of open access, either the Green (self-archiving) or the Gold (open access publishing). However, the expressed preference for one of the two routes is usually not exclusive of the other which can also be used, resulting in a mixed situation. Only a few Member States have national laws requiring open access to publications. However institutional requirements set by research institutions or funders can prove as effective as legal requirements, for instance when they tie open access to possible withdrawal of funds in the case of non-compliance, or to researchers' careers.

Perceived obstacles to further progress include the cost of switching to open access, diversity of copyright laws across national contexts, opacity of the legal aspects of rights ownership, private sector concerns about obligations to share data. Researchers researchers are also concerned about the consequences of open access publishing on the assessment of the impact of their work and therefore on career progression.

Open access to research data has also been developing but is at a less advanced stage. Here again we find a great diversity of approaches, both across national policy contexts and at the level of policy implementation by individual institutions. Important technical and financial barriers impede a transition to effective storage and reuse of data, while the lack of data specialists and the insufficient level of data skills among the population of researchers is a bottleneck for effective implementation.

Member States adopted on 27 May 2016 Council Conclusions on the transition towards an Open Science System. In particular they called for making open access to scientific publications the option by default for publishing the results of publicly funded research and supported a transition to immediate open access as the default by 2020

[10] Self-archiving an article in an institutional or subject repository

[11] Publishing an article in either an open access journal or a hybrid open access journal

[12] Note that an article can be available both in green and gold open access, which explains why the overall figure of 52% of open access is not simply an addition of gold and green open access.

[13] C(2012) 4890 final

The ERA National Action Plans pay a lot of attention to concrete actions to promote open access. These include:

- Creating e-infrastructures to enable access to the results of publicly funded research and storage of science-related digital content;
- Developing national strategies and action plans, both for open access to publications and research data including monitoring mechanisms;
- Developing open access policies for business-oriented and applied research;
- Requirements of open access for publicly funded research including archiving in repositories and promoting data management plans;
- Supporting and training actions for researchers including aligning with European Initiatives within Horizon 2020;
- Acquiring licenses for research databases, Concordat on Open research data[14];
- Promoting actions in international bodies to achieve better alignments of definitions.

An analysis of the objectives and measures in the national action plans against the main challenges identified in the Science-Metrix report shows that the main emphasis is still on soft measures supporting open access to data and publications while there is less attention on regulatory aspects. Effective storage and hosting of data is still hindered by important technical and financial barriers[15].

The ERA Stakeholders Organisations have continued to be very active in the field of open access, through organizing dedicated meetings, publishing statements and principles, participating in expert groups, monitoring developments by surveys and organising training programmes. LERU has made a strong contribution by organising dedicated workshops on big data management.

ERAC set up a Task Force on Open Access and Innovation which report was adopted as an ERAC Opinion on Open Research Data on 3 February 2016.

The ERAC report aims to contribute to the progress of open research data and the optimal reuse of research data from publicly funded research. It further highlights the potential of open access policy, while stressing the need to remove obstacles and ensure common understanding early in policy development. It presents a list of 11 recommendations that consider the national, European and global state of play with regard to open research data. These recommendations cover four types of policy objectives: Training of stakeholders and awareness raising; Data quality and management; Sustainability and funding; and legal issues.

Overall Conclusion

Open access to research results (scientific publications and research) is being supported by a growing number of universities, research centers and funding agencies across Europe in recent years. However, as the number of policies and initiatives has increased, this has resulted in a very diverse ecosystem in Europe (e.g. as regards the preference for gold or

[14] See https://www.jisc.ac.uk/news/concordat-on-open-research-data-launched-28-jul-2016
[15] Science Metrix report, section 3.5

green open access). As a next step, more coordination and policy convergence across national borders (including at the level of funders and universities) could be useful, based on the sharing and mainstreaming of best practices. In the case of open research data policies, much still needs to be done and Horizon 2020 provides a useful reference model.

Priority 6: International cooperation

The 2012 ERA Communication sets out that the international dimension in relation to ERA is a so-called cross cutting issue that should be included in each priority. The 2014 ERA Progress Report assessed that it is important that the international dimension is mainstreamed across all priorities.

The 2015 ERA Roadmap included the international cooperation as a new individual priority with the main action 'Develop and implement appropriate joint strategic approaches and actions for international STI cooperation on the basis of Member States' national priorities' with the headline indicator *on "co-publications with non-ERA partner per thousand researchers in the public sector"*.

Table 6 Co-publications with non-ERA partners per 1 000 researchers in the public sector (2005-2014)

Country	Weight in GDP	Score (2014)	CAGR (2005-14)	Lead/Gap to EU-28 CAGR	Trendline
EU-28		**50.7**	**4.1%**	**N/A**	
Cluster 1	13.1%	85.8	4.8%	0.6	
Cluster 2	75.9%	55.1	6.0%	1.9	
Cluster 3	5.8%	27.4	7.7%	3.5	
Cluster 4	4.2%	11.7	3.2%	-1.0	
Cluster 1					
CH	3.5%	*96.6*	*1.4%*	-2.7	
IE	1.3%	87.5	6.2%	2.1	
NL	4.4%	87.1	5.4%	1.2	
CY	0.1%	86.5	8.4%	4.2	
SE	2.9%	85.1	3.8%	-0.4	
DK	1.7%	72.2	3.5%	-0.6	
Cluster 2					
BE	2.7%	62.8	3.0%	-1.1	
UK	15.1%	62.8	5.7%	1.6	
IS	0.1%	62.2	9.9%	5.8	
FR	14.3%	59.7	4.2%	0.0	
AT	2.2%	57.7	2.9%	-1.2	
NO	2.5%	55.3	6.0%	1.9	
IT	10.8%	51.4	2.9%	-1.3	
FI	1.4%	50.5	8.9%	4.8	
DE	19.5%	49.6	0.0%	-4.2	
ES	7.0%	48.7	9.1%	5.0	
LU	0.3%	44.7	13.8%	9.7	
Cluster 3					
SI	0.2%	37.2	5.3%	1.2	
CZ	1.0%	34.3	6.3%	2.2	
HU	0.7%	33.2	3.0%	-1.2	
PT	1.2%	32.2	11.1%	6.9	
MT	0.1%	28.4	16.4%	12.2	
ME	0.0%	27.0	:		
EE	0.1%	24.6	8.4%	4.3	
TR	:	21.4	3.8%	-0.3	
EL	1.2%	21.2	:		
RO	1.0%	20.9	8.6%	4.5	
HR	0.3%	*20.8*	6.3%	2.1	
Cluster 4					
PL	2.8%	16.8	3.0%	-1.1	
RS	0.2%	16.3	*4.6%*	0.5	
LT	0.2%	10.6	7.7%	3.5	
BG	0.3%	10.5	1.4%	-2.7	
SK	0.5%	10.5	1.6%	-2.5	
MK	0.1%	9.2	2.4%	-1.7	
LV	0.2%	8.1	1.6%	-2.6	

Note: Break in time series: BE (2012); 2005 (CZ, IT, UK); 2007 (DK, NO); DE (2006); 2011 (EL, RO, SI, FI); FR (2010); PT (2005-2008, 2013); SE (2005, 2007, 2011, 2013); IS (2011, 2013); RS (2014)
For further notes see annex 1

Source: Computed by Science-Metrix using WoS data (Thomson Reuters) and Eurostat data (online data code: rd_p_persocc)

The analysis in the Science-Metrix report shows a substantive growth rate for the headline indicator at 4.1% in the years 2005-2014. This was slightly higher than the growth rate in the same period for co-publications with ERA partners where the growth rate was 3.6%.

This result is an indication of the increasing internationalization of science in general and the appearance of new international partners, notably within the G20 group of countries. The comparison with the other co-publications indicator within the ERA suggests that although there is already a strong cooperation culture in Europe, the growth rate continues to be nearly as high as for the emerging science nations around the globe, reinforcing the importance of ERA.

Looking at the absolute numbers, differences between EU Member States in order of a factor ten are found between the leading country and the country at the lower end of the scale. Again, a comparison with the related indicator on co-publications within the ERA, though the difference between the two indicators at EU level, reveals that the difference is substantial for cluster 1 and 2; i.e. the cooperation inside ERA is twice as high as the international cooperation. This result underlines the high importance of intra-ERA cooperation, but also the growing importance of the international cooperation.

This interpretation is reinforced by the additional ERA indicators, *the percentage of non-EU doctorate students and the license and patent revenues from abroad* which shed a light on two other dimensions of international cooperation, notably international mobility and international commercial knowledge flows. Both show as well substantive growth rates over the observed time periods. In 2012, already 25% of doctorate students in Europe came from outside the ERA which strongly displays the degree of international mobility in research.

The JRC's RIO country reports as well as the ERA National Action Plans and also the preliminary results of the OECD STI Outlook questionnaire present a broad range of measures and activities of Member States to strengthen their international cooperation dimension.

Main findings in the Science-Metrix report shows that international collaborations with third countries are developing, although Western European nations are leading the way and a gap is opening with the rest of the ERA. In addition, international recruitment is advancing as well, although once again Western Europe is leading the charge on this front, and pulling away from the rest. A broader conception of human resourcing will be important to address the disparities in the research environment that have given Western Europe its present advantage.

The National Action Plans overview on the scope of activities and measures is presented.

- Strategy development at national level in order to facilitate international cooperation and/or international mobility, such as the opening-up of national programs or the legal requirements for foreign researchers;
- Measures towards coherent European approaches; i.e. better coordination between national and EU bilateral cooperation activities, including bi-regional dialogues, and/or between national bilateral cooperation with third countries;

- Communication and Information measures through improving the information flow between the policy level and the research community on international STI cooperation;
- Outreach and networking measures focusing on more targeted international cooperation policy.

There is a growing recognition among Member States of the relevance of international cooperation and for joint action in particular vis-a-vis the emerging science nations, including China and South-Korea. However, often the described activities are geared towards international cooperation in general and less towards the ERA Roadmap top priority, notably to "develop and implement appropriate joint strategic approaches and actions for international STI cooperation on the basis of Member States' national priorities" which is also in line with the findings in the Science-Metrix report.

Major activities contributing to the 'further development, implementation and monitoring of the international dimension of the ERA' by the ERA related groups, especially SFIC. This group has been used as a fruitful framework for cooperation between Commission, Member States and Associated Countries for strategic discussions on international cooperation, to develop operational approaches and to engage in the development of multi annual roadmaps. One example of the support is the new working group on a "Toolbox for international cooperation". SFIC also continued work in the country-specific working groups on Brazil, Russia, USA, China and South Africa.

ERA Stakeholders Organisations have contributed through e.g. a taskforce on internalization by CESAER and various strategic papers including the international dimension (LERU)

Overall Conclusion

Analysis shows that many Member States experience substantial progress concerning their international cooperation capacities over the last years. It seems that the added value from joint approaches in international cooperation between the Member States and the EU as one strategy element beside the existing bilateral cooperation is no longer questioned. Especially smaller Member States underline the need for and the added value of joint approaches in particular vis-à-vis the large existing and emerging science nations.

Conclusion

It is with the current report the first time that progress on ERA has been measured on the basis of the development of a set of indicators in time. The report confirms that ERA has made strong progress during the last years. All headline indicators show progress over time according to the EU-28 averages, although large varieties, both in performance levels as in growth rates between countries exist, see the overview table of the growth rates.

That institutional contexts vary between countries indicates that there is still much room for further progress on all priorities. The EU and its Member States still have not fully implemented ERA as envisaged in the 2012 Communication. Further work is needed by different actors. ERA 'top-scores' can be used as potential benchmarks for countries lagging behind.

The ERA national action plans that have been published by Member States and Associated Countries are a clear proof of political ownership on all ERA priorities and show the high level of ambition to make further progress on ERA.

The Commission's policy agenda on Open Science, Open Innovation and Open to the World will also take the ERA to developments of tomorrow like the digital and global levels. This reconfirms that ERA is an evolving concept in time. New challenges arise and it is up to governments to define how to take advantage of it. There are new barriers to tear down. A successful ERA will lead to Open Innovation, Open Science and Open to the World.

At the same time focus should now turn towards reinforced implementation to deliver on all ERA priorities. This is the responsibility of Member States, with monitoring and policy support from the Commission.

The ERA Stakeholders' Organisations sustained their efforts towards the implementation of ERA priorities. Their commitment was underlined by the signing of a new Joint Statement by the Presidents of the five organisations represented in the ERA Stakeholders' Platform and Commissioner Moedas in June 2015. In addition, the ERA Stakeholders' Platform welcomed new members in 2016, thereby broadening its spectrum of actors. EIRMA, ERF-AISBL, ERRIN, EU-LIFE and TAFTIE were granted observer status after they adopted ERA action plans.

The integration of the monitoring of the ERA Roadmap in the current progress report is a powerful tool to help Member States and Associated Countries define and implement the necessary ERA reforms at national level. Also streamlining with other reports on ERA priorities could be considered. Using the ERA Monitoring Mechanism as a backbone could further strengthen the quantitative foundation of ERA NAPs. The ERA monitoring process could further be strengthened by mutual learning exercises on the basis of a combination of the ERA NAPs and the complementary country snapshots for the next ERA Progress Report.

