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ERA Communication Synthesis report

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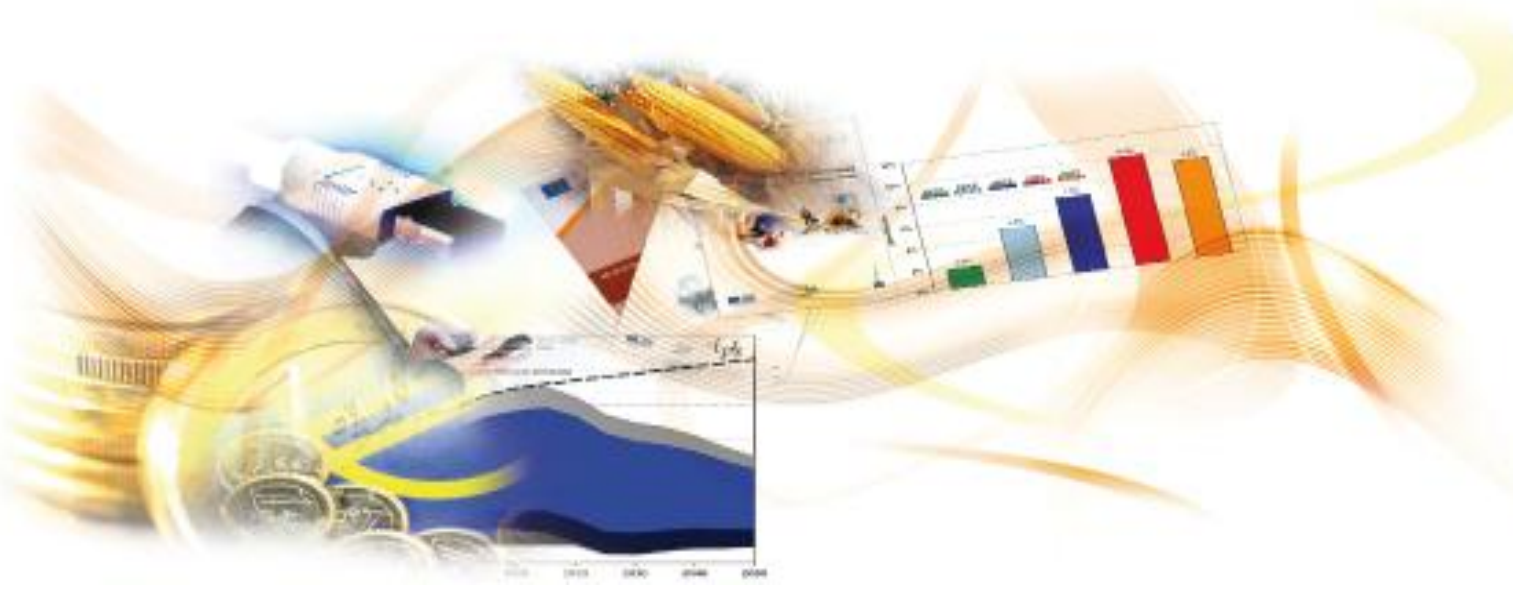

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This report has been produced by JRC-IPTS (Mathieu Doussineau, Elisabetta Marinelli, Mariana Chioncel, Karel Haegeman, Gérard Carat and Mark Boden).

The report has also benefitted from the comments of Patrice Dos Santos and Susana Elena-Pérez of JRC-IPTS, various colleagues in DG RTD, and members of the European Research Area and Innovation Committee.

EXECUTIVE SUMMARY

Produced by JRC-IPTS, this report aims to provide a synthetic perspective on progress towards achievement of the European Research Area (ERA). It is primarily based on an analysis of dedicated country information on ERA priorities in the EU Member States and countries associated to the Seventh Framework Programme. This information has been systematically collected with the support of independent national experts and focuses on the nature and status of national laws, policies and policy measures relevant to the five priorities and associated actions set out in the 2012 European Commission ERA Communication: a Reinforced European Research Area Partnership for Excellence and Growth.

Organised by priority, a number of key messages emerge from the JRC-IPTS analysis of the ERA communication fiches.

ERA priority 1 (More effective national research systems):

- National research performers across the EU have access to very different levels of public funds for R&D. These are dispersed through various mechanisms, further increasing the heterogeneity of the R&D landscape.
- Countries with moderate to well established evaluation mechanisms and traditions in competitive funding make the largest contribution (~78%) to EU GBAORD. This implies that a high proportion of EU public funds is focused on excellence and efficiency.
- Most countries adopt policies with the aim to promote excellence. However the specific approach varies. This includes implementation of new evaluation practices, related institutional arrangements and undergoing reforms. Such reforms frequently face stakeholder resistance, lobbying efforts and, consequent delays to their implementation.
- All countries allocate research funding through competitive calls for projects and generally this share is increasing. However, the exact proportion is not available through official sources.
- Allocation of funds based on regular, efficient, transparent institutional assessment is at an early stage or moderately developed in most countries. Countries where evaluation culture is already relatively advanced continue on a learning track, expanding practices with respect to systematic evaluation approaches.
- Various formulae for the allocation of core funds are used across Europe. In many countries, new distribution models have been adopted recently, and include research performance indicators.
- Some countries have shifted focus from direct funding measures to indirect R&D finance related ones such as loans or credit for businesses, or the extension of tax credit schemes for R&D activities.
- In most countries there are provisions for using the core principles for international peer review, yet formal compliance to the rules varies.
- In a few countries, there is a formal and explicit request for the involvement of a certain share of international reviewers (particularly in the new Member States adopting new schemes, redesigning the R&D funding system). In countries with a tradition in evaluation, although the core principles of peer review and the involvement of international experts are embedded, there tend not be explicit formal requirements. "Appropriateness" (relevance), "excellence", "ethical and integrity" criteria are used more systematically in the evaluation of proposals.

ERA priority 2 (Optimal transnational co-operation and competition and research infrastructures):

- The share of public national funding dedicated to transnationally coordinated research in Europe (EU28+NO+CH) is 4.27% of total GBAORD, or €4.2 billion. Around two thirds of this consists of contributions to the European Space Agency. The other types of coordinated funding represent €1.5 billion (1.47% of GBAORD), of which two thirds are spent by only four countries (DE, FR, UK, IT).
- When including ESA contributions, the countries with the highest share of transnationally coordinated national public funding (% of GBAORD) also represent the largest joint national public funding in absolute terms. The largest spenders are also those with the highest degree of coordination. When excluding ESA contributions, the degrees of coordination are much more diverse.
- The same high spenders all have a clear orientation towards grand challenges, albeit in different ways. From EU-12 there seems to be a gap between Poland and Czech Republic (and also the low spender Estonia) that have a clear orientation towards grand challenges, and the rest of EU-12, where joint programmes appear more weakly connected to grand challenges.
- Regarding research infrastructures and related policy measures, various factors enter into consideration in the implementation of national policies for research infrastructures embedded in the ERA through the ESFRI. A first factor is critical mass. It is more relevant to publish a national roadmap for countries that already have large infrastructures in their territories (Germany, United Kingdom, France, Italy or the Netherlands). A second factor is the level of RDI investment (Finland, Sweden, and Denmark). EU funding only covers the initial investment (preparatory phases) through the FP7 and ERDF. The full impact of the current economic climate is not clearly discernible but there are clear reflections in the situation of certain countries with regard to research infrastructures (e.g. Spain and Portugal, where budget cuts have been particularly significant).

ERA priority 3 (An open labour market for researchers):

- While the principles of open, merit-based and transparent recruitment appear increasingly recognised in the regulations and legislation, difficulties persist in implementing them. These are partly due to the fragmentation of career structures across MS, which severely hinders the creation of an open research market. For instance, in some countries, access to certain positions is subject to a formal, national-level evaluation process. Whilst this may be open to citizens of all MSs, non-nationals who do not possess the relevant institutional knowledge may be discouraged.
- Broadly speaking countries fall into two main groups: in the first, the recruitment and career structure of researchers is largely regulated at the national (or, in some countries, regional) level. This includes a sub-group of most of the Central and Eastern European MS, where there are significant shifts away from the previous strong centralised tradition, with revisions of the regulatory frameworks and Higher Education systems, aiming at higher autonomy and decentralisation. The second group of countries is characterised by institutions with a high degree of autonomy in hiring and promotion practices.
- Attractiveness of the research profession has been affected by the financial crisis. In certain countries, this has led to the creation of a dual labour market for researchers, where employment conditions vary remarkably between researchers with permanent contracts and those without.
- Much work needs to be done to achieve full open access and portability of grants. Access to public grant schemes is open to non-nationals affiliated to a local institution in the vast majority of MS, whereas only in two MS and one associated country, are public grant schemes accessible by non-nationals and non-residents, regardless of affiliation.
- The concept of Innovative Doctoral Training (IDT) is not yet commonly used in official measures. However, as IDT is based on good practice in PhD training across the EU, many of its elements are implemented de facto across the EU.

- Interest in the Charter & Code's principles and in the Human Resource Strategy for Researchers (HRS4R) process is spread across MS. In certain countries national laws or government measures encourage the process, while in others the endorsement is given by the conference of rectors or another group of University leaders. Finally, in other countries support to the charter and code is left to individual institutions.