Growth rates of countries across ERA priorities (headline indicators)[16]

Country	JRC Res Excellence (2010-2013)	GBARD transnat (2010-2014)	EURAXESS job postings (2012-2014)	Women Grade A (2007-2014)	Public or Private research insitutions co-op (2008-2012)	Higher educ-private co-op (2008-2012)	Non-ERA pubs per 1000 res (2005-2014)
EU-28	**6.4%**	**7.8%**	**7.8%**	**3.4%**	**3.5%**	**1.3%**	**4.1%**
AT	2.6%	3.4%	2.3%	*6.0%*	14.7%	1.7%	2.9%
BE	9.5%	1.0%	1.8%	*6.4%*	0.4%	-1.2%	3.0%
BG	0.6%	*16.0%*	-2.0%	5.5%	-9.3%	-1.7%	1.4%
CH	4.2%	:	4.6%	*-1.9%*	:	:	*1.4%*
CY	8.7%	0.7%	-1.4%	*4.6%*	11.2%	-6.5%	8.4%
CZ	1.9%	-3.4%	-39.1%	1.7%	-2.3%	2.3%	6.3%
DE	6.0%	*-1.1%*	8.5%	5.9%	:	:	0.0%
DK	8.4%	-3.7%	3.0%	*5.4%*	-7.2%	-4.6%	3.5%
EE	3.8%	25.7%	13.7%	3.2%	10.0%	8.8%	8.4%
EL	5.5%	*-12.6%*	-8.8%	4.3%	:	:	:
ES	5.9%	6.2%	21.3%	1.9%	13.1%	11.9%	9.1%
FI	5.6%	*-0.2%*	-29.4%	2.5%	-0.1%	-1.5%	8.9%
FR	6.2%	:	16.7%	*2.5%*	-1.6%	-2.9%	4.2%
HR	5.2%	22.5%	308.2%	*6.4%*	-2.2%	-0.1%	6.3%
HU	5.2%	3.8%	-29.4%	-0.7%	-2.6%	-2.3%	3.0%
IE	7.3%	5.7%	17.2%	*12.7%*	:	:	6.2%
IS	:	:	:	:	:	:	9.9%
IT	5.6%	*18.1%*	10.7%	2.1%	12.2%	0.2%	2.9%
LT	-0.6%	24.8%	-19.2%	12.3%	2.9%	9.3%	7.7%
LU	13.6%	35.2%	-26.0%	*8.6%*	-12.0%	-12.3%	13.8%
LV	4.1%	47.1%	72.3%	*2.8%*	0.1%	-9.8%	13.8%
MT	8.0%	-100.0%	:	*34.6%*	-0.6%	7.6%	16.4%
NL	9.1%	10.4%	13.4%	6.3%	:	:	5.4%
NO	7.1%	-3.9%	11.2%	5.4%	0.8%	0.3%	6.0%
PL	3.6%	76.8%	-4.7%	1.6%	-3.8%	-3.0%	3.0%
PT	4.7%	1.4%	31.0%	*2.0%*	3.5%	1.2%	11.1%
RO	1.3%	*9.5%*	-34.8%	*-1.1%*	22.9%	-4.0%	8.6%
RS	-1.5%	:	-12.1%	:	:	:	*4.6%*
SE	5.2%	*-2.5%*	17.0%	4.3%	8.9%	4.2%	3.8%
SI	-1.0%	*-18.4%*	21.2%	6.0%	:	:	5.3%
SK	4.0%	15.7%	111.8%	3.3%	-11.5%	0.1%	1.6%
UK	9.1%	11.0%	4.9%	:	:	:	5.7%

[16] No growth rates for "Availability of national roadmaps with identified ESFRI projects and corresponding investment needs" and "Share of publications available in Open Access".

Country	Performance of countries across ERA priorities (headline indicators)								
	JRC Res Excellence (2013)	GBARD transnat (2014)	Part ESFRI Landmarks (2014)	EURAXESS job postings (2014)	Women Grade A (2013)	Res Inst-private co-op (2012)	Higher educ-private co-op (2012)	Total OA pubs (2014)	Non-ERA pubs per 1000 res (2014)
EU-28	**44.4**	**3,511**	**30.2%**	**47.0**	**20.9%**	**7.3%**	**12.0%**	**52.2%**	**50.7**
AT	48.6	6,958	27.6%	71.3	*20.3%*	12.6%	20.9%	53.3%	57.7
BE	57.2	9,251	48.3%	51.9	15.6%	13.3%	18.1%	57.9%	62.8
BG	17.2	97	6.9%	1.4	31.7%	2.6%	4.4%	59.0%	10.5
CH	97.5	*27,941*	24.1%	*16.1*	19.3%	:	:	58.0%	*96.6*
CY	36.6	3,018	3.4%	81.7	*10.8%*	4.7%	4.7%	56.4%	86.5
CZ	23.4	1,245	48.3%	11.4	*13.1%*	5.7%	14.3%	53.2%	34.3
DE	49.9	*4,686*	69.0%	5.5	17.3%	*5.9%*	*13.9%*	49.8%	49.6
DK	70.2	2,787	44.8%	17.8	19.2%	10.9%	14.7%	55.9%	72.2
EE	29.7	939	20.7%	21.8	*17.2%*	4.4%	9.9%	57.7%	24.6
EL	28.7	1,098	34.5%	78.8	*19.6%*	15.7%	18.6%	52.0%	21.2
ES	33.9	2,385	31.0%	13.0	20.9%	10.6%	9.2%	53.0%	48.7
FI	54.5	3,795	44.8%	5.4	26.6%	23.0%	26.2%	54.1%	50.5
FR	46.5	:	82.8%	49.8	*19.3%*	8.0%	11.0%	55.8%	59.7
HR	17.8	1,569	3.4%	362.0	*38.0%*	10.1%	14.4%	60.4%	20.8
HU	29.7	194	13.8%	1.0	24.1%	5.9%	17.0%	59.2%	33.2
IE	47.3	2,951	6.9%	139.1	*28.2%*	*7.1%*	*9.8%*	54.6%	87.5
IS	40.2	*6,927*	0.0%	42.6	*26.3%*	*9.7%*	*8.4%*	56.4%	62.2
IT	33.0	8,395	65.5%	26.4	21.1%	2.8%	5.3%	53.5%	51.4
LT	16.4	220	10.3%	1.7	*14.4%*	10.7%	18.1%	57.6%	10.6
LU	44.6	3,387	3.4%	73.7	16.5%	7.7%	7.0%	61.0%	44.7
LV	20.1	1,030	0.0%	2.7	34.4%	6.8%	7.0%	50.0%	8.1
MT	22.8	0	6.9%	:	*44.5%*	1.5%	4.1%	46.6%	28.4
NL	70.1	4,101	58.6%	98.7	16.2%	*6.6%*	*8.3%*	58.7%	87.1
NO	56.5	4,414	34.5%	69.1	25.2%	13.8%	12.8%	57.4%	55.3
PL	18.2	678	31.0%	146.7	22.6%	7.8%	9.4%	55.1%	16.8
PT	27.0	749	31.0%	7.3	*25.0%*	6.5%	9.3%	59.0%	32.2
RO	15.7	1,191	13.8%	17.0	29.7%	6.9%	4.3%	56.0%	20.9
RS	14.3	101	6.9%	0.6	:	0.0%	0.0%	59.7%	16.3
SE	66.6	6,067	55.2%	156.1	23.8%	10.8%	17.1%	57.0%	85.1
SI	26.3	955	20.7%	28.0	22.5%	*14.3%*	*22.0%*	53.2%	37.2
SK	18.6	52	6.9%	1.4	23.7%	5.3%	12.6%	53.2%	10.5
UK	72.5	2,561	55.2%	63.8	*17.5%*	10.0%	15.9%	56.4%	62.8

Annexes

Annex 1: Statistical notes and footnotes to tables

The European Research Area and Innovation Committee (ERAC) selected eight core high level indicators (one per priority or per sub-priority for priorities 2 and 5) that are regarded as the most relevant in monitoring progress in achieving the ERA. In addition to these Headline indicators, the ERAC selected two complementary ERA Monitoring Mechanism (EMM) indicators per priority (including the sub-priorities for priorities 2 and 5), resulting in a total of 24 EMM indicators (including the Headline indicators).

Because the goals to be reached in achieving the ERA constitute moving targets, it is difficult to establish reference values to be attained in relation to specific ERA policy actions; some of these targets could become obsolete in between each EMM round. Each table shows country-by-country scores for national performance based on the indicator in question.

In the tables, the countries are sorted in descending order of performance, meaning that the strongest performers appear at the top, with softer and softer performance results as one reads down the table. The countries are clustered into groups based on performance for the same purpose. This clustering operation is based on the distribution of scores for all of the ERA countries for which data is available; countries more than one standard deviation above the ERA average (unweighted) average across the MS/AC for which data is available) for a given indicator are in Cluster 1, the strongest cluster; those at or above the ERA average but within one standard deviation are in Cluster 2; those below the average but within one standard deviation are in Cluster 3; those more than one standard deviation below the ERA average are in Cluster 4, being the least performing cluster. For each country and cluster, the percentage of the ERA GDP that is accounted for by each country and cluster is provided as a reference of the country/cluster GDP weight among the ERA countries; at the cluster level, this helps in appreciating the share of the ERA's global economy that is found in each performance cluster, as well as the importance of the progress — from an ERA-wide perspective — made in each cluster. In addition to a measurement of performance in 2015 (or the most recent reference year for which sufficient data was available at the time of producing this report), the indicator tables also assess changes in national performance over time, computed as a Compound Annual Growth Rate (CAGR) Country-by-country results for performance and growth have been colour-coded to ease the reading of tables, with blue representing the lower scores and orange representing the higher scores. The connection between performance and growth is a point of interest to follow throughout this report, as it shows whether countries lagging somewhat behind are catching up to their stronger counterparts in progressing towards the ERA, or whether the stronger performers are pulling further away from the pack.

The performance–growth connection for each indicator can be assessed visually based on the colour-coding of results: performance scores will always be sorted from orange at the top to blue on the bottom, so if growth scores are predominantly orange at the top and blue towards the bottom, one can conclude that the leaders are pulling away from the pack; contrarily, if growth

scores are predominantly blue at the top and orange towards the bottom, this finding shows that those behind are catching up, closing the gap to the leaders.

The footnotes for each table have been gathered hereunder:

Table 1 Adjusted Research Excellence Indicator (2010-2013)

The adjusted REI is a composite indicator integrating of four components: share of top 10 % most highly cited publications per total publications (data source: CWTS); PCT patent applications per population (OECD); ERC grants per public R&D (DG-RTD, Eurostat, OECD) and participation in Marie Skłodowska-Curie fellowships (DG-EAC). Dates refer to actual data years, except for MSC fellowships. It was calculated using the latest available data as of April 2016 (i.e. 2013), taking into consideration the presence of a citation window for the highly cited publications indicator.
Source: Calculations by European Commission, DG Joint Research Centre, Competence Centre on Composite Indicators and Scoreboards. For details on the methodology, please refer to Vértesy (2015)

Table 2A GBARD (EUR) allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE researcher in the public sector (2010-2014)

The CAGR is computed on the 2010-14 period but the trendline shows data for the period 2007-2014.
Break in time series: EU-28 (2007, 2008, 2012, 2013); 2012 (BE, LV); 2007 (DK, NO); PT (2008, 2013); 2011 (RO, SI, FI); SE (2013); IS (2011, 2013); RS (2014)
Definition differs: 2007-2014 (EU-28, NL, SK); HR (2012-2014); NO (2007-2009); CH (2008, 2010, 2012)
Estimated: 2007-2014 (EU-28, BE, NL); DK (2014); IE (2007, 2014); HR (2013); 2012-2014 (IT, SE); LU (2007, 2014); AT (2008, 2010, 2012, 2014); SK (2007); FI (2011-2014); UK (2010-2014); CH (2008, 2010, 2012)
Provisional: 2014 (EU-28, BE, CZ, DK, IT, CY, LU, MT, NL, AT, PT, SI, UK
Potential outlier: EE (2009); CY (2008); HU (2012)
Eurostat country flags have been retained in the EU-28 aggregate
Missing countries in EU-28 aggregate: Performance (FR); Growth (DE; EL; FR; IT; RO; SI; FI; SE)
Exception to reference year: DE (2013); IS (2013); CH (2012)
Exception to reference period: DE (2011-2013); 2011-2014 (RO, FI); 2012-2014 (EL, IT, SE)
Data unavailable: FR, ME, MK, AL, TR, BA, IL, FO, MD, UA
(:) = missing data
CH is more than four standard deviations away from the mean and was therefore not used in establishing the clusters' boundaries. The data for Researchers in FTE in the Swiss Government sector are only covering the Federal or central government. However, recall that public sector researchers in this study refer to the sum of the Government and Higher Education sectors, the latter usually being much larger than the former. As a result, a bias favouring Switzerland is possible, although likely not that large.
For the Netherlands, data for the category 'National contributions to Europe-wide transnational public R&D programmes' do not include the joint programmes as defined in the JOREP project. All projects have to be approached separately. An "Estimated" flag is used in Eurobase, but it is likely that the real value is underestimated..
Source: Computed by Science-Metrix using Eurostat data (online data codes: gba_tncoor and gba_nabsfin07)

Table 2B Availability of national roadmaps with identified ESFRI projects and corresponding investment needs

References to a 'Latvian Roadmap of National Level Research Centres' may be found online (see e.g. http://connection.ebscohost.com/c/articles/77424776/latvian-roadmap-national-level-research-centres), which describe it as a 'long-term planning instrument that lists research infrastructures on national importance, either new or in need of upgrading' but the roadmap per se is not available.
Source: National roadmaps for research infrastructures: https://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-national-roadmaps

Table 3 Number of researcher postings advertised through the EURAXESS job portal, per 1 000 researchers in the public sector (2012-2014)

Break in time series: EU-28 (2012, 2013); BE (2012); 2013 (PT, SE, IS); RS (2014)
Definition differs: EU-28 (2012-2014); HR (2012-2014); NL (2012-2014); SK (2012-2014); CH (2012)
Estimated: EU-28 (2012-2014); 2014 (BE, DK, DE, IE, LU); AT (2012, 2014); SE (2012-2014); UK (2014)
Provisional: 2014 (EU-28, BE, CZ, DK, DE, FR, IT, CY, LV, LU, NL, AT, PT, SI, UK)
Eurostat country flags have been retained in the EU-28 aggregate
Missing countries in EU-28 aggregate: MT
Exception to reference year: CH (2012)
Data unavailable: MT, MK, AL, BA, IL, FO, MD, UA
(:) = missing data
The data for Researchers in FTE in the Swiss Government sector are only covering the Federal or central government. However, recall that public sector researchers in this study refer to the sum of the Government and Higher Education Sectors, the latter usually being much larger than the former. As a result, a bias favouring Switzerland is possible, although likely not that large. HR is more than four standard deviations away from the mean and was therefore not used in establishing the clusters' boundaries.
Source: Computed by Science-Metrix from EURAXESS historical data and from Eurostat data (online data code: rd_p_persocc)

Table 4 Share of women in Grade A positions in the Higher Education Sector (2007-2014)

Exception to reference year: 2013 (BE, LV, LU, AT, RO, CH); 2012 (IE, PT, IS, MK); TR (2007); 2006 (UK, IL)
Exception to reference period: BE (2007-2014), DK (2006-2014), EE (2004-2014), IE (2003-2012), EL (2000-2014), FR (2006-2014), CY (2006-2014), LV (2007-2013), LU (2006-2013), MT (2004-2014), AT (2006-2013), PT (2003-2012), RO (2007-2013), IS (2007-2012), CH (2007-2013)
Data unavailable: ME, AL, RS, TR, BA, IL, FO, MD, UA
Data prone to yearly fluctuations due to small denominator: MK (6/9 = 66.7 %)
(:) = missing data
MK is more than four standard deviations away from the mean and was therefore not used in establishing the clusters' boundaries.
Trend column not presented due to sparse time-series.
Source: Women in Science database, DG Research and Innovation

Table 5A1 Share of product or process innovative firms cooperating with public or private research institutions (2008-2012)

Definition differs (added by Science-Metrix): 2012 (EU-28, BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, PT, RO, SI, SK, FI, SE, UK, NO, RS, TR)
Provisional: EU-28 (2008); DK (2008)
Low reliability: EU-28 (2008); SE (2008)
Eurostat country flags have been retained in the EU-28 aggregate
Missing countries in EU-28 aggregate: Growth (DE, IE, NL, SI)
Exception to reference year: 2010 (DE, IE, NL, SI, IS)
Data unavailable: CH, ME, MK, AL, BA, IL, FO, MD, UA
(:) = missing data
Source:Computed by Science-Metrix using Eurostat data (online data codes: inn_cis6_coop, inn_cis7_coop, inn_cis8_coop, inn_cis6_type, inn_cis7_type, inn_cis8_type)

Table 5B Share of publications available in Open Access (2014)

The clusters are based on total OA
(:) = missing data
Source:Computed by Science-Metrix using 1science data

Table 6 Co-publications with non-ERA partners per 1 000 researchers in the public sector (2005-2014)

Break in time series: BE (2012); 2005 (CZ, IT, UK); 2007 (DK, NO); DE (2006); 2011 (EL, RO, SI, FI); FR (2010); PT (2005-2008, 2013); SE (2005, 2007, 2011, 2013); IS (2011, 2013); RS (2014)
Definition differs: FR (2005-2009); HR (2012-2014); NL (2005-2014); SK (2005-2014); SE (2005-2007); NO (2005-2009); CH (2006, 2008, 2010, 2012)
Estimated: EU-28 (2008-2010); 2014 (BE, DK, DE); IE (2007, 2014); EL (2006, 2007); LU (2007, 2014); AT (2005, 2008, 2010, 2012, 2014); SE (2005-2014); UK (2005-2008, 2014)
Provisional: 2014 (EU-28, BE, CZ, DK, DE, FR, IT, CY, LV, LU, MT, NL, AT, PT, SI, UK)
Eurostat estimate: PT (2005)
Exception to reference period: CH (2006-2012); RS (2008-2014)
Data unavailable: AL, BA, IL, FO, MD, UA
(:) = missing data
Source: Computed by Science-Metrix using WoS data (Thomson Reuters) and Eurostat data (online data code: rd_p_persocc)

Annex 2: Actions in support of ERA by the various ERA working groups gathering national representatives

Under the authority of the European Research and Innvovation Advisory Group (ERAC) Steering Group, each specialised working groups bringing together representatives of Member States is in charge of one of the ERA priorities. The aim is to foster implementation through reforms at national level. Although an effort has been made to harmonize their mandates, each working group retains its own characteristics, inherited from a complex history.

Each operational working group was asked to report on the success achieved in its activities since the last ERA Progress Report, i.e. over the period 2014-2016.

ERA Priority 2A: High Level Group for Joint Programming (GPC)

Fostering the Joint Programming Process

The first task of the High Level Group for Joint Programming (GPC) mission was to identify and establish the Joint Programming Initiatives (JPIs). By the end of 2014, all ten JPIs had fully functioning governance systems in place. The GPC considered that development as a remarkable success. Althgough the GPC considered that developement as a remarkable success, it acknowledged that this achievement fulfilled only part of the objectives of the Joint Programming Process (JPP).

As a result, the GPC explored ways on how to best contribute to foster the JPP and established new working methods in order to become more operational. Four Working Groups (WGs) were set up dealing with issues related to the collaboration between the GPC and JPIs, the promotion of alignment, the Framework Conditions for JP and the JPIs' progress and impact. The final reports of the WGs were adopted by the GPC in September 2014.

Building on the WGs' reports, the GPC considered, among others, the following elements as being crucial for the development of the full potential of the JPP:

- Commitment and support from both the participating countries and the EC towards the JPP and the JPIs must be strengthened;
- Following the adoption of Strategic Research Agendas in the context of JP, the participating countries should follow a strategic approach to, when appropriate, align their national programmes, priorities or activities, with a view to implementing changes to improve efficiency and effectiveness of investment in research;
- ***JPIs must become strategic hubs or platforms for research and innovation*** in their respective challenge and be used as such by all relevant actors and stakeholders;
- The interoperability of national research systems should be spurred also by reducing the degree of divergence of terminology, rules and procedures for funding R&I throughout MS and AC;
- Effective methods, parameters and indicators for measuring the impact of the JPIs on their respective societal challenge, and of the JPP in general, must be developed and implemented.

GPC Self-Assessment

During the last months of 2014, the GPC has gone through a self-assessment of its activities. The exercise indicated a widespread willingness to enhance and streamline the cooperation between the GPC and the other ERA-related Groups, including ERAC, to produce a more comprehensible

and coherent picture. Furthermore, the GPC clearly expressed its wish to see its mandate updated, according to the requirements of the new scenario, and to be involved in the preparation of the relevant aspects of the ERA Roadmap.

Implementation Groups

In early 2015, the GPC established 3 Implementation Groups (IGs), in order to build on the work of the previous WGs and to promote and facilitate full implementation of their recommendations.

The IG1 on "*Fostering Relationships among the JPIs and the GPC*" provided the essential elements for the drafting of a document on *"Keeping the GPC up to the job – Tasks and Profile of the GPC Delegates"* and led to the decision of inviting, wherever possible, the JPIs' Representatives to the meetings of the GPC.

The IG2 on "*Improving Alignment and Interoperability*" performed an alignment mapping exercise which highlighted the importance of a high level national commitment, of an overarching inclusive national strategy, and of using the national budget as an instrument for promoting alignment. Interestingly, also the national governance of the JPP was explored, which led to a set of recommendations.

The IG3 on "*Monitoring and Evaluation*" mainly focused on the establishment of minimum conditions for JPIs to be used both for possible new JPIs, as well as for the assessment of the existing ones.

The final reports of the IGs were adopted by the GPC in late 2015 and 2016.

Lund Declaration 2015

In December 2015, a high level conference, entitled '*Lund Revisited: Tackling Societal Challenges',* was organised to discuss the progress that had been made since the Lund Declaration of 2009 and propose an updated Lund Declaration 2015. The updated Declaration identifies four priority areas (alignment, frontier research and European knowledge base, global cooperation and achieving impact on challenges) and calls on all stakeholders to take these priorities into account in their field of responsibility.

Revision of the GPC Mandate

The revision of the GPC mandate was accomplished according to the main concept that *"**the focus of the GPC activity should shift from the JPIs to the JPP**".* After extensive discussions, the renewed mandate was adopted by the GPC on 12 February 2016 including the 'common clauses' of all the 'ERA-related Groups'.

Hernani's Report

In June 2015 the EC established an Expert Group (chaired by J. Hernani) to carry out an *'Evaluation of Joint Programming to Address Grand Societal Challenges'*.

The key message from the Hernani Report (March 2016) is that the *'Joint Programming Process does not yet have sufficient Commitment from national stakeholders to achieve its potential'*. The final recommendation of the Group is therefore addressed to all policy stakeholders who will play an influential role in the planning process, due to start in 2017, for the next Framework Programme (FP). The Group recommends that *'each of the JPIs should be invited to consider their longer term strategy in terms of socio-economic impact objectives/deliverables and what support instruments they would need from the next FP'*.

WG on the "Long Term Strategy of Joint Programming»

Following the Lund Declaration 2015, the output of the Annual Conference of JP (organized by ERA-LEARN 2020 in Jan. 2016) and the recommendations given by the Hernani Report, the GPC decided (April 2016) to establish a WG on the ***'Long Term Strategy of Joint Programming'*.** The WG is composed of volunteering GPC delegates, JPIs representatives and representatives of the EC.

The main output of this WG is not an additional evaluation of the JPIs, but a general framework for JPI long- term strategy which will serve as a basis for GPC recommendations regarding the future of JP in the next FP. Moreover, as a first step towards a common approach for connecting the JPIs and the next FP, the Working Group will also prepare a proposal for the positioning of JPIs in the Work Programme 2018-2020.

Mutual Learning Exercise

In addition, to enhance the alignment process, the GPC decided to launch in collaboration with the EC a Mutual Learning Exercise (MLE) on *"Alignment and Interoperability of Research Programmes"* using the 'Policy Support Facility' (PSF) under H2020. The MLE will run in sequences and is expected to support the countries to find solutions for increasing MS/AC and EC commitment to the joint programming process and to the JPIs, for enhancing alignment of strategies and programmes and for improving interoperability among MS/AC instruments and with the EC instruments.

Future Vision

A synthesis of the GPC view on the state-of-the-art and its vision for the near future includes the following:

- a genuine joint programming of research strategies, programmes and activities is at the core of the full implementation of the ERA in the corresponding priority area of the societal challenges;
- joint funding activities are not per se making a genuine JPP to develop and grow;
- a stronger effort of the national scientific communities and an effective political will of the decision makers are required for aligning strategies, programmes and activities on major societal challenges;
- most likely, a more visible role of the JPIs within the H2020 could contribute to effectively developing JPIs as strategic hubs for the European research on major societal challenges.

ERA Priority 2B: European Strategy Forum on Research Infrastructures (ESFRI)

In **2014**, ESFRI published a **prioritisation report**[17], identifying a limited number of projects from the ESFRI roadmap[18], which were mature enough to be under implementation by 2015-2016 and were considered essential to extend the frontiers of knowledge in the fields concerned. This task implied a strong involvement of the different ESFRI Strategy Working Groups.

[17] https://ec.europa.eu/research/infrastructures/pdf/ESFRI_projects_for_impl_7_april_2014.pdf

[18] https://ec.europa.eu/research/infrastructures/pdf/ESFRI_projects_for_impl_7_april_2014.pdf

The prioritisation exercise started from the report of the Assessment Expert Group (AEG), published in September 2013. This AEG report[19] provided a snapshot of the status of implementation of 36 projects on the ESFRI Roadmap, not including the already implemented "success stories" and two other projects that fall within the domain of EURATOM.