ERA priority 4 (Gender equality and gender mainstreaming in research):

- In general, MS are moving, through various laws and strategies, towards greater gender inclusion in science and research. However, the lack of evaluation studies, does not allow the level of implementation of such measures to be assessed.
- In the majority of countries, gender equality is regulated –legislatively- at the level of the general labour market, with other measures (i.e. government strategies or research council regulation), specifically tackling the research profession. In Austria, France, Germany and Spain, gender equality in the research profession is addressed directly at the legislative level.
- In some countries, including Bulgaria, Slovakia, Greece Czech Republic, parental rights vary remarkably between permanent contracts and various temporary arrangements (such as stipends and similar fellowships). Furthermore, in the new Hungarian Labour Code the positions of women on maternity leave are no longer safeguarded.
- In Austria, Belgium, Croatia, Finland, France, Greece, Italy, the Netherlands, Poland, Portugal, Slovenia, Spain and Sweden, legislative, governmental actions or research council decisions address the issue of gender representation in decision making bodies, with a specific focus on scientific recruitment and evaluation. Whereas in Denmark and Ireland, laws cover gender balance in decision making committees in public bodies in general.
- Insufficient attention appears to be paid to strengthening the gender dimension in research, despite it being an important aspect in Horizon2020. Only Lithuania, Austria and Germany, report gender mainstreaming initiatives in their ERA Facts and Figure 2013, whereas only in France and Spain, does this issue appears to be addressed by legislative measures.

ERA priority 5 (Optimal circulation, access to and transfer of scientific knowledge including via digital ERA):

- Regarding circulation and access to scientific information, the emergence of International Open Access collaboration platforms relates to two main factors: linguistic economies of scale and scope; and optimisation of resources due to geographical and/or cultural proximity.
- The presence of well-functioning bottom-up stakeholder initiatives can be seen in some countries (e.g. EE, IL) to render a national Open Access policy redundant.
- Most countries that have national Open Access policies in place joined the EU prior to the 2004 enlargement (except EE, MT and PL).
- With respect to knowledge transfer, 22 countries are identified as having implemented schemes or strategies at national level. Knowledge transfer is among the issues most widely addressed –albeit with various levels of completeness- by both governments and stakeholders.
- Concerning E-identity, EU-wide or international initiatives have a strong federative power, as in the case of researchers' e-Identity through EduROAM, EduGAIN, NRENs (National Research and Education Networks), and REFEDS (Research and Education Federations). The same can be said about the wide participation in the OpenAIRE Open Access platform.

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1. INTRODUCTION

This report provides a synthetic perspective on progress towards achievement of the European Research Area (ERA). It is based primarily on an analysis of information on country activities in relation to the ERA priorities. Much of this information has been collected with the support of independent country experts during the first semester of 2013[1].

Based on analysis of the strengths and weakness of Europe's research systems and the overall objective of inducing lasting step-changes in Europe's research performance and effectiveness by 2014[2], the ERA priorities are:

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

This report covers the 28 EU Member States (MS) and 13 Countries Associated (AC) to the Seventh Framework Programme. It provides a synthetic overview of the current status of implementation of the ERA priorities, as defined in the EC Communication (2012a) taking into account certain limitations regarding data availability and quality. The main aims of this document are:

- To contribute to the Commission's monitoring of ERA by providing, for each ERA priority, a synthetic and cross-country analytical overview of relevant national policies and related policy support measures adopted and implemented (including necessary legal changes enacted);
- To group countries where there are emerging commonalities in terms of the types of actions and reforms they have undertaken in order to identify behavioural patterns (but not an assessment or ranking of performance)
- To take into account trends evident in Member States and Associated Countries in relation to the ERA priorities since the July 2012 EC communication; and
- To review the methodological lessons obtained in undertaking such an exercise, with a view to enhancing future such activities.

This document provides a transverse analysis of country data on the 28 EU Member States and 13 Associated Countries based on structured contributions from independent country experts. These data have been complemented by other relevant indicators and study results.

Chapter Two describes the approach to the production of this report and the principal sources of information used. Chapter Three provides a detailed assessment of progress in each of the five ERA priorities in turn. The report concludes by reviewing the methodological implications for future monitoring and analysis of progress towards the realisation of the ERA.

[1] These took the form of dedicated ERA Communication country fiches, structured according to the five ERA priorities and associated actions, completed by independent national experts.
[2] A Reinforced European Research Area Partnership for Excellence and Growth, COM(2012) 392 final, 17/07/2012

2. SOURCES OF INFORMATION AND METHODOLOGICAL APPROACH

The key source of information for this report is the set of systematic country analyses (ERA Communication Fiches) developed by JRC-IPTS in 2013 in collaboration with independent national experts across 28 Member States and 13 Associated Countries.

The results of these country analyses have been integrated with other sources of information including the ERAWATCH Country Reports[3], the ERAWATCH online Country Fiches and other *ad hoc* sources of information used according to the specific ERA priorities (Eurostat statistics, European roadmaps etc.).

This approach enables examination of different national situations with regard to each of the five priorities in turn. This extensive review of documents, combined with expert knowledge, has allowed the identification of key issues and common patterns of behaviour across countries.

Given the heterogeneity both of the information available for each country and the nature of the priorities and their constituent actions themselves, specific methodological perspectives (with related sources of information) are necessary in order to analyse each of the five ERA priorities. The report aims primarily to address the formal adoption of initiatives at national level. However, other steps of the policy cycle (i.e. strategy, implementation and evaluation) can also be covered according to the specificities of priorities. Moreover, the preparation of this document was also intended to complement other parallel European Commission information collection activities supporting the preparation of the 2013 ERA progress report[4].

Thus this synthesis report identifies as far as is possible, for each priority policy, patterns across Member States, providing suggestions for monitoring future progress (in certain actions, given the policy configuration, monitoring can be extremely complex) and summarising the overall situation. By providing a snapshot of how the ERA is being addressed in terms of national or institutional policies, it provides evidence for assessment of the implementation of the ERA priorities.

Whilst this synthesis report provides an up-to-date, consistent picture of the ERA, its value also lies in the identification of the gaps in our understanding of the ERA itself and of the obstacles that currently hamper the full deployment of the five priorities.

[3] http://erawatch.jrc.ec.europa.eu/

[4] EUR 26030 EN – European Research Area – Progress Report 2013

3. PROGRESS ASSESSMENT IN THE FIVE ERA PRIORITIES

3.1. More effective national research systems (ERA priority 1)

Box 1 Key findings

- In a context of continuous pressure on national R&D budgets, structural reforms are implemented with the aim of using available resources more efficiently and therefore maximise the return on investment in research;
- The shares of competitive and of performance based institutional funding are increasing in Europe. Various formulas for the allocation of core funding are used across Europe. In many countries, new distribution models have been recently adopted, and include research performance indicators;
- Allocation of funds based on regular, efficient, transparent institutional assessment is at an early stage or moderately developed in most of the countries. Countries where evaluation culture is already relatively advanced, are continuing on a learning track, expanding practices with respect to systematic evaluation approaches;
- Emerging evaluation systems have caused some controversy among stakeholders, and often raised methodological concerns. Apparent more positive side-effects of budget cuts on STI governance include more coherent funding efforts, as well as reinforcement of political will for on-going HEI reforms;
- In some countries institutional funding remains the main funding stream. This may be fully justified given the size, youth of the systems and/or the well-established and efficient institutional assessment mechanisms and funding distribution models based on the outcome of such exercises.
- High monitoring, competition and evaluation requirements related to EU funding have some leveraging effects on national efforts, in terms of increasing the share of resources allocated competitively as well as evaluation practice.
- In most of the new Member States, the national research and innovation system remains rather vulnerable to the unstable political and economic national context, facing the longer term consequences of chronic under funding, further exacerbated by recent budget cuts. New regulatory frameworks increased the pressure on the research community to perform "excellent" research, while most often lacking access to appropriate research infrastructures, funding, working conditions. This mismatch between public R&D supply and demand can lead to further deterioration of the national labour market for researchers.
- The core principles of international peer review are increasingly being applied. In a few countries, there are formal requirement for a certain proportion of international reviewers to be involved.

3.1.1. Scope and methodological approach

Overall Europe underperforms compared to its main competitors in terms of R&D funding and scientific output, while having a very heterogeneous RDI landscape. Europe also faces a series of significant challenges, including: economic and financial crisis, low growth, and an ageing population. Recognizing that Europe's future growth relies to a large extent on research and innovation, the European Council reaffirmed in March 2010 that the overall R&D investment level should be increased to 3% of EU GDP as part of improving the conditions for research and development. Wide disparities in GBAORD are observed across EU. This is also reflected in the heterogeneous distribution of knowledge production which is concentrated in a relatively small number of MS.

National research performers across the EU have access to very different levels of public funds for R&D, which are dispersed to the R&D performers through various mechanisms. These two factors exacerbate the divergences in performance across the EU. The variety of national approaches to competition for funding is one of the underlying 'structural' barriers impeding the development of adequate framework conditions for research and innovation (R&I) at national and European level.

Modes of public funding allocation refers to the different ways in which public funding is allocated in the R&D system to beneficiaries, the organisations responsible for funding decisions and the types of instruments used. Particular interest in *allocation modes* emerged in the 1970s and 1980s for two main reasons: firstly, the stagnation of the volume of public research funding and, secondly, a new policy rationale oriented to create incentives for an efficient use of public funding through competitive allocation mechanisms (Geuna, 2001)[5]. There are two main allocation mechanisms of public research funds: institutional (general/block) and project funding.

- **Institutional funding** (general/block) is attributed directly and globally to institutions such as universities or public research institutes. Such funding is provided through various distribution algorithms, which may include a share based on institutional performance assessments. The allocation of funds, as well as the nature of the research to be carried out, is at the discretion of the institute receiving the funds.
- **Project funding** is broadly defined as money attributed through an open and competitive process to a centre, group, or individual to perform a research activity limited in scope, budget and time. Public project funding is made available through specific instruments directly to individual researchers or research units (rather than channelled through large research organizations) (Lepori, 2006)[6]. This type of funding has been used as an instrument for steering research activities towards political and economic goals.

  In organisational terms, the decisive feature of project funding is the existence of dedicated institutions (agencies, academies or councils) external to the central administration selecting the projects to be funded and allocating money to research groups.

There is academic evidence that excellence in science is linked to competition between researchers and evaluation of scientists against comparable international criteria and also that there is a clear link between a more competitive funding environment for universities and the productivity of the whole research system in terms of the number of publications per euro invested (Auranen and Nieminen, 2010[7]).

Against this background, in the ERA communication, July 2012[8], the EC invites national authorities of Member States to:

- Introduce or enhance competitive funding through calls for proposals and institutional assessments as the main modes of allocating public funds to research and innovation, introducing legislative reforms if necessary.
- Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review (excellence, impartiality transparency, appropriateness of purpose, efficiency, speed, ethical and integrity, evaluation is performed by independent national and international experts.

The two approaches should be focused on the core of research funding decisions in all Member States in order to overcome divergences in performance across the EU, although the balance between these two approaches may vary.

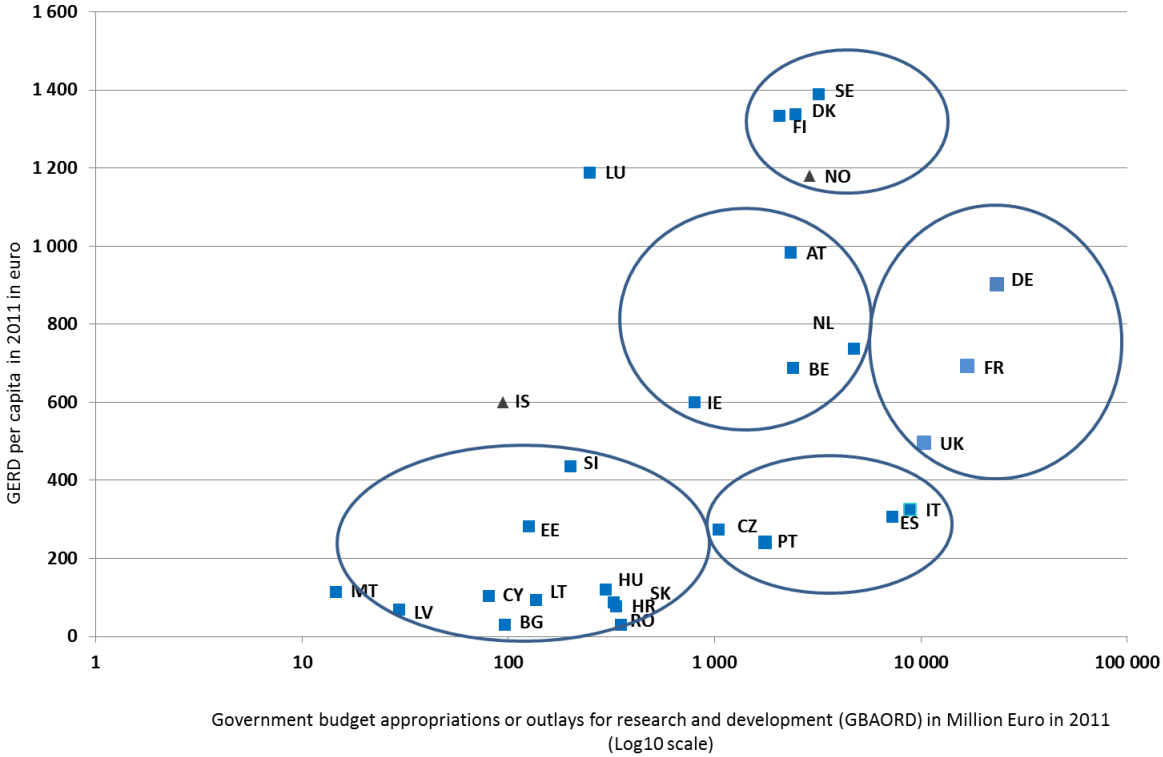
Background information: Total and public R&D spending in EU

One of the key targets of the Europe 2020 Strategy[9] is to achieve a 3% R&D intensity. In 2011, EU27 R&D intensity, with a value of 2.03%, showed a slight increase compared to 2010 figure (2.01%). Among the EU Member States, only Nordic countries have so far exceeded the 3% target, while seven Member States, namely Germany (2.84%), Austria (2.75%), Slovenia (2.47%), Estonia (2.38%), France (2.25%), the Netherlands and Belgium (both 2.04%) were above the EU27 average although below the

[5] Geuna, A. (2001), Journal of Economic Issues 35: 607-32.
[6] Lepori B, *Research Evaluation*, volume 15, number 2, August 2006, pages 133–143,
[7] Auranen O and Nieminen M, Research Policy, 2010, vol. 39, issue 6, pages 822-834
[8] European Commission (July 2012) ERA Communication from the Commission to the European Parliament, the Council, the European economic and social committee of the Regions A Reinforced European Research Area Partnership for Excellence and Growth
[9] European Commission (2010a) EUROPE 2020 A strategy for smart, sustainable and inclusive growth;

target figure of 3%. Germany, France and the United Kingdom together accounted for more than half of all R&D expenditure in the EU-27.

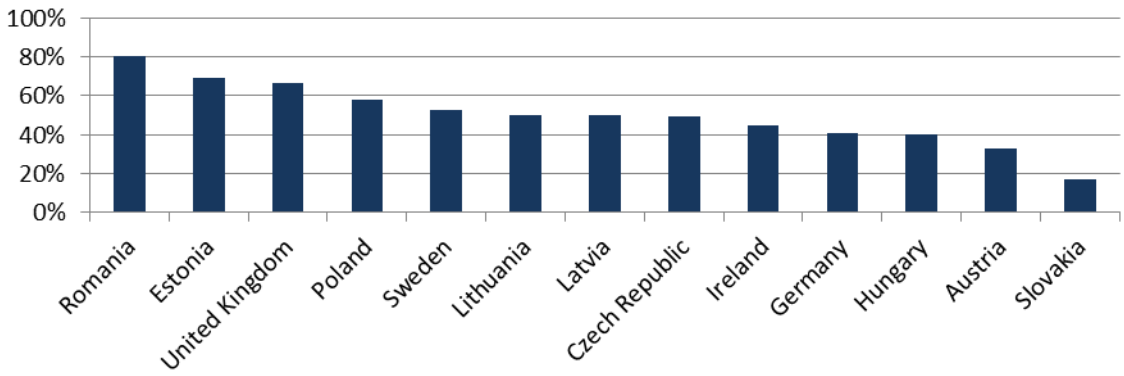
Figure 1 Country grouping according to the GBAORD - Total R&D appropriations and GERD per capita, 2011



Source: EUROSTAT

Overall European public efforts to implement national research and innovation activities have been decreasing as a consequence of the public budget constraints affecting many EU Member States, with some notable national exceptions. In 2011, EU27 GBAORD expressed as a percentage of GDP was 0.73%, compared to 0.76% in 2010. In 2011, wide disparities in GBAORD were observed across EU, its value ranging from 1.09% in Finland to 0.15% in Latvia.

Figure 2 Share of project-based funding



Source: JRC-IPTS based on contributions of independent country experts

Sources of information

In assessing progress in implementing these actions, this synthesis report tries to identify policy patterns, to briefly assess the impact of the economic crisis on this ERA priority and to draw some conclusions. Based primarily on the expert ERA Communication Fiches, this analysis also draws on the

annual ERAWATCH Country Reports covering the years 2009 - 2012[10] and relevant recent JRC-IPTS analytical work[11]; [12].

One important weakness is herein signalled: available R&D statistics centre on R&D expenditures and their detailed breakdown by performers, funders and sectors, but largely disregard funding instruments and allocation mechanisms. Systematic and comparable information across countries on the quantitative importance of the different instruments has been lacking[13]. Consequently, a systematic quantitative analysis of allocation modes/funding instruments is still not yet in place. The following analysis of the current situation provides a rather broad description, highlighting the trends.

Grouping methodology

The grouping used below is based on analysis which tries to go beyond the current state of play of national policies with ERA relevance, and takes into consideration other research and innovation policy and system features, and relevant RDI indicators. On the basis of observed similarities, a number of country groups have been identified.

3.1.2. Country grouping on open national-level competition and evaluation

According to the level of complexity of their respective national research and innovation systems, the level of GBAORD, the level of GERD and the existence of evaluation mechanisms, six distinct groups of countries have been identified.

Group 1: Countries with complex R&I systems, high GBAORD (10-30 billion Euro), GERD per capita at EU average or above, good evaluation mechanisms (DE, UK, FR)

Table 1 GBAORD - Total R&D appropriations (€ million) and GERD per capita in UK, FR, DE in 2011

	GBAORD - Total R&D appropriations (€ million)	GERD (euro per capita)
United Kingdom	10386.45	495.5
France	16813.58	671
Germany	23483.80	855.1

Source: Eurostat and JRC-IPTS, based on contributions of independent country experts

These are large countries, have complex research and innovation systems and are the leading Member States in terms of GBAORD, accounting for more than half (55.4%) of the total EU GBAORD, and around 30% of global production of the highly cited (top 1%) scientific publications (2006-08) as a percentage of highly cited scientific articles worldwide.[14] Investment in research and innovation in Germany has been rising even in the years of economic downturn. Total GBAORD was increasing until 2009 in UK, and 2011 in FR. The effectiveness of national research systems has been at the core of the respective research and innovation policy agendas. UK and DE have funding systems oriented towards excellence, allocating competitive and institutional funds based on evaluation mechanisms (of researchers, institutions, projects, programmes) which are efficiently and regularly implemented, while in FR recent changes led to the transition to an organisational form of public research funding more akin to those of other European countries (Thèves et al, 2007).