ESFRI Chair communicated the short list of projects to the Greek Presidency of the Council. The Competitiveness Council conclusions (adopted on 26 May 2014) acknowledged the work done by the ESFRI on prioritisation of projects for implementation and welcomed plans to update the ESFRI roadmap with new research infrastructures of pan-European interest.

In 2014 ESFRI revised the structure of the ESFRI Roadmap and the methodology to be followed for the 2016 update. Main innovations were a) the ten-year rule that limits the permanence of a proposal on the Roadmap: implementation is expected to occur within ten years of the first entry; b) after ten years the project leaves the Roadmap unless it moves to the list of implemented/science performing research infrastructures newly defined as ESFRI Landmarks, or it can re-apply as project in competition with new proposals and only after deep revision or reorientation; c) the extensive Landscape Analysis of all the RIs performing services and open access to the European scientists in all the domains covered by ESFRI.

Consequently in 2014 the **Strategy Working Groups** started developing a landscape analysis in their respective scientific fields - Energy, Environment, Health and Food, Physical Science and Engineering, Social and Cultural Innovations. The Physical Science and Engineering Strategy Work Group (PSE SWG) created an ad-hoc Working Group to develop a thorough analysis of the European Landscape of Research Infrastructures devoted to Neutron Scattering and Spectroscopy, and its evolution in the next decades. The rationale behind this decision was that on one hand the ESFRI project ESS-neutrons was launched. But on the other hand, a number of national facilities, based on nuclear reactor sources, had announced their termination creating a complex cross-over dynamics that needed to be well understood in order to plan strategically the availability of neutron resources for European science in the period 2020-2050. This Neutron Landscape Group (NLG), co-chaired by Prof. Colin Carlile (former Director General of the ILL and of the ESS-Scandinavia) and Prof. Caterina Petrillo (now vice-chair of the ESS Council) has delivered a report[20] that was published in 2016 as the first "ESFRI Scripta".

Following the 28-29 May 2015 Competitiveness Council meeting, ESFRI was invited to explore mechanisms for better coordination of Member States' investment strategies in e-infrastructures, covering also HPC, distributed computing, scientific data and networks. For this purpose, ESFRI launched a **Working Group on investment strategies in e-infrastructures**, chaired by Mr. Sverker Holmgren (also e-IRG Chair). This Working Group will provide its final recommendations in late 2016.

ESFRI activities in **2015** focused on implementing the innovative scheme of the 2016 ESFRI Roadmap. The process included the following steps:

[19] The assessment was based on a detailed methodology described in the report that looked critically at all non-scientific aspects of the projects, i.e. governance, management, funding, legal issues, etc. The AEG report gave a reasoned assessment of the status of maturity of each of the projects under these aspects and, specifically, of their likelihood of reaching the official kick-off of the implementation phase by the end of 2015, as sought by the "Innovation Union". The AEG rated the projects that they assessed under 3 categories: Category 1 – "ready for implementation in 2015" (although may not be fully secure in terms of financial commitments); Category 2 – "might be able to achieve maturity by 2015, if substantial actions are implemented to address the bottlenecks and weaknesses"; and Category 3 – "minimal chances of achieving maturity by 2015 for various reasons".

[20] http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-publications

- Assessment of Implementation of projects which entered the Roadmap in 2008 and 2010;
- Collection of new proposals submitted to the 2016 ESFRI Roadmap;
- Evaluation of proposals consisting of scientific assessment and the assessment of maturity;
- Selection of ESFRI Projects and ESFRI Landmarks to be included in the Roadmap;
- Preparing the landscape analysis of large-scale research infrastructures in Europe;
- Drafting of the 2016 ESFRI Roadmap document.

The **ESFRI Roadmap 2016 document**[21] consists of three Parts. Part 1 provides the outline of the ESFRI strategic considerations in the development of research infrastructures in Europe as well as gives an overview of projects included in the Roadmap, the methodology, lessons learnt and the outlook into the future.

The Roadmap contains 21 ESFRI Projects[22] and 29 ESFRI Landmarks[23], whose detailed descriptions are included in Part 2. ESFRI selected new projects following evaluation by a) the Strategy Working Groups with respect to their scientific excellence, pan-European relevance and socio-economic impact and b) with respect to their degree of maturity as benchmarked against an "assessment matrix" developed by the ESFRI Implementation Group (IG).

Other proposals that did not enter the Roadmap were described in the landscape analysis as having a high potential of scientific excellence and/or complementarity to existing ESFRI Projects or Landmarks. These are expected to compete for future updates or coordinate with existing RIs.

The landscape analysis contained in Part 3 of the Roadmap document provides the current context, in each domain, of the operational national and international research infrastructures open to European scientists and technology developers through peer-review of competitive science proposals. It represents an impression of the European RI ecosystem. This responds to the invitation by the Competitiveness Council to broaden the view of ESFRI beyond the Roadmap list of projects. It has been produced by the five Strategy Working Groups (SWGs) of ESFRI that are composed of well-recognized scientists and are coordinated by a member, or a permanent expert, of the ESFRI Forum. The e-infrastructures landscape, transversal to all domains, has been elaborated by the e-Infrastructure Reflection Group (e-IRG). The landscape analysis is a key ingredient of the new ESFRI evaluation methodology as it supports the understanding of the impact of new projects. It does not represent in any way the view or prioritization of ESFRI or of any Member State for commitments or future investments. ESFRI in no case acts as an advocate of specific potential future projects. ESFRI and its Member States have taken note of it.

With the 2016 ESFRI Roadmap update, the process incorporated the necessary steps to further strengthen the RI ecosystem in the years to come. ESFRI will continue to update its roadmap in 2018, further refining its methodology, and offering opportunities to new projects in all fields of science.

[21] https://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-roadmap

[22] These ESFRI Projects consist of nine from the 2008 Roadmap, six from the 2010 Roadmap, five new projects plus one reoriented project that were selected from among twenty eligible proposals that were submitted in March 2015.

[23] ESFRI Landmarks are the successfully implemented ESFRI projects delivering science services or effectively advancing in their construction

The ESFRI Roadmap 2016 was launched on 10 March 2016, in Amsterdam. The event was organized under the Dutch Presidency by the Royal Netherlands Academy of Arts and Sciences (KNAW) in close cooperation with ESFRI, the European Commission and the Dutch Ministry of Education, Culture and Science. Discussions focused on strategic road-mapping, long-term sustainability and the socio-economic impact of research infrastructures.

In 2016 the ESFRI **Innovation Working Group** published its report[24] to contribute to the development of a strategy aimed to strengthen and improve the relations between Research Infrastructures and Industry and to promote the potential for innovation of Research Infrastructures.

ESFRI presented the 2016 Roadmap in the Competitiveness Council meeting of 27 May 2016. The Council conclusions welcomed the identification of ESFRI Landmarks and recognised their continued strategic role in driving scientific excellence and innovation in Europe and called on ESFRI to closely monitor the implementation of ESFRI projects, to periodically assess the scientific status of ESFRI Landmarks, and to prepare the next ESFRI Roadmap update in 2018.

As a follow-up of the May Council conclusions, ESFRI started to streamline the Roadmap methodology in order to prepare the 2018 Roadmap Update.

Specifically on Long term sustainability of Research Infrastructures, the Competitiveness Council conclusions invited the Commission to prepare together with ESFRI and relevant stakeholders a targeted action plan". As a follow-up, ESFRI created a **dedicated Working Group on Long term sustainability of Research Infrastructures**, which will start its' activities in the last trimester of 2016.

ERA Priority 3: Steering Group on Human Resources and Mobility (SGHRM)

The SGHRM aims to advise and support the Commission on aspects related to **the implementation of ERA[25] and its impacts** at national level, monitoring developments related to researcher careers and mobility at EU level. In this respect, **ERA priority 3 is 'key'** for the work of the group which is focusing on this priority since its establishment in 2001 while **priorities 1, 2 and 4 are inextricably linked**.
The group contributes to **creating awareness on European/national level** and provides the **forum for mutual learning and exchange of good practice** among MS and AC, while reinforcing a consistent implementation of actions of common interest or inspiring new or improved actions.
Its main task is the definition of Community actions within the ERA Framework by liaising with other relevant groups and stakeholders to make better use of existing initiatives, such as the EURAXESS activities by **strengthening links with the national Bridgehead Organisations** and by ensuring **effective coordination with activities of HORIZON 2020** and the relevant Programme Committees with the aim of **supporting a coherent development of policies** and measures at national level and by **enhancing complementarities and synergies** between national and Community actions.

[24] https://ec.europa.eu/research/infrastructures/pdf/esfri/publications/wginno_final_report_032016.pdf#view=fit&pagemode=none

[25] *COM(2012)329*

The SGHRM provide **regular updates and advice to ERAC** or to the Competitiveness Council as appropriate on the work undertaken and the results achieved.

Main achievements and action taken

According to its workplan, the SGHRM has recently **developed a strategy to reach by 2020 the aim of *'recognizing researchers as professionals'*** in order to achieve a fully open labor market for researchers. All recommendations and reports on various aspects contribute to this ambitious challenge and already to date, much progress has been made.

1. **Portable pensions for researchers (RESAVER)**
   The mobility of researchers being a driver of excellence in research, researchers still face many difficulties in preserving their supplementary pension benefits when moving between different countries, an issue that was identified by the SGHRM as a major barrier to mobility.
   In creating a **single European pension arrangement (RESAVER)** offering a defined contribution plan, tailor-made for research organisations and their employees, a significant momentum was reached at the launch of RESAVER[26] on 1 October 2014.
   RESAVER will now enable mobile and non-mobile employees to remain affiliated to the same pension vehicle when moving between different countries and changing jobs.

2. **Doctoral Training and Professional Development of Researchers**
   In 2014 the SGHRM produced two key reports on **Doctoral Training**[27] and **Professional Development of Researchers**[28] which were adopted by the Member States. As a real example of the transposition from policy to practice, it is worth noting that the group's work on Doctoral Training has been integrated into Horizon 2020 especially within the Marie Sklodowska Curie Actions.

3. **Open, Transparent and Merit-Based Recruitment of Researchers (OTM-R)**
   Open Recruitment being still an issue in a certain number of Member States and Associated Countries, the SGHRM established a working group tasked to elaborate sound recommendations easily usable for **Open, Transparent and Merit-Based Recruitment of Researchers**. The report was approved by the SGHRM in June 2014 and contributed directly to reinforcing the HRS4R implementation procedure under preparation in parallel. This report provides a highly valuable tool (OTM-R Checklist[29]) for institutions planning to ensure the openness and transparency of their recruitment processes for researchers.

4. **Strengthening the procedure implementing the principles of Charter and Code (HRS4R)**
   In parallel, a mixed group of members of the SGHRM and specialized experts tackled the **issue of strengthening the implementation of the Charter and Code principles** in research institutions. This group was set up in follow-up of a feasibility study which presented the issue of strengthening as the best option.

[26] *See http://europa.eu/rapid/press-release_IP-14-1063_en.htm and http://www.resaver.eu*
[27] *http://ec.europa.eu/euraxess/pdf/research_policies/SGHRM_IDTP_Report_Final.pdf*
[28] *http://ec.europa.eu/euraxess/pdf/research_policies/Final%20Report%20of%20the%20ERA-SGHRM%20WG%20on%20Professional%20Development%20of%20Researchers%202014.pdf*
[29] *http://ec.europa.eu/euraxess/pdf/research_policies/OTM-R-checklist.pdf*

The strengthened **HRS4R** implementation procedure to obtain the '**HR excellence in research**' award now incorporates elements of earlier internationalization, open recruitment, international peer review and reinforced monitoring while **moving from measuring progress towards quality**, thus remaining a flexible, but essential tool for institutions engaged in the HRS4R process.

On-going and upcoming actions in the second semester 2016

In 2015, the SGHRM also established 2 further working groups focussing on specific topics related to ERA Priority 3 and working to an agreed mandate under the chair, with membership of the SGHRM, including selected external experts and major European stakeholder organisations (e.g. EUA, LERU).
As a general rule, such groups are expected to report back within a defined timeline, usually 6 months. These 2 working groups focus on '**intersectoral mobility, asymmetric mobility and skills**' and '**welcoming culture for non-EU researchers**' to Europe (linked to the EURAXESS initiative of '**Science for Refugees**').

5. **Inter-sectoral Mobility and Skills**
   The objective is to identify and propose solutions to overcome barriers for mobility of researchers across sectors. One significant barrier is **transferable skills**, which are often requested from industry and business, but not a regular part of training of PhDs and post docs. These issues are highly relevant in a culture of the 3Os policy initiative by Commissioner Moedas. This initiative advocates the advancement of knowledge and innovation through a collaborative approach, seeking solutions to overcome these obstacles and recommend adequate actions to the European Commission, national research councils, research institutions (HEIs) and potential employers in the private and public sector. The report is close to finalization and should be approved by the SGHRM in September 2016.