[10] 2012 ERAWATCH Annual Country Reports http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/reports/country_rep/
[11] Chioncel, M. and Cuntz, A. (2012), "Research and Innovation Challenges and Policy Responses in Member States", JRC Scientific and Policy Reports
[12] Cuntz, A and Chioncel, M. (2013), European Research Area Impact on Member States' policy development", JRC Scientific and Policy Reports
[13] The PRIME (Policies For Research and Innovation in the Move towards the European Research Area) project is the first experiment on quantitative assessment on changes in allocation mechanisms (http://www.prime-noe.org/).
[14] European Commission (2012b) Impact Assessment. Accompanying the document "A Reinforced European Research Area Partnership for Excellence and Growth"

A large variety of stakeholders are performing specific tasks in a highly differentiated German research landscape, with 16 Länder providing R&D funding under their own programmes. A comprehensive evaluation system had been established, increasing the share of competitive funding while relying on appropriate forms of peer reviewing, benchmarking and impact assessment analyses (ex-ante/ ex-post). The share of GBAORD allocated as project based was estimated to 33.62% in 2008. However, the funds allocation mechanism is complex, often institutional funds attributed to a large research organization (i.e. Max Planck Institute) being further distributed through competitive calls to individual research centres.

In the United Kingdom, Research Councils provide competitive funding for basic projected-oriented research while the Higher Education Funding Council allocates institutional funding for research using the Research Excellence Framework allocation mechanism. The UK has well-established mechanisms, effectively and regularly implemented, for the evaluation of publicly funded R&D performers. R&D funds are allocated via a process that is firmly based on open calls for proposals with independent evaluation and peer review using national and international reviewers.

In **France**, the share of project-based funding has been rising continuously with the creation of the large intermediary agency (Agence Nationale pour la Recherche, ANR), complemented by an increasing share of the institutional R&D funding based on the performance indicators. The Evaluation Agency for Research and Higher Education (AERES) was established in 2007 as an independent administrative authority to evaluate, *inter alia*, Research and Higher Education Institutions, Research Organisations and research units. Both phenomena triggered the change of the funding patterns in FR (Thèves et al, 2006). Another trend in research innovation governance was the creation of Research and Higher Education Clusters (PRES), in five fields called 'Alliances' and the Competitiveness clusters ('pôles de compétitivité'), while the law on the autonomy of universities (2008) modified the university governance. The share of competitive vs. institutional funding is not available.

The core principles of independent evaluation and peer review, using national and international reviewers, are implemented. International peer review principles are embedded in UK, Germany, and France research funding allocation mechanisms, while the evaluation has also become increasingly international recently. Both countries represent a good example for the application of evaluation and assessment practice.

Group 2: Countries with high GBAORD in the range 2-3.5 billion Euro, GERD per capita well above EU average (>1000 Euro) and funding focused on excellence. High R&D input and output: Denmark, Finland, and Sweden (Norway)

Table 2 GBAORD - Total R&D appropriations (€ million) and GERD per capita and some output indicators in DK, SE, FI, NO in 2011

	2011 GBAORD - Total R&D appropriations (€ million)	**GERD (euro per capita) 2011**	**Competitive share**	**Institutional assessment**	**Triadic patents (2008)**	**Top100 HEIs**
EU27		510.8	~40		2,196.1	
Denmark	2,458.889	1337.4	40	Regular evaluation. Reform of HE	51.14	2
Finland	2,071.703	1332.7	51		36.33	1
Sweden	3,208.82	1389	52.50	Regular evaluation. Research Bill 2008	131.54	3
Norway	2,897.426	1178.8	:	Regular evaluation. Reform of HE	10	1

Sources: Eurostat and JRC-IPTS based on contributions of independent country experts

In these countries, R&D intensity is above the EU average and above the 3% GERD target. GERD per capita is significantly above the EU average and increased even in the context of the economic crisis. R&D is given high priority in the national political agenda and generally there is consistency and coherence between political statements and actions. Both SE and FI have 4% R&D intensity as national targets. Their combined contribution to GBAORD represents around 11% of total EU GBAORD. It can be said that generally the structural features of the public and private R&D funding system secure its financial stability. The balanced share of funding mechanisms (40% competitive share in DK, 52.5% in SE, and 51% in FI) complemented by performance based institutional funding ensure the efficiency of public support to R&D, which is further strengthened by recent policy and system reforms. The distribution of university funding is largely based on performance in all four countries. Given that all four countries have appropriate institutional assessment mechanisms in place and implement performance based block funding, it is arguable that reversing the balance can further improve the excellence in research. In addition, the increased share of competitive funding for thematic research, contributes to pressure on universities to align their research specialisation with nationally agreed priorities. Concerns have been raised that academic autonomy, reinforced due to recent reforms (DK, FI), may be at risk in terms of decisions related to budget allocation.[15] Peer review evaluation is typically in line with international standards, often involving foreign evaluators, however with a tendency towards Nordic composition of the evaluation boards.

In 2009, in Sweden, total R&D intensity fell, due mainly to a decrease in BERD, caused by multinational companies relocating their R&D activities. Finland and Sweden are among the countries with the highest proportions of enterprises engaged in internal R&D activities in the EU, while Finland (54.9%) is among the countries with the highest proportions of enterprises engaged in external R&D activities. All three MS countries are above the EU27 average in terms of Innovative enterprises as a proportion of the total of enterprises. In Finland and Denmark research, higher education and innovation policies appear well coordinated, while Sweden has had a relatively fragmented governance system.

All countries show a high level of scientific output in terms of publications. There has been some concern that publication figures are only the logical impact of high R&D input and that R&D investments have not been converted into new innovations and jobs as expected, best expressed by the "Swedish Paradox."[16] Conversely, high publication figures can be taken as an indication that active publication is an established practice. Nevertheless, the Nordic countries are above the EU27 average in terms of the total and per capita numbers of patent applications.

The distribution of university funding is largely based on performance in all the countries. In DK, FI (2010-2012), SE (2008 Research bill) new funding models based on bibliometric indicators have been recently implemented, while in NO, the performance-based funding system was introduced step-wise in the Higher Education (HE) sector (2002), Public Research Organisations (PROs) (2009) and in the health trusts in (2004).

[15] Independent country experts (DK, FI) who support JRC-IPTS in the production of the ERAWATCH country reports 2012
[16] Ejermo and Kander (2006).

Group 3: Countries with GBAORD 1-10 billion Euro, GERD per capita 200-350 Euro. Increasing share of competitive funding and based on research performance assessment, on-going reform of the R&I system and of the funding allocation mechanisms. R&D policy evaluations are not a systematic activity (IT, ES, PT, and CZ)

Table 3 GBAORD - Total R&D appropriations (Euro million), GERD per capita and competitive funding share: IT, ES, PT, CZ in 2011

	2011 GBAORD - Total R&D appropriations (in € million*)	GERD per capita 2011**	Competitive Share***
Czech Republic	1,048.315	272	49% (2012)
Italy	8,890.8	325	unknown
Portugal	1,753.67	241	
Spain	7,252.316	307	81%

Source: *. **Eurostat and ***JRC-IPTS based on contributions of independent country experts

With the exception of Czech Republic, these countries faced a reduction of nominal GBAORD in the past few years. The countries' contribution to the total EU GBAORD is 20.71%. All are characterised to some extent by the fragmentation of the public funding landscape, insufficient horizontal coordination between research and innovation policies as well as limited coherence with sectoral policy. This results in a low rate of transformation of research into commercial products. The economic crisis triggered horizontal R&D budget cuts, although not necessarily aligned with the efficiency of policy initiatives and research institutions. Competitive project-based funding has gained importance in the recent years. However, the assessment of the quality of research-performing organisations is generally not the basis for institutional funding decisions. Striving towards excellence is hindered by limited advancement in evaluation practices. The emerging evaluation systems have caused controversy among stakeholders, e.g., lobbying on favourable evaluation criteria and methodological concerns. Apparent, more positive side-effects of budget cuts on STI governance include more coherence in funding efforts (less fragmentation, IT case) as well as reinforcement of political will for on-going HE reforms, in the Italian and Czech cases, respectively.

Total nominal GBAORD rose in ES and PT until 2008, when it started to decline. In ES a high proportion of funding is allocated through competitive calls, institutional funding representing 19% of the GBOARD in 2011. Institutional funding for HEIs is under regional responsibility, and is based mainly on the number of students and staff. In PT, the competitive funding has been rising, while overall the funding provided though peer review mechanisms, especially within the university system, has been increasing. Peer review of international standards is proposed for the selection of projects, human resources activities and development of infrastructures in the new Spanish Strategy for Science, Technology and Innovation (EESTI) and the plan implementing it (PECTI). In PT, while the culture of international peer review is widespread in the university system, the network of public laboratories is not subject to peer review mechanisms.

Italy has an underdeveloped R&D intensity in comparison with its economic profile, BERD intensity of 0.68 (2011) is well below the EU-27 average (1.26), while the recession has led to a worsening of public finances. The share of GBAORD allocated as project based is unknown. The system has been lacking efficient implementation of policy measures, continuity of policy and systemic evaluation. The HEIs are characterised by good performance indicators and the presence of important isles of excellence, but it suffers from low mobilisation of financial and human resources[17]. Fragmentation and dispersion (many small measures with relatively low budgets) have characterised the national public funding system for a long time. This trend has been changing in recent years, funding efforts focusing on financing large projects on specific key strategic areas. Recent reform of the PROs and HEIs

[17] Italy has the lowest number of researchers per unit of GDP among industrialised countries and the lowest percentage of researchers in the active population.

foresee change of the governance, a multiyear planning of the activities for pursuing scientific excellence and integration with the private research sector. The share of core funding allocated on the basis of evaluation results recently increased.

In the **Czech Republic**, a comprehensive reform of the RDI system was launched in 2008. Since this reform, there has been a continuous increase of project-based funding and a decrease in institutional funding from 56% in 2009 to 51% in 2012, with a further decrease to 47% un 2014. Over the period 2010-2013 the performance of research institutions was systematically evaluated on an annual basis and used as the base for the allocation of funding. However, the methodology has been criticised by some stakeholders and by the independent international audit (Arnold, 2011t) due to the fact that it is based strictly on quantitative indicators which do not sufficiently reflect the quality of the S&T outputs or the specificities of different scientific fields. A revised methodology for the period 2013-2015 has been prepared to better take into account the quality and relevance of the research performed.

Group 4: Countries with GBAORD in the range 0.5 – 5 billion Euro, high GERD per capita (above EU average). Increasing share of the competitive funding, new distribution models for the allocation of institutional funds based on research performance. Good evaluation mechanisms (AT, NL, BE, IE, IL, CH).

Table 4 GBAORD - Total R&D appropriations (€ million), GERD per capita and competitive funding share: AT, NL, BE, IE, IL, CH in 2011

	2011 GBAORD Total R&D appropriations (€ million)*	**GERD (EUR per capita)****	**Competitive share (latest available data)*****
The Netherlands	4,740.148	738	32 % (2009)
Belgium	2,391.877	686	Unknown
Austria	2,330.43	983	33%
Ireland	801.906	598.2	45%
Israel	1003,32	880,34	Unknown (high share)
Switzerland	3,361.588	n.a	n.a

Source: *. **Eurostat and ***JRC-IPTS based on contributions of independent country experts

In these countries, R&D intensity is above the EU average but below the 3% GERD/GDP target, while GERD per capita is well above the EU average. The countries' combined contribution to total EU GBAORD is 11.22**%.** In all cases, the allocation of public funds aiming at scientific excellence is based on international peer-review and internationally recognized standards for peer-review.

In **Austria**, the bulk of research funds is distributed at federal level. Regional strategies and funding agencies complement the activities at national levels. The institutional share of the R&D public funds roughly accounts for 2/3, while competitive funding for 1/3, respectively, of total funding. National public funding for the HEIs is mostly institutional and is based on performance agreement. HEIs undergo external quality assurance every seven years; the block funding includes a share based on research performance indicators and a strategic budget depending on the societal objectives of the universities. Implementation of new institutional funding model is foreseen for the performance contract period 2019-2021.

In the **Netherlands**, while the scientific output is quite good, the input shows a declining trend. The Dutch research system performs very well in terms of scientific productivity (high number of ISI publications and patents, the latter due largely to Philips but not necessarily due to R&D performed in the country), impact scores and success rates in FP7. While a large part of Dutch R&D funding is institutional, an increasing part is allocated on a competitive basis, using international peer review. In 2009, 68% of R&D budgets from all ministries were allocated via institutional funding and 32% via

project-based funding. A significant shift from R&D direct funding instruments to indirect funding schemes took place in the last year, which makes the situation of competitive vs. institutional rather blurred[18].

Policy governance had been complex and fragmented for a long time, with a consequent lack of coordination in policy design and implementation. Historically, a strong division of labour existed between science and basic research on the one hand, and technology and innovation on the other, both in terms of policy design, funding and research performers. The governance mechanisms for these separated science and innovation systems have been gradually moving towards each other with the creation of the 'super ministry' of Economic Affairs Agriculture and Innovation (EL&I). The new policy for the business sector ('Naar de Top'), launched in 2012, and the reform of the Dutch HE sector are aimed to positively impact the effectiveness of the R&I system, improving the knowledge transfer and cooperation with industry. A new funding mechanism for HEI, to be implemented over the period 2013-2016, based on performance agreements and complemented by financial sanction mechanism, is aimed to improve the academic landscape.

Belgium is characterised by high internal R&D policy heterogeneity generated by the division of labour between the federal and regional/community entities. The Federal Government retains most of the competences for fiscal measures, therefore influencing regional R&I policies, in particular the tax deduction schemes. Research performance of HEIs/PROs is not systematically monitored and evaluated on the federal level and, except for the ECOOM service in Flanders, can be assessed as relatively weak.[19] In the Wallonia-Brussels Federation, block funding for HEIs is allocated on the basis of the number of students and full-time equivalent researchers, without considering indicators of scientific performance. In the Flemish Community, additional funding for universities is partially based on scientific output indicators. In Flanders, a Dutch-Flemish accreditation body carries out systematic review, primarily focused on education. In Flanders, the Research Foundation – Flanders (FWO) calls on international experts for the evaluation of all applications, both fellowships and projects. These procedures are based on ESF's European Peer Review Guide.

Ireland Project based funding received around 51.43% of GBAORD in 2008 (OECD). The largest share of publicly funded R&D is allocated to the HE sector through the Higher Education Authority (HEA). In 2008, 78% was allocated by HEA as block grant and 22% as competitive funding. The small size and relatively recent nature of the Irish research sector, coupled with the national policy aspiration to be a world-leading knowledge economy, established the peer review and evaluation procedures as a customary culture. *Powering the Smart Economy (2009-2013)* states that international peer review would remain the cornerstone of its evaluation system. The Government has instituted a rolling programme of organisational evaluations.

Israel. The competitive R&D fund is the main instrument of the R&D law and is channelled through two main sources. Israeli universities benefit from a quality assurance mechanism. The Planning & Budgeting Committee of the Council for Higher Education (VATAT) is responsible for academic quality assurance and for the allocation of block funding. The research budget allocation model has a weighting of 34% corresponding to competitive grants, 34% to publications adjusted to the importance of the journal, and the remaining 32% to factors such as non-competitive grants and the numbers of doctoral students.

Switzerland. The effectiveness of the Swiss research system is high and performance indicators are generally above the EU average. Swiss research and innovation system has well established funding mechanisms. Given these stable features, no new initiatives or legislative measures have been implemented recently.

[18] ERAWATCH Annual report (2012): The Netherlands,
http://erawatch.jrc.ec.europa.eu/erawatch/export/sites/default/galleries/generic_files/file_0379.pdf
[19] JRC-IPTS based on contributions provided by independent country expert for Belgium

The HEIs and Federal Institutes of Technology are evaluated regularly against a set of quality criteria. Competitive funding is at the core of the Swiss research and innovation system: most funds targeted at individuals and companies are allocated competitively. Both the Swiss National Science Foundation (SNSF) and the Commission for Technology and Innovation (CTI) allocate their competitive funding by submitting projects to a thorough peer review in line with international standards. Competitive and institutional funding will increase over the next four years.

Group 5: Countries with GBAORD in the range 0 - 500 Million Euro, low to very low GERD per capita (25 - 400 Euro). Significant revision of legislation towards policy accountability and policy learning (RO, PL, HR, SK, HU, LI, SL, EE, BG, LV, TR, RS. EL is singled out in the group).

Table 5 GBAORD - Total R&D appropriations (€ million), 2011 GERD per capita and competitive funding share: RO, PL, HR, SK, HU, LI, SL, EE, BG, LV, EL in 2011

	2011 GBAORD Total R&D appropriations (€ million)*	**2011 GERD (EUR Per capita)****	**Competitive Share*****
Latvia	29.591	48.3	~50%
Bulgaria	96.421	28.5	46% (2009)
Estonia	125.908	173.7	69%
Slovenia	200.705	364.4	unknown
Lithuania	136.672	66	~50% (2012)
Hungary	296.173	112.4	~40%
Slovakia	323.598	76.8	16.8%
Croatia	334.206	75.7	27%
Romania	352.815	26.7	82%
Poland	n.a.	n.a	unknown
Greece	n.a.	120 (2007)	unknown
Turkey	n.a	64.7	
Serbia	n.a.	n.a	unknown

***Source:** *. **Eurostat and ***JRC-IPTS based on contributions of independent country experts*

Most of these countries have experienced a chronic shortage of public resources for R&D, often stretched across an oversized public institutional structure inherited from central planning. In most cases, the economic crisis triggered R&D budget cuts. The total contribution to the EU GBAORD is very low (2.18%) given the size and the number of countries. Reforms take place, yet the path is slow. The often prevailing public funding of research activities is indicative of problems related to the efficiency of research in stimulating economic growth. The increase in EU Structural Funds has had some leveraging effects on national efforts, both in terms of increased competitive share as well as improved evaluation and monitoring practices. The Structural Funds also secured short term sustainability of R&D expenditure, some countries heavily relying on such funds. Evaluation practice is only now developing and the legal framework reflects good policy intentions rather than operational efficiency. The regular institutional assessments and allocation of funds based on performance results have not been effectively implemented. Project funding is based on evaluation following the core principle of international peer review. The involvement of international reviewers is increasingly required (e.g. RO). However, in some countries the submission of proposals in the native language can hamper the participation of international reviewers. The research community is often frustrated, being pressed to demonstrate internationally recognized excellence, while working in an environment that often does not match such high requirements. In most of these countries, the RDI system remains rather vulnerable to the unstable political and economic national context, facing the long term consequences of chronic under funding, further worsened by budget cuts.