6. **Welcoming culture for non EU researchers**
   This group deals with asymmetric flows of researcher mobility, including particularly services for incoming researchers to Europe. The WG discussing measures and innovative transnational mobility initiative in order to take into account the asymmetry of researcher mobility brain drain within Europe and include the issue of diaspora researchers. The work of this group is contributing to the broader policy of Open to the World. The report is currently to be finalized and will be presented to the SGHRM in December 2016 for approval.

Open Science, Open Innovation and Open to the World being Commissioner Moedas' recent policy initiative, the SGHRM was tasked to take care of 2 working/expert groups reporting directly to the Open Science Policy Platform advising Commissioner Moedas.

7. **Modernisation of scientific career assessment in an Open Science environment (Rewards)**
   Modernisation of scientific career assessment including elements related to 'recognition/rewards/incentives' guaranteeing fair/equal career development of individual scientists is a top priority to be addressed. The mixed working group (SGRHM/experts) is currently working on sound **recommendations to modernize the current career assessment system** based on (biblio)metrics. The group also works with Member States & Council Presidencies to follow up on the 2012 Recommendation on Scientific

Information to ensure that at MS level the **academic career system supports and rewards researchers working in a culture of OS**. A final report is expected by the beginning of 2017.

8. **Open Science education and training of researchers (Skills)**
   Open Science education and training tailored to all research career stages (R1 to R4) as well as in early education while developing **links with the European Skills agenda** is another top priority while at a policy level this activity would need the **linkage between ERA and the EHEA**. The group is expected to deliver a finalized outcome in early summer 2017.

Both groups will **promote and encourage implementation of best practices of Open Science issues**. In particular, the SGHRM will raise awareness in the Member States to ensure that Open Science education and training is offered in all curricula and at all levels and that ideally all research institutions are to take up the modernized career assessment system for the best and harmonized equal treatment of researchers.

In the context of the SGHRM's **strategy towards *'recognizing researchers as professionals'*** in order to achieve a fully open labour market for researchers, the SGHRM currently started, in follow-up of the **Young Researchers' Bratislava Declaration**, an **in-depth discussion with the upcoming Presidencies** to ensure progress of the research career file tackling it under diverse aspects within the next years.

ERA priority 4: Helsinki Group on Gender in Research and Innovation

The Helsinki Group on Gender Equality in Research and Innovation (the HG) gives strategic policy advice to the Commission and the Council on policies and strategies on gender equality in Research and Innovation (R&I) at European, national and regional levels; contributes to creating awareness at European and national levels of European, national and regional policies and strategies related to gender equality in science, technology and innovation; and provides a forum for mutual learning and best practice exchange among member states and associated countries related to advancing gender equality and gender mainstreaming in science, technology and innovation in the ERA, thus contributing to policy coordination of ERA Priority 4.

The HG brings together representatives of national authorities, and thus provides authoritative advice reflecting positions of MS and AS. The HG also plays a vital role in the policy coordination of gender equality and gender mainstreaming in research and innovation at the EU level and between the MS and the Commission. In line with the ERA Communication of 12 July 2012, the HG provides strategic policy advice, including to RFOs and RPOs, on gender balance in leadership and decision-making positions, gender balance in research careers and integration of gender dimension in research programmes.

The HG currently has four subgroups to move ahead its Work Plan. Formed in 2014 are (a) subgroup on the Cooperation with other ERA-related groups, with mandate to foster cooperation with these groups, with a particular focus on SGHRM and SFIC; (b) subgroup on ERA governance with a mandate to foster coordination and mutual learning among MS with a view to implementing Priority 4; (c) subgroup on H2020, with a mandate renewed in April 2016 as subgroup on European funding systems, to develop advice on gender equality and gender mainstreaming in H2020, the upcoming framework programme and European Structural Funds, including the integration of the gender dimension in research content, and (d) subgroup on awareness raising with a mandate to draft background documents to facilitate the work of HG

members (work completed and subgroup terminated). Formed in 2016 is: (d) subgroup on gender balance in decision-making with a mandate to deliver guidance in line with Council Conclusions on advancing gender equality in ERA.

As an ERA-related group, the HG is aligned with the new ERA governance structure.

Main achievements and action taken

1. Recommendation delivered to the Commissioner on role and responsibilities of NCPs with regard to gender equality in H2020 and on the evaluation of the gender dimension in H2020. In 2015 the HG communicated recommendations to the Commissioner on the role and responsibilities of NCPs in providing information on gender equality and gender mainstreaming in H2020 calling for training activities to be stepped up in NCP networks. Secondly, the HG submitted recommendations on the evaluation of the gender dimension in H2020, calling on the Commission to comply with its own commitments and highlighting the importance of coordination between Commission and MS policies and actions. These recommendations were communicated to the Commissioner through a letter of 25 June 2015.

2. The Rome Declaration: The HG co-chair participated in the IT Presidency Conference "Science, Innovation and Society: Achieving Responsible Research & Innovation" and HG provided strategic advice to include gender equality and gender dimension in research content in the Rome Declaration (2014).

3. Development of comparable European statistics and indicators. Throughout 2014 and 2015 the HG members and statistical correspondents supported and advised the Commission in the preparation of comparable European statistics and indicators on gender equality in R & I and provided feedback and comments on individual chapters of the 2015 She Figures. HG members liaised with their respective national statistical correspondents to coordinate the national data collection and verification.

4. A particular achievement was the work to support the Luxembourg Presidency in the preparation of Council Conclusions on gender equality in the European Research Area of 1 December 2015.

On-going and upcoming actions in the second semester 2016

1. Guidance on gender balance in decision-making positions. In line with the Council Conclusions on advancing gender equality in the ERA, a subgroup on gender balance in decision-making was formed in April 2015, with the mandate to map and assess current practices and policies to support gender balance in decision-making positions with a view to giving guidance to MS in this regard. The work of the subgroup is planned for completion by the end of 2016, with dissemination to commence as of 2017.

2. Joint HG/SFIC guidance on gender dimension in international cooperation in STI. In line with the Council Conclusions on advancing gender equality in the ERA, the subgroup on cooperation with other ERA-related groups, formed in 2014, initiated contact with SFIC, to carry out the task. In fall 2016, rapporteurs will be appointed in both groups, to coordinate the work, which is scheduled for completion by the end of 2016.

3. Recommendation to the Commission and the Council on the inclusion of gender equality and gender mainstreaming in NCP activities. Following a questionnaire survey among MS and AS carried out in 2015 and again in 2016, recommendations will be delivered to the Commission and Council following the adoption of the recommendations in September 2016.

4. Mutual learning and coordination of ERA Priority 4. Building on its long-standing objective to facilitate mutual learning between more and less advanced countries, following the adoption of national strategies and actions to implement ERA Roadmap, the HG will regularly at its meetings feature 3 national presentations of ERA Roadmap Priority 4 actions and indicators.

ERA priority 6: Strategic Forum for International Cooperation (SFIC)

As the ERA-related Group responsible for ERA Roadmap Priority 6 (International cooperation), SFIC has during mid-2014 – mid-2016 contributed both to the external dimension of ERA[30] and to the ERA Roadmap process.

SFIC's main task is to provide 'strategic and timely advice on international S&T cooperation´ including 'the implementation and further development of the ERA Roadmap'. The activities have mainly been carried out in line with SFIC Work Programme 2015-16[31] including a specific section on 'Contribution to further development and implementation of the ERA Roadmap'.

Major activities contributing to the 'further development, implementation and monitoring of the international dimension of the ERA'

- SFIC has been used as a fruitful framework for cooperation between Commission, Member States and Associated Countries:
  - to build a more open and strategic discussion on ways to improve structured policy coordination and a more open and transparent approach vis-à-vis Joint Science and Technology Cooperation Commitee (JSTCC) meetings and bi-lateral dialogues (both at national level and EU-level);
  - to have an operational approach towards enabling SFIC to propose activities in support of policy dialogues (in the framework of the future Service Facility in support of the strategic development of international cooperation in research and innovation); SFIC has appointed a rapporteur in order to consolidate input from SFIC;
  - to discuss and engage in the further development of the Multi-Annual Roadmaps process and the 2nd Report on the implementation of the EC's international R&I Strategy where SFIC engaged with constructive input to the EC during the whole process through e.g. several Workshops.

- SFIC has provided sound and timely advice to Council/Commission via relevant opinions on:
  - the implementation of the Strategy for international cooperation in research and innovation of the European Commission[32] and the related Reports, with SFIC reiterating its recommendation to systematically include Member States in the further implementation of its strategy for international cooperation and the Multi-Annual Roadmaps;
  - ERA Governance: Review of the status, the mandate and the reporting lines of SFIC[33];

[30] It is worth noting that SFIC's contribution to ERA Roadmap Priority 6 is not the exclusive remit of SFIC's activities, as many initiatives are covering areas of action not specifically touched upon by the ERA Roadmap (e.g. initiatives by SFIC country-specific working groups).
[31] ERAC-SFIC 1353/15, as adopted on 12 February 2015.
[32] ERAC-SFIC 1352/15, as adopted on 27 January 2015
[33] ERAC-SFIC 1355/15, as adopted on 4 March 2015.

- common principles for the conduct of international R&I cooperation[34], as response to a Council request, including a mapping of global research standards, a questionnaire amongst Member States and interactions with relevant stakeholders.

- SFIC has contributed to the new priority of the European Commission and in particular 'Open to the world':
  - opinion on Commission's "Open to the World" agenda[35] where SFIC in particular highlights:
    - *SFIC considers that strengthening the external dimension of the European Research Area (ERA) is a key element towards a more coherent and efficient interaction in research and innovation at a global level;*
    - *SFIC believes that Europe, its Member States and Associated Countries should benefit from and engage more in already existing or planned specific R&I initiatives, for instance joint R&I programmes or regionally-targeted initiatives, as well as developing new ones;*
    - *As an advisory body, SFIC is ready to continue to play an active role by supporting external policy, contributing to science diplomacy, serving as an exchange platform to discuss implementation of S&T cooperation agreements or strengthening its networking with stakeholders.*

- SFIC has created a new working group on a "Toolbox for international cooperation"[36], with the objective to develop a practical overview for Member States, Associated Countries and the Commission in their implementation of international STI agreements and STI cooperation activities at bilateral and multilateral level. Based on already initiated activities, such as the comprehensive gathering of information from MS/AC/EC by means of a questionnaire and an overall assessment of already existing studies, the working group seeks to provide an overview of relevant instruments for international cooperation.

- Continued work by the SFIC country-specific working groups:

- Brazil: successfully contributed to the Destination Europe as well as Tour of Brazil events, participation to Science without Borders programme and developing a SFIC Roadmap towards Brazil;

- Russia: hosted a workshop on "Internationalisation of the European Research Area: Towards a Common European Approach in STI Cooperation with Russia" in 2014, compiled an overview of the member states' cooperation agreements with Russia, its activities of implementation, and the main topics of bilateral cooperation by means of a questionnaire, and developed and adopted an EU/MS/AC-Russia Strategic Research and Innovation Agenda (SRIA);

- USA: successfully engaged in a number of events, such as a workshop on innovation issues in EU-US research cooperation in 2015, thematically focused on ocean literacy and marine litter and started developing a campaign on it, opened-up initiatives towards Canada;

- China: successfully engaged in a number of Workshops in China and also engaged in JPI such as "Urban Europe";

[34] ERAC-SFIC 1357/15, as adopted on 9 June 2015
[35] ERAC-SFIC 1354/16, as adopted on 21 March 2016
[36] ERAC-SFIC 1360/15, as adopted on 29 September 2015

- SFIC has also engaged in South Africa during the period though Workshops and a questionnaire.

- SFIC has been represented in five Destination Europe events in the US as well as one in Brazil. The SFIC Chair, the vice-Chair and the Chairs of WGs have participated in numerous seminars/conferences on behalf of SFIC both in Europe and outside Europe.

- SFIC has engaged with the EC's Science Counsellors, e.g. participation in meetings in Beijing and Tokyo.

Annex 3: Actions in support of ERA by the members of the Stakeholders' Platform

The ERA Stakeholders' Platform convened regularly in 2015 and 2016 (4 regular meetings each year) and had several additional extraordinary meetings dedicated to its own future (April 2015), the monitoring of the ERA Roadmap at EU level (June 2015) and its enlargement to other pan-European organisations active in the field of research and innovation (September 2015). The important conference "Opening up to an ERA of Innovation", held on 23-24 June 2015, was intensively prepared in the context of the Platform insofar as a new Joint Statement was signed on 23 June.

Renewing and reinforcing relations between EARTO (European Association of Research and Technology Organisations), EUA (European University Association), CESAER (Conference of European Schools for Advanced Engineering Education and Research), LERU (League of European Research Universities), Science Europe and the European Commission, the Joint Statement extended the ERA partnership to 2020 and opened the Platform to new organisations. As a result, 5 organisations have already joined the Platform as observers: EU-LIFE (European Life Sciences Institutes for Excellence), EIRMA (European Industrial Research Management Association), ERRIN (European Regions Research and Innovation Network), ERF (Association of European-level Research infrastructure Facilities) and TAFTIE (The European Network of Innovation Agencies).

The founding members of the Platform were closely associated to the tuning of the new ERA monitoring tools, which were designed to incorporate the monitoring of the ERA Roadmap at EU level and the various national ERA Action Plans that derive from it.

Members and observers were consulted on many policy topics such as research integrity, the Charter for access to Research Infrastructures, Scientific Advice Mechanism (SAM), the preparation of the Lund Conference on Societal challenges, Gender, the "science4refugees" initiative, Open Innovation and the proposed European Innovation Council, Open Science and its Policy Platform. Exchanges were also organised with the incoming Dutch and Slovak Presidencies 2016 to enable better interactions and synergies. This practice will be continued with future Presidencies of the Council.

In the following sections, some of the recent activities of each Stakeholder Platform member are presented.

Conference of European Schools for Advanced Engineering Education and Research (CESAER)

Over fifty European universities of science and technology from twenty six countries united within the Conference of European Schools for Advanced Engineering Education and Research (CESAER) adopted a Unilateral ERA Statement in June 2013 endorsed by CLUSTER, EuroTech Universities Alliance, IDEA League and Nordic Five Tech (N5T), drafted joint statements and deployed initiatives in relation to the European Research Area (ERA).

Acting as an umbrella organisation and interlocutor to the European Commission (EC) when presenting jointly agreed common positions regarding European education, research and innovation policies, CESAER reports on the actions undertaken in support of ERA from the universities of science and technology for the ERA Progress Report 2016.

1. Optimal transnational co-operation and competition

- The universities of science and technology actively participate in the EU Framework Programmes for Research & Innovation and pro-actively contribute to the ERA initiatives.
- The universities of science and technology were active in the `Widening participation and spreading of excellence` actions under Horizon 2020, linking between institutions from EU15 and EU12: Twinning and Teaming between universities, utilising monitoring data for identifying possible partners and developing new collaborations.

2. An open labour market for researchers

The CESAER Task Force Human Resources (TFHR) directly promoted the awareness on the European Charter and Code for Researchers and stimulated institutional initiatives through two workshops (Leuven, Aachen) and a parallel session during CESAER Human Resources Conference in 2014 at TU Delft. Concerning the open, transparent and merit based recruitment (EURAXESS Jobs Portal), the TFHR organised a parallel session on recruitment at the Annual Seminar 2014, drafted a CESAER position on `Open, transparent and merit-based recruitment` (July 2014) and a CESAER representative was appointed to the new SGHRM Working Group `Open Recruitment`. Two further documents followed, i.e. a CESAER position on `Adapting Hiring Procedures to the Challenges of the Future (December 2014) and a CESAER position on `Performance Management and Appraisal Systems` (February 2015).

The universities of science and technology indirectly contributed to an open labour market:

- A survey on `Career development for researchers` was carried out and discussed at a parallel session at the HR Conference in 2014 resulting in a report (December 2014).
- A survey on `Leadership training for researchers` was carried out, discussed during a parallel session at the HR Conference in 2014 resulting in a report (September 2014).
- The TFHR organised workshops on `Tenure Track Policy` on 22nd April 2016 at Aalto University, on ` Graduate Training` on 2nd November 2015 at TU Munich and on `PostDocs` on 7th October 2015 at KU Leuven.
- The EuroTech Universities Alliance organised a High Level Event on 'Tenure Track – A Real Paradigm Shift for Attracting Top Research Talent?' in June 2013 in Brussels. In follow-up, the Alliance contributed to a panel discussion organised by the League of European Research Universities' on 'Tenure and Tenure Track Models in Europe' in September 2014 in Brussels.
- In collaboration with the EC and the European Regions' Research and Innovation Network, the EuroTech Universities Alliance jointly organised an event on 'Fostering attractive research careers – the role of the EU HR Strategy for Researchers' in May 2015 in Brussels.

- Five European associations of universities of science and technology – CESAER, CLUSTER, EuroTech Universities Alliance, IDEA League and Nordic Five Tech published and presented a discussion paper on `Innovative Doctoral Training at Universities of Science and Technology` in October 2015 in Brussels. Colleagues from European universities of science and technology will discuss practical examples during a workshop in August 2016 at DTU.
- As a European framework to promote international and interdisciplinary research collaboration, the EuroTech Universities have promoted exchange between their graduate schools. They have developed joint interdisciplinary summer schools, a common database of doctoral courses and a framework for promoting joint supervision of doctorates. Since 2012, the EuroTech Universities have each invested €1 million in a joint GreenTech initiative for doctoral and postdoctoral researchers to collaborate on projects in the fields of Energy efficient buildings and communities, Photovoltaics and Wind.
- CESAER was a partner in the first and second edition of EIT Foundation's Internship Programme (2013 pilot action): 7 universities participated, 45 eligible applications, 3 students selected, 2 students active. 10 available positions were offered for 2014-2015 and resulted in one internship starting February 2015.
- A high level representative was mandated by CESAER to help prepare the ground for the effective establishment of RESAVER and is member of the Board of Directors of RESAVER. Thanks to this connection CESAER was able to keep its members up to date on the Retirement Savings Vehicle for European Research Institutions.
- The CESAER Task Force Entrepreneurship (TFE) did a survey on entrepreneurship in engineering, organised a workshop in 2015 and published a summary report in June 2016.
- The EuroTech Universities Alliance has organised a High Level Event on 'Addressing Societal Challenges through Strategic University-Industry Partnerships' in December 2013 in Brussels and the EuroTech Universities' Technology Transfer Offices have an exchange programme on key related topics related to university-industry collaboration, including intellectual property portfolio and licence management, market orientation, license deal structures and conditions and conflict of interest policies. In addition, 14 professors across the EuroTech Universities presented a joint discussion paper on 'The Future of the EU as an Inclusive and Sustainable Innovative Economy' at a High Level Round Table in May 2016 in Brussels.

- The EuroTech Universities organised a High Level Event on 'Nurturing the Entrepreneurs of Tomorrow – A Central Role for Europe's Universities' in June 2015 in Brussels, accompanied by a Policy Paper. The European Venture Programme, funded by the ERASMUS+ Strategic Partnership Initiative, funds 20 student entrepreneurship exclusive access to the entrepreneurship expertise and networking resources available at the EuroTech Universities. Further, the EuroTech Universities' joint communications platform, TECHNOLOGIST, was launched in June 2014 and covers the latest news in Science and Technology in Europe, including a dedicated section on start-ups.
- The CESAER Task Force Responsible Research and Innovation (TFRRI) held its kick-off meeting in April 2014 at Delft University of Technology, organised a workshop in October 2014 and contributed to the Dutch Presidency Conference on RRI in June 2016.
- The EuroTech Universities Alliance organised the Plenary Session on 'Translating Responsible Research and Innovation Policies into Practice' at ESOF in July 2016 in Manchester.

3. Gender equality and gender mainstreaming in research

CESAER undertook a Gender Equality Survey, discussed and presented it findings at various conferences and workshops (CESAER HR Conference 2014, workshop in Vienna 27-28 November 2014; COST meeting, March 2015) resulting in a report on `Gender Equality at European Universities of Science and Technology`(2015).

4. Optimal circulation, access to and transfer of scientific knowledge

- From 2015 to 2016, the CESAER Task Force Knowledge Transfer (TFKT) selected twelve universities for a survey on technology transfer, followed by a visit to each of these universities. A summary as well as examples of best practice in knowledge transfer at universities of science and technology will be presented in October 2016.
- `CESAER towards Open Science` (March 2015) was the first result from our commitment to open access. Open Science was a prominent theme at the CESAER annual meetings in October 2015. In 2014, the universities of science and technology expressed their support to the LIBER letter on `Text and Data Mining` to ELSEVIER and discussed the Data Protection Regulation.
- The EuroTech Universities Alliance will organise a High Level Event on 'Opening up Science, Advancing Innovation' on 21 September 2016 in Brussels.

5. International cooperation

CESAER recently established a Task Force International Cooperation addressing this sixth action line of the ERA. The scope of the TFIC also extends to competition and cooperation as well as development in higher education, research and innovation.

European Association of Research and Technology Organisations (EARTO)

In view of the preparation of the 2016 ERA Progress Report, this section gives a short overview of the main activities of EARTO supporting the ERA objectives in 2015 and 2016. EARTO has participated actively in the ERA Stakeholders' Platform and has informed and mobilised its members on the ERA objectives.

EARTO Working Groups' Activities Linked to ERA

EARTO has currently 10 active working groups, 7 of them discussing topics related to ERA.

EARTO Working Groups		
Working Group	**Experts**	**Topics Related to ERA**
1. Financial Experts	30	• How to improve EU financial rules and auditing rules to best support the ERA objectives.
2. Legal Experts	18	• How to improve state aid RDI Framework, GBER & IPCEI schemes to best achieve ERA objectives.
3. Horizon 2020 Experts	50	• Looking at all Horizon 2020 implementation aspects, including open access, research integrity, gender requirements in H2020 projects.
4. Structural Funds	28	• Discussions on how to best achieve synergies between Horizon 2020 and EU Structural Funds (ESI Funds).
5. Human Resources	10	• HR managers discussing topics such as the HR Strategy for Researchers (HRS4R), gender balance, EU pension scheme for researchers, intersectoral mobility of researchers. This WG contributed to the update of the research integrity article in H2020's Model Grant Agreement, to the consultation organised by ALLEA to review the European Code of Conduct for Research Integrity as well as to the consultation on the EC gender equality online tool.
6. European Innovation Council	15	• How to ensure the EIC is supporting EU R&I activities which contribute to achieving the ERA objectives.
7. EARTO-EIB Joint WG on Access to Finance for RTOs	18	• How to ensure EIB funding is supporting EU R&I activities which contribute to achieving the ERA objectives.

1. EARTO Publications & Events Linked to ERA

1.1 Publications

EARTO has published several position papers in relation to ERA objectives in 2015 and 2016:

- EARTO Response to EC Consultation on the Financial Regulation.
- EARTO Recommendations for a European Innovation Council Pilot.
- EARTO Inputs to European Structural and Investment Funds Simplification.
- EARTO Paper on How to Boost Pre-Commercial Procurement in Horizon 2020.
- Economic Footprint Study: Impact of 9 European RTOs in 2014.
- EARTO Paper on Open X.
- EARTO Paper - The European Innovation Council – A New Framework for EU Innovation Policy.
- EARTO Letter to President Juncker on Appointment Adviser on Innovation.
- EARTO Open Letter to European Parliament on EFSI.
- EARTO Feedback on EU Audit & Control Approach.
- EARTO Paper - Data on European RTOs.
- EARTO Amendments to the European Commission's Proposal for Regulation on the European Fund for Strategic Investments (EFSI).
- EARTO Answer to EC Consultation on Patents and Standards CESAER, EARTO, EUA, LERU, Science Europe Joint Statement on Juncker Investment Fund.

1.2 EARTO Events supporting ERA Objectives

EARTO organised several events on ERA related topics in 2015 and 2016:

EARTO Annual Conferences

- 2015: Infrastructures and Resources Sharing between Industry & RTOs in Europe
- 2016: Today's Challenges for Innovation Infrastructures within EU Innovation Ecosystems and Industrial Value-chains

EARTO Policy Events

- 2015: ERA of Innovation: Finding Better Ways To Help Business To Be More Innovative
- 2016: EU R&I Policy Supporting Europe's Innovation Ecosystems: H2020 & Beyond (October 2016)

EARTO Innovation Schools

- Understanding Innovation and the Technology Readiness Levels Scale
- Is There Still Room for Open Innovation in a Digital Single Market Built on Open Science?
- How RTOs Contribute to the EIT KICs and What Can Be Improved to Boost EIT's Impact?

Other EARTO Events:

- EARTO-ERRIN High-Level Debate "How Can Regional Smart Specialisation Strategies Support Innovation Ecosystems & Value–Chains?"

- Towards Horizon 2020 Midterm Review: Funding Models & Auditing Policy in EU R&I Programmes (September 2016)
- EU Regional Innovation Policies looking forward Post-2020: RIS3 & Simplification (October 2016)

EARTO members also active in the following key external events:

- HR Circle Workshop: Making The Best Out Of Our Diverse Talent (September 2015)
- Info Day HRS4R: How to Comply with Article 32 of the H2020 Grant Agreement (October 2015)
- EC Seminar on Intersectoral Mobility and Industrial Talents (January 2016)

All details and proceedings of those events can be found on the EARTO website at: www.earto.eu

European University Association (EUA)

During 2014-2016, the European University Association (EUA) supported the development of the European Research Area (ERA) through a wide range of activities with focal points in research and innovation; governance, funding and public policy development; and, doctoral education.

EUA's commitment towards strengthening the ERA was further reinforced in June 2015 by signing – after similar agreements in 2012 and 2013 – a third joint statement with the European Commission and the other members of the ERA Stakeholder Platform.