Latvia. Public R&D funds are provided via a mix of institutional and project based competitive funding. The share of competitive versus institutional funding is close to 50%. The approach to

evaluation changed in 2012, when international peer evaluation of proposals was put in place for projects with an annual budget above €60K.

Bulgaria. There is a clear trend towards increasing the share of competitively allocated research funding (from only 10% in 2004 to almost 50% in 2008). However, institutional funding still prevailed in 2009 (54%), representing a drawback for the efficiency of public support, given the lack of evaluation culture. Starting in 2010, the receipt of EU Cohesion and Structural Funds increased the overall share of competitive public funding for R&D. There is almost no institutional assessment of the PROs, and thus very limited relations between institutional funding and research performance. Only one international evaluation and consultation of PROs has been undertaken, however with no significant implications. In 2011, a new ranking system for HEIs was introduced as a tool for performance-based allocation of funding, although, so far, this tool has not been extensively used.[20] In October 2010, the Law on Scientific Research Promotion was amended in order to ensure accountability of public funds for R&D, requiring mandatory independent national and/or international assessment of research projects. However, the submission of proposals only in Bulgarian, in some cases, can hinder foreign review.

Slovenia. In terms of scientific output quality assurance, the national evaluation system is advancing. An independent, national evaluation agency for HEI was established in 2010. The national reform programme 2013 proposes to increase institutional funding linked with regular evaluation of research institutes and universities. The share of GBAORD allocated as project based is unknown. Peer review process for competitive research is enforced since 2008.

Lithuania. Overall there is a clearly pronounced policy shift towards increased competition and sustained investment in research. The competitive funding share has increased from 12.1% in 2006 to around 50% in 2012. A major policy shift occurred in 2009, when the Research Council of Lithuania acquired the functions of a funding agency. The Government decision (adopted in 2009 and subsequently amended in 2010 and 2012) on the method for allocation of budgetary appropriations for R&D for HEIs and PROS[21] stipulated that higher share (50% in 2011) of basic funding should be linked to research performance. There is, so far, no publicly available data on the extent to which the peer review involves international scholars. However, most of the grant proposals are submitted in Lithuanian language (with a short summary in English), which could pose barriers to the participation of international reviewers.

Hungary. The quality of scientific output is low to medium and is not leveraged by its underdeveloped evaluation culture. STI policy governance structures have been frequently reorganised. A related risk is the lack of an overall, strong consensus among stakeholders and policy-makers on the desired objectives and instruments, leading to an unpredictable policy environment. In the same context of governance instability, various plans have not been efficiently put into practice or remained largely on paper. No comprehensive analysis is publicly available to establish whether an adequate balance between institutional and project-based funding of research is provided. The R&D block funding does not include performance criteria. The three-year 'maintenance agreements' and the 'research university' label represent a step in the direction of applying performance-based criteria for determining state funding. STI policy evaluation culture is weakly developed in Hungary. However, according to the law, publicly financed STI policy measures shall regularly be evaluated by independent experts.

Slovakia. The Slovak Republic is slowly reforming its PROs and HEI system. Among the main perceived weaknesses are: lack of clear thematic and/or sectoral priorities, no focus on excellent

[20] The Commission Staff Working Document on the 2013 NRP

[21] LR Vyriausybės nutarimas dėl LR valstybės biudžeto lėšų moksliniams tyrimams, eksperimentinei (socialinei kultūrinei) plėtrai ir meno veiklai plėtoti valstybinėms mokslo ir studijų institucijoms skyrimo tvarkos aprašo patvirtinimo, Nr. 76-3103, 2009 September 27.

research, fragmentation of support (high number of small-scale projects), and poor design of policy measures. National support to competitive funding decreased from 35.1% in 2008 to 16.8% in 2011. Since 2010 funding provided by the European Union increased in importance, having some leverage and short term sustainability effects. Evaluation culture is underdeveloped in Slovakia, with limited impact on fostering excellence in research at HEI and PROs, mainly because funding was not affected by the results of the evaluation. The government has declared its support for international peer review and the participation of foreign experts in panels of evaluators.

Croatia. The largest part of GBAORD (around 73%) has been regularly allocated to cover overheads for institutions and staff salaries at PROs and HEIs. Efforts to strengthen competitive funding and improving the ratio between institutional and project funding have gained increasing importance since 2010. A new draft of the Law on Science and Higher Education, adopted by on 01.02.2013 and sent to the parliamentary procedure, envisages a new model of intuitional funding through "programme contracts" between the Ministry of Science, Education and Sports (MSES) and PROs/HEIs. This new model is driven by the need to increase the proportion of budget funds for research activities in relation to the institutional "lump-sum" funding, which today largely exceeds financing of the competition-based projects.

Romania. The funding mechanism indicates a clear trend towards increasing competitive funding. Romania is perhaps the most notable example among the EU MS in terms of a shift towards competitive funding. From 2007 onwards, competitive funding has become dominant. In 2008, public funding allocated on a competitive basis reached 89.2%. However, 2009 budget cuts triggered a "re-prioritisation" of funding, with the nominal block funding for the national R&D institutes increasing by 30%. This was largely a social policy aiming to retain the scientific human resource base rather than an R&D measure aimed at increasing performance. The new regulatory framework (2011) stipulates that all R&D units in order to be entitled to R&D public funds must be evaluated and ranked by their research performance into five performance classes. In the past only PROs benefited from block research funding, with HEIs having access only to competitive R&D funding. A new model for the distribution of block funds allocated to HEIs will include a share based on research performance. Projects are funded based on evaluation following the core principle of international peer review. The rules stipulate that a share of 50% of foreign experts must be ensured for each project and programme (except those with national specificities, or with a budget above 20K euro).

Poland. A wide-ranging science and higher education reform from 2010-2011 established new institutions and rules, promoting the effectiveness of R&D activities. A bill on principles of science financing, introduced in 2010, obliges the government by 2020 to allocate half of the entire science budget to R&D projects. In 2012, 52.67% of the science budget was distributed via open competitive calls. Another consequence of the reform is allocation of institutional funding based on the results of scientific evaluations of institutions. The first institutional evaluation using the new criteria was performed in 2013.

In Romania and Poland, a fairly advanced performance-orientated system has been designed at policy level, aiming to monitor and review the quality and performance of knowledge production. This is safeguarded by a legal framework assuring that all R&D institutions operating as a public legal entity should be registered and evaluated periodically, institutional and targeted financing being directly linked to evaluation results.

Greece is singled out in this group. The Greek RDI system has been affected by the economic crisis and is strongly dependent on EU support (EU Framework Programme and structural Funds). In 2011 Greece set an R&D intensity target of 2%, revised in 2013 downwards to 0.67%. EU structural funds continue to play an increasingly important role in promoting R&I. The Law provides for the evaluation

of all HEIs and PROs every 4-5 years. However, the evaluation results do not influence the attribution of block funding.

Group 6: Small countries. GBAORD 10 - 250 Million Euro. Limited number of public research organisations, competitive allocation of institutional funding often is not realistic or effective (LU, MT, CY, IS, LI).

Table 6 GBAORD - Total R&D appropriations (€ million), 2011 GERD per capita for LU, MT, CY in 2011

	2011 GBAORD - Total R&D appropriations (€ million)	GERD (per capita)
Luxembourg	248.978	1,178.3
Malta	14.595	101.4
Cyprus	80.605	105.2
Iceland	94.433	843.8 (2009)
Liechtenstein	N A	N A

Sources: Eurostat and JRC-IPTS based on contributions of independent country experts

These are very small countries, having a low (0.37%) contribution to the total GBAORD. The size or/and the lack of maturity of the research and innovation systems are not incentives for the competitive funding.

Luxembourg The most significant feature of Luxembourg's national research and innovation system is its youth, the oldest PRO being just over two decades old and its only university established by law in 2003. While Luxembourg's GERD/GDP ratio is below the EU average, GERD per capita is well above EU average, with private R&D funding overshadowing public. It features a small R&D system, political stability, a prosperous standard of living and an attractive taxation legislation that encourage firms to declare their R&D activities in the country although performed elsewhere. Public funding has become more selective and results-based, public PROs signing three year performance contracts. The University of Luxembourg, focused on research, is lacking cost accountability, yet, this deficit is essentially due to the institution being so new.

Malta Total GBAORD per capita rose until 2010, when it started to decline. The share of GBAORD allocated as project based is unknown. Although it is not clear whether the evaluation process is in line with the international peer review principles, there is a strong competition for the limited amount of funding available. There are no institutional assessments of the University of Malta or the public research centre and the allocation of institutional funding is hence not based on performance.

Cyprus The national research system in Cyprus is young. GERD and BERD remain among the lowest in the EU, despite efforts to increase them. Severe austerity measures are weakening all public spending. Public finances are in a very precarious situation and unforeseen changes may occur at short notice. The main funding mechanism is block-funding, although State Aid for research and innovation allocates some funds via competitive mode. However, due to financial constraints and provisional governance problems competitive funding has diminished rather than increased since 2011. While there is no explicit, mandatory legal provision all indications are that national policies respect the core principles of peer review, the main funding authority, has introduced peer "independent" review by Greek researchers.

Liechtenstein. Despite its small size and youth, the R&D system ranks well in the area of innovation, as evidenced by significant corporate R&D spending, the high percentage of companies carrying out innovative activities and output R&I indicators. At the basis of the innovation system is a generally favourable business climate, characterised by low levels of bureaucracy, a liberal economic order and low levels of taxation nurturing entrepreneurial activities. Liechtenstein formally established only in 1992 a tertiary education sector, consisting of three institutes of higher education and one university-like institute. A limited portfolio of research projects supports the R&D activities.