- Highlights of past and present EUA activities in promoting the ERA since the 2014 "ERA: Facts and Figures" report include:
  - EUA issued its Antwerp Declaration, "A strategic agenda for universities: Developing strong institutions to advance the knowledge-based society", as an outcome of the 2015 EUA Annual Conference, Antwerp, 17-19 April 2015. The declaration advocated strong European Research and Higher Education Areas.
  - EUA provided steady input to the European-level debate on the ongoing progress and the future of the current EU funding programmes and their post-2020 successors, e.g. as part of its member consultation in the context of the mid-term review of Horizon 2020 and Erasmus+.
  - EUA endorsed sustainable, sufficient and simple funding for universities in Europe through a coherent campaign aimed at raising awareness of financial and other pressures facing universities in contributing to the ERA among high-level policy makers and public funders at European and national levels.
  - EUA's Research Policy Working Group (RPWG) discussed ERA developments regularly at their meetings and provided, among other undertakings, input for the ex-post evaluation of FP7 in May 2015. In its response, EUA highlighted that FP7 has been instrumental in supporting universities in consolidating their actions towards the ERA goals, particularly in removing barriers and implementing policies.

- EUA established an Expert Group on 'Science 2.0/Open Science' in 2015. Its members prepared and released the "EUA Roadmap on Open Access to Research Publications" in early 2016. The roadmap strove towards a more open system for the generation and circulation of new knowledge through research and thus contributed to major ERA goals.
- EUA also intensified its activities in the area of smart specialisation (RIS3). Its RIS3 Expert Group published a report focusing on the contribution of universities to regional development and innovation in April 2016. The report argued, inter alia, for a better alignment of funding instruments and intensified cooperation across regions. It hence bolstered key priorities of the ERA agenda.
- EUA contributed in close cooperation with the other ERA, ESFRI and e-IRG stakeholder organisations to the "Charter for Access to Research Infrastructures" (RI) that was released in March 2016. The charter followed the 2012 ERA Communication and set out principles and guidelines for access to RI.
- EUA organised the upcoming 3rd EUA Funding Forum in October 2016 bringing together higher education and research stakeholders to discuss funding models, social and economic contributions of the university sector to society and efficient university management.
- EUA's Council for Doctoral Education (EUA-CDE) hosted the Third Global Strategic Forum on Doctoral Education in May 2015 and held its ninth annual meeting in June 2016 with more than 200 participants. EUA-CDE furthermore issued a new set of recommendations on doctoral education, "Taking Salzburg Forward", in April 2016. The paper insisted on continued reform and internationalisation of doctoral education and recommended shared ownership among all participants. It therefore promoted main objectives of the ERA.

- In terms of monitoring and analysis, the following activities amongst others can be mentioned:
  - Monitoring and reporting on trends in public funding of the university sector via the EUA Public Funding Observatory (yearly release and online tool including data for more than 20 European countries).
  - Monitoring and reporting on national and institutional trends in university autonomy and governance via the EUA University Autonomy Scorecard (release of updated data in spring 2017).
  - Monitoring of mergers and concentration processes in the university sector that are featured in an interactive map of European university mergers and comprise the largest online database of university mergers across Europe.
  - Monitoring of national and institutional developments in Open Access through annual surveys with EUA members; input of its Expert Group 'Science 2.0./Open Science'; and, dialogue with the National Rectors' Conferences (NRCs).
  - EUA continued analysing data on the gender composition of university leadership and top-level management based on the database of its membership (ca. 4.000 individual university leaders including rectors, vice-rectors and high-level administrators).

- Participation in EU funded projects:
  - Fostering European universities' financial sustainability. Completed in 2015, the DEFINE project (Designing Strategies for Efficient Funding of Higher Education in Europe)

has resulted in a final report offering recommendations to policy makers and university leaders with regard to the impact of public funding schemes stimulating excellence in the university sector, the rationales for universities to merge and the related costs and gains, and the use of performance elements in public.

- Enhancing university efficiency through the ongoing USTREAM project (Universities for Strategic, Efficient and Autonomous Management). EUA is seeking to examine measures that are in place in universities across Europe to enhance efficiency at operational level, and also explore conducive policy environments for efficient university management, with a view to identify good practices and develop recommendations for both university managers and policy makers.
- Improving the quality and relevance of higher education systems through cooperation with universities, NRCs and ministries of education in the Eastern Neighbouring Area (Moldova, Ukraine and Armenia). The ATHENA project (Fostering Sustainable and Autonomous Higher Education Systems in the Eastern Neighbouring Area) outcomes include analyses of the progress of university autonomy over the past three years and policy roadmaps indicating the remaining challenges and offering concrete steps for further reforms.
- Mapping and mobilising the research, innovation and educational capacities of Europe's universities in the field of energy, one of the major societal challenges of today, through the UNI-SET project (Universities in the SET-Plan). UNI-SET is an FP7 Coordination and Support Action that started in September 2014. It is coordinated by EUA and jointly implemented with KU Leuven, representing universities in KIC InnoEnergy.

League of European Research Universities (LERU)

Events organisation and participation

LERU has unabatedly continued its support for ERA in the period since the previous ERA progress report, renewing its engagement by signing a Joint Statement on ERA together with the other stakeholder organisations (SHO) in the ERA Platform (CESAER, EARTO, EUA, Science Europe), and the European Commission in Brussels on 23 June 2015.

LERU has participated in many ERA related events organised by stakeholders or the EC and has consistently participated in the ERA SHO platform meetings and the do-ers meetings. It has informed all relevant LERU bodies, communities, working groups, etc. of the latest ERA developments, including those realised via the SHO partnership.

The Secretary-General of LERU was nominated as a member of the European Open Science Policy Platform. Various LERU representatives were appointed as members of the Open Science Expert/Working Groups, such as those for the European Open Science Cloud or Almetrics. LERU was also actively involved in the drafting of the Amsterdam Call for Action on Open Science and participated in the Open Science EU conference held in 2016.

For major LERU policy papers mentioned below LERU has organised a public event in Brussels to discuss ERA topics with a wide group of stakeholders and media.

LERU has organised briefings at the European Parliament, for example, on EU copyright reform and was actively involved in advocacy campaigns to highlight the need for a mandatory exception for text and data mining in the EU.

Recent LERU doctoral summer schools have been on ERA topics, namely 'Data Stewardship for Scientific Discovery and Innovation' (2016) and 'The Value of Knowledge Exchange' (2015).

Publications

Since the last ERA progress report LERU has published many policy papers and reports on many topics pertaining to the ERA priorities, covering for example doctoral education, gender, tenure-track careers, innovation, access to publications and to data, text and data mining, and copyright. A list of major papers is provided at the end of this document, and all publications are publicly available on the LERU website[37].

In addition, other LERU papers have addressed the additional topics that LERU suggested should be taken up in ERA in its 2014 "ERA of change" briefing paper, namely anchoring ERA in a strong international strategy, linking education, research and innovation in an EERIA (European Education, Research and Innovation Area), including the Humanities and Social Sciences, understanding Science 2.0 (open science), promoting the enhancement of research integrity, and fostering effective science and society interactions.

LERU furthermore continues to frequently issue press releases to comment on ERA topics, decisions, events, meetings[38].

LERU has contributed articles about gendered research and innovation and about global societal challenges for, respectively, the fourth and fifth ERA Newsletter published by the European Commission.

LERU was actively involved in the drafting of the European Charter for Access to Research Infrastructures.

The ERA SHO issued a joint statement on the European Fund for Strategic Investments on 23 January 2015.

Monitoring

LERU commissioned the report "The Economic Contribution of LERU Universities", which quantifies the combined economic value of the LERU members and, by extrapolating its results, presents an estimation of the economic contribution of research universities in Europe.

For the paper on tenure-track careers, LERU gathered facts and figures on tenure-track positions at LERU universities.

LERU ran an updated questionnaire on open access to publications and research data amongst its members (end of 2014) as a follow-up to the 2013 ERA Memorandum of Understanding questionnaire.

Other activities

LERU developed a statement on pen access "Christmas is over – research funding should go to research, not to publishers", which was issued as an online petition on the LERU website in late 2015. The petition which obtained almost 10,000 signatures, was handed over to Commissioner Mr Moedas and Dutch Secretary of State Mr Dekkers at the informal Competitiveness Council meeting in January 2016.

LERU has gradually intensified its contacts and gathered with sister organisations world-wide, aiming at the creation of a Global Council of Research-Intensive Universities Networks.

LERU has also reinforced its international positioning by setting up a close cooperation with the United Nations by signing up to the UN Academic Impact Principles (UNAI) and applying for a special consultative status at the UN Economic and Social Council (ECOSOC).

LERU fully supported the Science4Refugees initiative launched by the European Commission to help refugee scientists and researchers find suitable jobs that both improve their own situation and put their skills and experience to good use in Europe's research system. This support

[37] See http://www.leru.org/index.php/public/publications/

[38] See http://www.leru.org/index.php/public/news/press-releases/

complemented the many initiatives undertaken by the LERU members to offer solidarity and help to refugees and asylum seekers.

A selection of recent papers, reports and statements by LERU

LERU's response to the EC's call for Ideas on a European Innovation Council (April 2016, statement)

The new EU General Data Protection Regulation: why it worries universities & researchers (April 2016, policy brief)

Maintaining a quality culture in doctoral education (March 2016, advice paper)

LERU response to the Horizon 2020 simplification survey (October 2015, statement)

Gendered research and innovation: integrating sex and gender analysis into the research process (September 2015, advice paper)

The economic contribution of LERU universities (September 2015, report)

SSH and interdisciplinary research, a showcase of excellent research projects from LERU universities (November 2014, good practice report)

Leiden statement on the role of SSH in the global research landscape (November 2014, statement with six national and global university associations)

Tenure and tenure track at LERU universities (September 2014, advice paper)

Philanthropy at research-intensive universities (July 2014, statement)

Online learning at research-intensive universities (June 2014, advice paper)

Science Europe

The most direct contribution to European Research Area (ERA) by the Science Europe Member Organisations (MOs) is their role as public Research Performing Organisations (RPOs) and/or Research funding Organisations (RFOs) that employ and/or fund a significant part of Europe's researchers and provide world-class research infrastructure and framework conditions.

Collectively, using Science Europe as a platform for collaboration, the MOs have continued to work towards the objectives of the Science Europe Roadmap which contributes to the strengthening of ERA. The following are examples of Science Europe activities in various fields in the period since the last ERA Progress Report in 2014:

- **Research integrity** is a crucial element in the conduct of research, with a direct impact on scientific quality and on the reliability of individual results. The ability to prevent and deal with cases of research misconduct and to enhance research integrity is crucial for the effectiveness of national research systems and for scientific capacity building. The work of the Science Europe Working Group on Research Integrity supporting the MOs in the promotion of research integrity therefore directly contributes towards ERA Priority 1.
    - Contribution to the knowledge base: Science Europe published in December 2015 a Briefing Paper on 'Research Integrity: What it Means, Why it is Important and How we Might Protect it'. The paper reviews some of the most compelling evidence found

in the literature on research integrity, research misconduct, its consequences and the efforts to deal with it.

- Mapping and supporting policy development: In July 2016, Science Europe released a survey report 'Research Integrity Practices in Science Europe Member Organisations' that maps existing policies, procedures and practices for promoting research integrity in Science Europe MOs. The report makes a number of key recommendations for improving research integrity including processes and policies, awareness raising, training and collaboration.
- Awareness raising: The Brochure 'Seven Reasons to Care about Integrity in Research', produced by the Science Europe Working Group in June 2015, has been successfully used by Science Europe to advocate the importance of research integrity to non-specialist audiences, policy makers and key stakeholders.

- **Promotion of Open Access** to research publications has been one of the key priorities of Science Europe MOs and of ERA (Priority 4) in the past years.
  - Common position: In May 2015 all MOs of Science Europe adopted a set of 'Principles on Open Access Publisher Services' which set minimal standards of quality, transparency and openness to all publishers providing Open Access services. These principles set the bar very high for what are acceptable standards and practices, in order to ensure that the transition to Open Access is not in any way tarnished or hampered.
  - Mapping and supporting policy development: in autumn 2016 Science Europe will publish a survey report of Open Access policies of its members. The report highlights progress made in policy development made and lists some remaining challenges that need to be met in order to complete the transition towards full Open Access for all scholarly publications by 2020, as called for in the conclusions on 'The Transition towards an Open Science System' adopted by the Council of the EU on 27 May 2016.
  - Briefing and awareness raising: In April 2016 Science Europe issued a 'Briefing Paper on Open Access Business Models and Current Trends in the Open Access Publishing System'. This paper contributes to raising the general level of knowledge of audiences of policy makers and stakeholders about current developments in Open Access scholarly publishing.

- Helping to exploit the full potential of new technological possibilities to collect, store, analyse, confirm, share and re-use **research data** is a major step towards realising the ERA objectives and towards understanding the needs of Open Science.
  - Contribution to the knowledge base: Science Europe, together with Knowledge Exchange, conducted a joint study on 'Funding Research Data Management and Related Infrastructures' (report published in May 2016). The paper informs the discussion on the funding of Research Data Management and related infrastructures in Europe, helps raise awareness of the current challenges, and communicates opportunities for co-ordinated action to relevant stakeholders. The paper highlights that the funding of Research Data Infrastructures, enabling RDM, comes from a great variety of sources and institutions that have different responsibilities. The long-term

funding of data infrastructure, increasingly vital for science and scholarship, is by no means guaranteed and very few good practices exist across the ERA.

- Advocacy for better regulations and policy: In April 2015 Science Europe published a briefing paper with fact-based arguments for the need of a research-friendly Copyright reform in Europe. This briefing paper helped Science Europe in briefing the European Commission and the European Parliament working on Copyright reform. The 'campaign' for research friendly Copyright rules culminated in a workshop on 'The Importance of Content Mining for Science' organised by Science Europe in October 2015, attended by influential actors in the issue. Advocating for a broad exception for research in European Copyright rules that allows unrestricted Text and Data Mining is crucial to public research organisations and directly supports ERA priorities and Open Science.

The above is a sample of Science Europe activities with direct ERA relevance in three areas described in detail. Science Europe has taken similar action in many more areas including:

Research Infrastructures:

- Expert input to the European Charter for Access to Research Infrastructures together with ESFRI, e-RG and the ERA Stakeholder Organisations.
- Publication of a Science Europe Survey Report on 'Strategic Priorities, Funding and Pan-European Co-operation for Research Infrastructures in Europe' (January 2016).

Peer Review and other methods of assessing scientific quality:

- Expert workshop on 'Research Assessment for the Purpose of Resource Allocation' organised in October 2015 that looked into challenges of the Peer-Review and other assessment process and ways to address them.

Advancing research evaluation:

- Expert workshop on 'Societal Impact Assessment' in April 2016.
- Expert workshop on 'Data and Indicators Limitations' in June 2016.

Research Careers:

- Workshop and Report on Career Pathways in Multidisciplinary Research (published June 2016).

Cross-border Collaboration:

- Promotion of the Money follows Researcher (MfR) model of Cross-Border funding collaboration. By July 2016 twelve MOs have signed the declaration of intent and provided implementation details.
- Further development of the Lead Agency Procedure model for cross-border collaboration, through an expert workshop (December 2014) and subsequent report (October 2015) on 'Lead Agency Procedure Strategies'.

ERA Policy

Science Europe MOs harness their collective expertise to advise policy makers and EU institutions on ERA policy, notably through positions testament on ERA relevant topics:

- Position Statement on Priority One of the 2012 ERA Communication: 'More Effective National Research Systems', adopted and released in November 2014.
- Position Statement on 'The Role and Future of Joint Programming', adopted and released in August 2015.

The above are a few examples of activities that directly or indirectly support Science Europe MOs in performing their roles and which helped strengthen the ERA in the past two years. More information about all the above examples and the full portfolio of Science Europe activities is available online.

ERRIN (European Regions Research and Innovation Network)

ERRIN (www.errin.eu) is a Brussels-based platform for regions that wish to enhance their research and innovation capacity and has over 120 members mainly regions but also some cities, universities and innovation agencies.

ERRIN – European Regions Research and Innovation Network was invited to join the ERA Stakeholder Platform in April 2015 and presented its case for joining to the current ERA Stakeholder Platform in September 2015. Following the sending of a formal written application in November 2015, ERRIN was invited to become an observer on the ERA Stakeholder Platform in December 2015.

Because of the regional nature of the network, ERRIN cannot contribute to all the ERA priorities but considers that it can add value to the ERA roadmap in the following areas (see Figure 1).

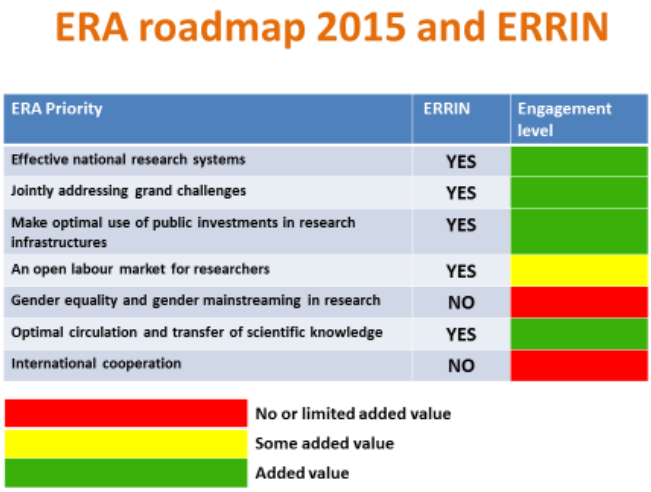

Figure 1 ERRIN's potential contribution to the ERA Roadmap

ERRIN has attended the Stakeholder Platform meetings in January, March and June 2016. ERRIN nominated a high-level representative for a Brussels meeting organised by DG RTD on completing the set of indicators for the ERA Monitoring Mechanism (EMM).

ERRIN Opening Science Working Group

The participation as an observer has meant that ERRIN can relay some of the main messages on ERA to its Opening Science Working Group. This working group is composed of regional representatives in Brussels and covers relevant aspects of Open Science, the European Research Area, Science With and For Society, Responsible Research and Innovation, Social Sciences and Humanities. The Working Group is led by five regions, Berlin, Bremen, Copenhagen, South Norway and Welsh Higher Education Brussels and especially welcomes university representatives.

Since the application to the ERA Stakeholder Platform, the Opening Science Working Group has met in Brussels on the following occasions.

September 2015	Commission presentations on Open Science and Science 2.0
November 2015	Commission presentation on Social Sciences and Humanities within Horizon 2020
February 2016	Commission presentation on European Innovation Council and the Dutch Presidency
April 2016	Commission presentations on European Open Science Cloud Initiative and the Interim Evaluation of Horizon 2020
June 2016	Brokerage session for Social Sciences and Humanities EU projects
September 2016	Universities and migration (with Copenhagen)
November 2016	Proposed event on the Circulation of Knowledge at the regional level

- *Table 1: ERRIN's Opening Science Working Group meetings*

ERRIN helping disseminate ERA to the regions

ERRIN has and will be been able to disseminate key messages from the ERA Stakeholder Platform and make regional stakeholders more aware of the Stakeholder Platform, the ERA Roadmap and ERA activities. ERRIN has also been able to bring to the Platform a stronger place-based perspective of research and innovation. As Robert Madelin's recent report 'Opportunity now: Europe's mission to innovate'[39] points out that 'Innovation very much still depends on location. There is plenty of scope for place-based public policy. Evidence from Europe confirms that Druckerian clusters remain a source of advantage, and that distance between assets or actors is often still a relative handicap. It is rare to see effective cooperation span 50 kilometres…'.

Specific focus on Priority 5 of the ERA Roadmap: 'Optimal circulation and transfer of scientific knowledge'.

ERRIN is therefore proposing to organise with the possible support of the Stakeholder Platform an event in Brussels late November 2016 to examine the circulation of knowledge at the local level which falls under Priority 5 of the ERA Roadmap 'Optimal circulation and transfer of scientific knowledge'.

Open science is an important priority for regions and there are numerous examples of improving communication between universities, companies and public authorities in regions. While the triple helix dimension remains important, increasingly, the active role of citizens in science is being discussed through debates on Open Science. Open Science can include citizen science where citizens directly contribute to scientific knowledge increasingly through digital innovations which opens up the discussions on the use of big data and how regions and cities can

[39] http://ec.europa.eu/epsc/pdf/publications/strategic_note_issue_15.pdf

increase their economic competitiveness through the collection and use of local and regional data. Open Science also brings in a stronger role for responsible research and innovation.

ERRIN would also like to examine the changing role of some universities towards a more 'civic' or regional focus where the university becomes a key driver of the economic strategy and economic success of the region.

EU-LIFE (European Life Sciences Institutes for Excellence)

EU-LIFE is an alliance of top research centers whose mission is to support and strengthen research excellence (www.eu-life.eu). Partners in EU-LIFE are renowned institutes that operate with similar principles of excellence, external reviews, independence, competitiveness, and internationality. The alliance spans geographically across Europe and represents a wide variety of the different European research contexts. Officially launched in 2013, the basis of foundation of EU-LIFE was the perception that there was a gap in the science policy landscape regarding the representation of independent research centers. EU-LIFE roadmap includes:

- Advocating for excellence in research
- Promoting fruitful scientific collaborations intra and internationally
- Attracting talents to Europe and retain top scientists
- Developing and disseminating best practices in science and science-related areas, such as advanced training, research infrastructures, science communication, technology transfer, funding, open science
- Contributing to European and International science policy dialogue
- Be a voice for research institutes in Europe

Contribution to the monitoring and implementation of ERA (2014-2016)

1. At present, EU-LIFE has eight Working Groups aiming at discussing and implementing activities in line with the achievement of ERA and focusing respectively on Grants and funding opportunities, Science Communication, Translational Research, Technology Transfer, Training, Information Technology, Core Facilities, Indicators and Strategy.

2. Issuing of position papers and statements, including:
   - Key elements of excellence in research, brainstorming about institutional policy and practices at research centers,(2016)
   - "Stimulating translational research: several institutes put their heads together" (2015)
   - Mentoring researchers for a scientific career, (2015)
   - The storage challenge *(work in progress)*

3. Designing and implementing transdisciplinary and multi-institutional projects to foster excellence in research in its several dimensions including production of research results and data, gender balance and knowledge circulation, among others.
   A flagship European-wide project is LIBRA (funded by H2020). Officially launched in 2015, the project designs and implements assessment procedures to investigate the unconscious gender bias (including running a survey among EU-LIFE partners), identifies causal factors for gender bias and extracts best practices to reduce inequity and provides frameworks for the development of gender equality plans within research performing institutions.

4. Development of online tools for talent circulation, enhancing mobility and promoting internationalization of research, including:
   - Funding opportunities search tool, launched online in February 2016 - allows searching for funding opportunities in the different regions of Europe.
   - Online database of Technological facilities, which are embedded and developed inside research intensive institutions of the EU-LIFE alliance. Available since 2014, allows researchers and other sectors (SMEs, industry) to search for technology expertise across Europe (130 entries).
   - Online database of independent research groups of the EU-LIFE alliance, allowing researchers at different career stages to search for future positions or scientific collaborations according to the academic field or institution (533 entries).
   - Scientific job opportunities available within the EU-LIFE network across 13 European countries; and expansion of this tool through partnerships with agencies from other regions (currently with Brazil) for cross-dissemination of job opportunities.

     All the tools aim at serving the worldwide Science and Innovation communities and thus are publicly available through the EU-LIFE website (http://eu-life.eu/).

5. EU-LIFE organizes regularly events on topics with relevance for the landscape of research in Europe, fostering transnational and international collaboration and sharing of good practices in the following topics:
   - Strategy and community meetings held every 6 months to discuss topics related to ERA such as: Strategies to enhance scientific cooperation across Europe, establishment of pan-European innovative training programmes, industry/academia interactions, international cooperation with other regions of the world, gender equality in research. Relevant stakeholders are invited as keynote / special guests to participate in the discussions.
   - Open Science and Bridging research & innovation: Organization of: 1) "Starting-up a company: alternative compensation for in-kind contribution Technology transfer", September 2015 to professionals within Research Performing Organizations (RPOs); 2) annual scientific workshops in translational research (2014 on "Biology of cancer: bridging basic and translational research" ; 2015 on "Epigenetics and disease"; 2016 "Inflammation & Immunity in health and disease"); EU-LIFE chaired a session at BioEurope Spring 2016 on "Innovation in Early Stage Funding"; 3): EU-LIFE workshop on communicating animal research - discuss institutional strategies for RPOs and peer-to-peer learning, Cambridge, Feb 2016
   - Monitoring progress in member organizations, benchmarking and sharing good practice through questionnaires and data analysis including the following topics related to ERA implementation: 1) Open Science: Open data, open access, research assessment; 2) Human Resources and innovative training; 3) Technology transfer; 4) Outreach; 5) Research infrastructure; 6) Actions towards gender balance in leadership in science & innovation; 7) Competitiveness of research institutes to attract international and national funding (private and public);
   - Joint scientific retreats / workshops between postdocs / PhD students' communities.

6. International Cooperation
   - EU-LIFE members are actively pursuing international scientific cooperation, talent circulation and innovative training with several regions of the globe and have institutional collaborations in Asia, America, Latin America, Africa and Australia.

- EU-LIFE / FAPESP (Brazil) cooperation agreement (2016): Signature of a Memorandum of Understanding between EU-LIFE and FAPESP, S. Paulo State's R&I funding agency, to implement scientific collaborations; and organization of a FAPESP-EU-LIFE scientific workshop (June 2016) to encourage talent circulation and scientific collaborations between Brazil and Europe.

7. Other activities:
    - EU-LIFE nominated for the EC platforms: Open Science Platform (2016) and ERA Stakeholders Platform (observer, 2015)
    - EU-LIFE member organization currently implementing institutional policies and training the next generation of scientists on open access, gender equality, research integrity, data management.