3.1.3. The impact of the crisis

GBAORD in the EU has declined in relative terms. However, the relative share of the public efforts increased compared to the business investment. This can be explained by a variety of reasons which significantly differ across countries. Combinations of these factors may also exist:

- Public R&D budgets having increased in absolute terms (i.e. Nordic).
- R&D budgets exempted from overall public budget cuts or national GDP decrease being relatively more pronounced than public sector cuts.
- Contractions in business R&D investment generated mainly by the reluctance of the private sector to take risks by investing in R&D during the crisis or multinational company relocating the R&D activities outside EU (Chioncel and Cuntz, 2012).

The *increased role of EU structural funds*, some countries heavily depending on such sources, has changed the funding pattern and evaluation practice. This triggered the increase of the share of competitive funding and is likely to have contributed to short-term stability, not necessarily long term sustainability, in the context of the policy commitments of co-financing.

A small number of countries have shifted their focus from direct funding measures to indirect R&D financing. Tax and risk capital related policies targeting the financing of innovation and entrepreneurship have experienced a certain boom due to the crisis: *governments more willing to temporarily share risks* with businesses (M Chioncel & A Cuntz).

Budget cuts mostly affect HEIs and PROs with either short-term consequences, e.g. reductions in researchers' salaries as well as temporary interruptions of R&D support measures, or, in very few countries, long-term implications, e.g. cuts in institutional funding prospects.

Policy responses with respect to fiscal consolidation efforts are found across all country groups, yet various approaches are used. Among "positive side-effects of budget cuts on STI governance are seemingly more coherent funding efforts (less fragmentation) as well as reinforcement of political will for on-going HEI reforms.

3.1.4. Is competition paying off?

While, in general, increased competition is associated with higher performance levels, the underlying situation is complex and includes other incentives and environmental factors. Among the most important factors to be considered are:

- **Selectivity**: competitive funding is generally concentrated on a set of predefined set of priorities, generally with potential socio-economic impact. Institutional funding provides freedom for researchers to develop ideas which may be considered too risky in competition.
- **Concentration**: funding is concentrated on the "best performers" and on "hot topics".
    - The increasing share of competitive funding increases the pressure on the research community to align research specialisations with economic needs, on "top down" "hot" priorities.
    - In all the ERA countries, policy measures are implemented with the aim of enhancing the link between science and business, to stimulate industry driven research. Nevertheless, the effects have been limited, although the reasons behind it are different among countries. In some countries the public push occasionally changed into substitution effect and/or into minimal results due to the limited absorptive capacity from industrial sector. These policies are implemented through competitive funding and their efficiency may be at risk if disconnected from the national economic context.

- The government efforts to increase share of the block funding allocated based of performance has been arguably assessed as means of reinforcing the structural division of the academic system: in Sweden, the 11 largest universities consume an average of 89% of the annual institutional block funding in the past five years, with the 18 newer university colleges sharing the rest.

- **Reduced autonomy of HEIs and PROs in design of the research agenda.** Institutional funding allows more autonomy in defining research strategies, while avoiding risks of convergence on 'hot areas'. This also raises the concern that competitive funding limits university autonomy to design research agendas and to align their research specialisations with nationally agreed priorities.

- **Sustainability versus accountability**: institutional funding provides a reliable finance for long term growth. There are also many equipment and support services which are not easily funded through individual grants. On the other side, the shorter timescales and higher granularity of competitive funding allow more scientific flexibility and may ensure higher accountability of the public money.

- **Cost and time efforts** required for preparation and review of the applications are relatively insensitive to the size of grant awarded.

3.2. Optimal transnational co-operation and competition (ERA priority 2)

Box 2 Key findings

Jointly addressing grand challenges

- The share of public national funding dedicated to transnationally coordinated research in GBAORD in Europe (EU28+NO+CH) is 4.27% or €4.2 billion. Of this, around two thirds consist of contributions to the European Space Agency. The other types of coordinated funding represent €1.5 billion or 1.47% of national GBAORD. Two thirds of this is spent by only four countries (DE, FR, UK, IT). Some Member States doubled their share of transnationally coordinated research in total GBAORD from 2010 to 2011 (Poland, Finland and Estonia) (Eurostat, 2012). Individual country shares range from 5.87% for FR (and 8.95% for BE but based on partial data) to 0.27% for Romania when including ESA, and from 3.39% (BG) to 0.13% (IE) when excluding ESA contributions.
- When including ESA contributions, the countries with the highest share of transnationally coordinated national public funding (% of GBAORD) also represent the largest joint national public funding in absolute terms. The largest spenders then are also those with the highest degree of coordination. When excluding ESA contributions, the degrees of coordination are much more diverse.
- The same high spenders all have a clear orientation towards grand challenges, albeit in different ways. Among the EU-12 there seems to be a gap between Poland and the Czech Republic (and also the low spender Estonia) that have a clear orientation towards grand challenges, and the rest of EU-12, where joint programmes seem more weakly connected to grand challenges.

Research infrastructures

- The assessment of national roadmaps made by ESFRI in 2010, updated in 2013 and complemented by JRC-IPTS information shows that Member States and some Associated Countries have taken into consideration aspects related to research infrastructures. Almost all MS have developed national roadmaps and linked them, when updated, to the ESFRI roadmap. Among Associated Countries, only Norway, Serbia, Switzerland have developed national roadmaps, soon to be followed by Israel and Turkey.
- Financial commitments to the preparation phase of ESFRI projects are rather unequal and strongly linked to GBAORD.
- Access to infrastructures for researchers from EU Member States is generally without serious problems. Direct participation of a country in the construction and implementation of an infrastructure, of course, further eases the access for researchers coming from this country. Access to research facilities for researchers coming from non EU Member States, however, depends on individual institutional agreements.

3.2.1. Jointly addressing grand challenges

3.2.1.1. Scope and methodological approach for actions covering grand challenges and interoperability of national programmes

The three following actions cover grand challenges and the interoperability of national programmes:

- Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas and that common ex post evaluation is conducted;
- Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions;
- Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant.

Most Member States are involved in some form of research coordination at transnational and international level, through participation in ERA-NETs, JPIs and/or other types of (pan-) European multilateral projects, as well as various bilateral collaborations.

Wide differences exist in the extent to which grand challenges are addressed (through joint research agendas and other means), strategic alignment versus project based participation, the existence of ex-post evaluation, and the level of funding provided.

The volume of joint programmes is still very limited. The proportion of 2010 MS R&D budget directed towards transnationally coordinated research is estimated to be of 4.27% on average[22] (based on data from 21 MSs), ranging from 0.27% in Romania to 5.87% in France[23] (8.95% for Belgium but drawing on partial data. This is a slight increase [24] compared to the 2009 figure of 3.84%. The total transnationally coordinated research budget for 2010 represents €4.2bn. Out of this, €2.7bn is assigned to the European Space Agency, leaving €1.5bn for all other types of transnational coordination.

The Member States and Associated Countries are examined in more detail below, grouping them according to the proportion of national public funding allocated to transnationally coordinated research as a percentage of GBAORD in 2010 (both with and without ESA contributions). In order to take into account the size of countries and their relative weight in the European Research Area, the following two dimensions have been chosen to identify groups of countries (see Figure 5a and 5b):

- GBAORD (divided into 4 categories: from 10 to 100 million Euros, from 100 million to 1 billion Euros, from 1 to 10 billion Euros and greater than 10 billion Euros).
- The share of public funding dedicated to transnationally coordinated research in GBAORD compared to the EU average (which is 4.27% of GBAORD with ESA contributions and 1.5% of GBAORD without ESA contributions). For the grouping the contributions excluding ESA have been chosen.

As indicated in Figure 5b, which excludes the ESA contributions, four main groups of Member States and Associated Countries can be identified according to the amount of their public spending for research and development. This grouping will be further used below.

[22] Average based on Eurostat data complemented by ESA data and additional sources for France

[23] Estimations for France are based on JRC-IPTS calculations using Eurostat data, ESA data and data from the French Ministry of Research complemented by annual reports and web search.

24 When comparing Eurostat data for 2009 and 2010 there is a slight decrease from 3.84% (2009) to 3.79% (2010).

Figure 5a Share of national public funding to transnationally coordinated research vs.in total GBAORD in 2010 (including ESA contributions)

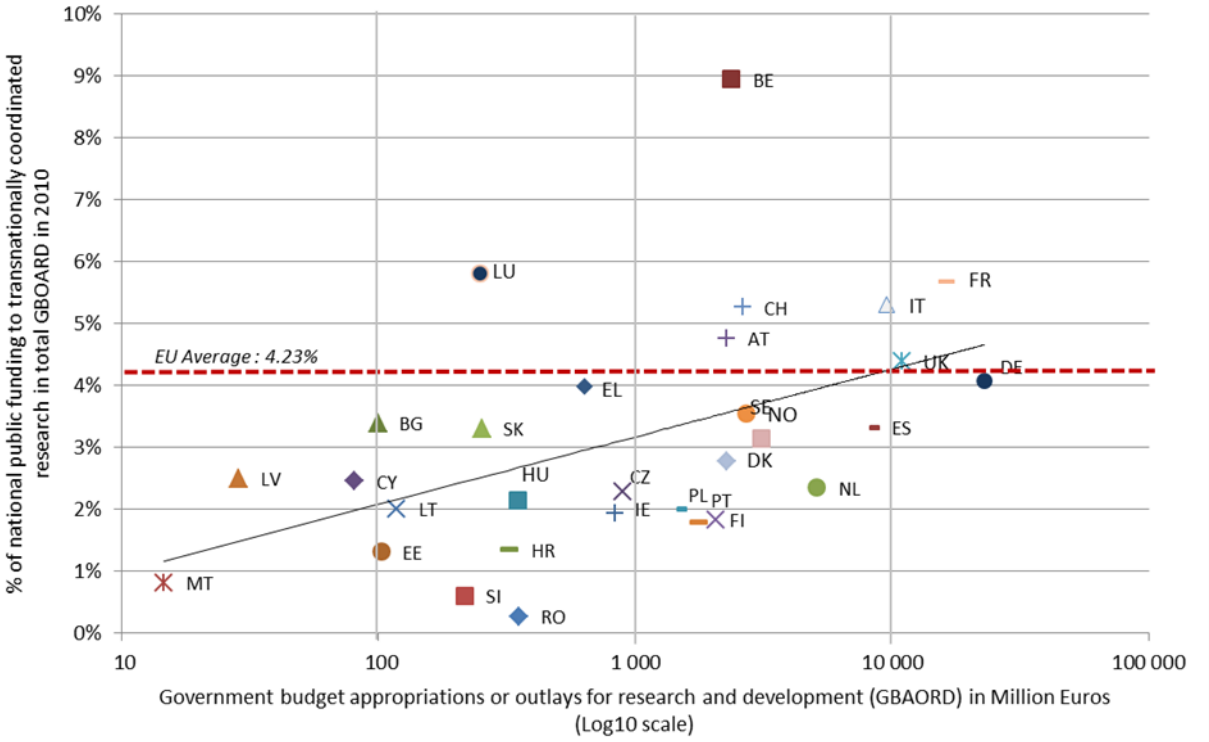
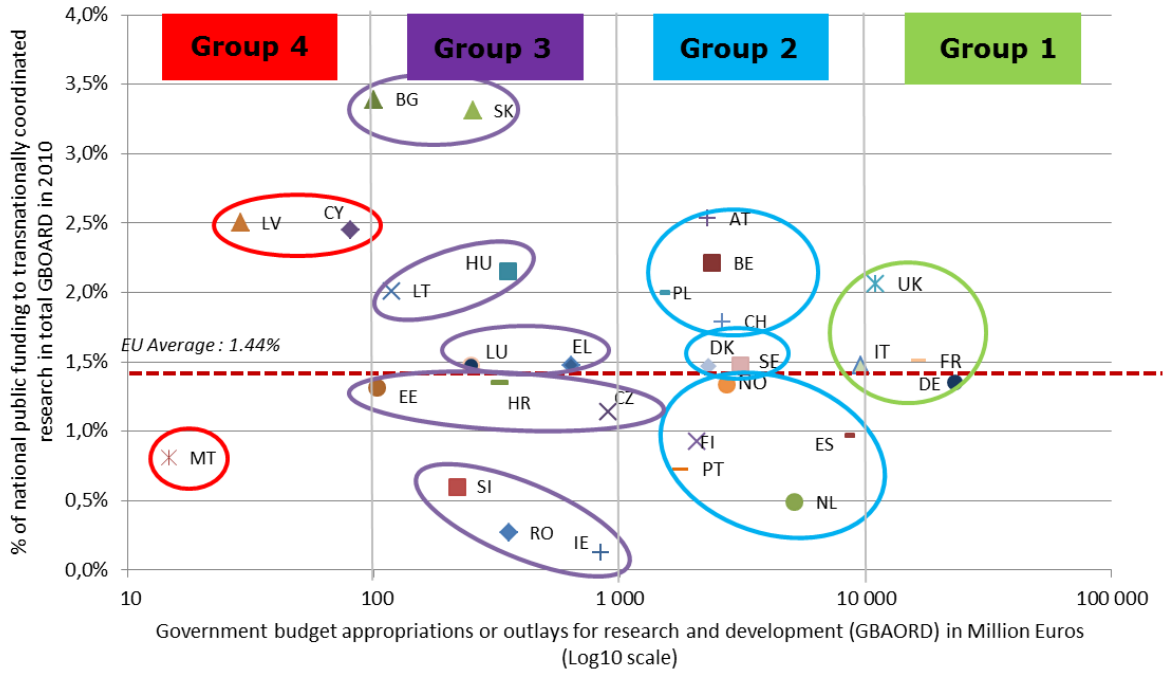


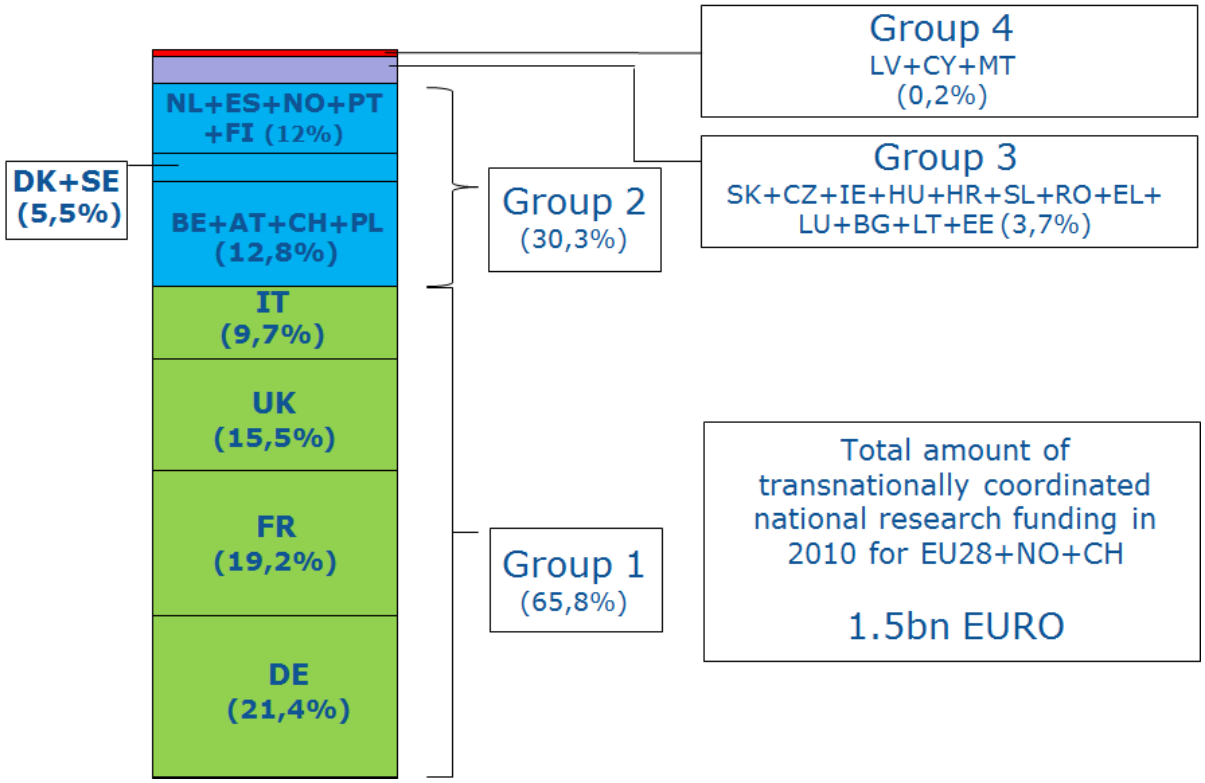
Figure 5b Share of national public funding to transnationally coordinated research in total GBAORD in 2010 (excluding ESA contributions)



3.2.1.2. Country grouping for actions covering grand challenges and interoperability of national programmes (excluding ESA contributions)

As Figure 6 (below) illustrates, the four main groups of Member States and Associated Countries contribute differently to the total amount of transnationally coordinated public national research funding. For 2010 group 1, consisting of only four countries (DE, FR, UK, IT) represents two thirds of total coordinated funding. The second group, of ten countries, represents 30%, and the rest only 4%. Within each group further heterogeneity among countries can be observed.

Figure 6 Relative contributions of EU Member States and two associate countries (Norway and Switzerland) to the total annual transnationally coordinated public national research funding for 2010 (excluding ESA contributions)



Group 1: Countries with high national public spending[25] (GBAORD above 10 billion Euros)

Germany, France, United Kingdom and Italy represent close to 66% of the EU Member States total GBAORD. Both the UK and France are above the EU average (1.44%) with respectively, 2.06% and 1.70% of their GBAORD dedicated to transnationally coordinated research. With 1.35% Germany is slightly below EU average when excluding ESA contributions. No information regarding share of GBAORD is available on Eurostat for Italy[26], but the 2010 ESA contribution alone amounts to €370mln or 3.9% of GBAORD.

In Germany, there is, so far, no explicit strategy towards ERA (see Daimer et al, 2011)[27], but over recent years more strategic thinking and action towards the ERA has been developed, with a stronger awareness of European issues across all ministries. There has been no significant change in the

[25] Source: JRC-IPTS calculations based on Eurostat data. Data for IT, SE, DK, EL, LU are based on estimations using EU average for coordinated funds. Data for France based on IPTS calculations.
[26] Note that the 2010 GBAORD for Italy is slightly below 10 000 million euro (9548 mln euro).
[27] Daimer, et al. (2011).

GBAORD and in the share of transnational research from 2010 to 2011 (when considering Eurostat data including ESA contributions).

The UK is an active and leading participant in several EC initiatives aimed at grand challenges, which align closely to national programmes focusing on grand challenge issues and operated by the UK Research Councils. However, the latter are more tailored to the national research capability and to national priorities.

For France a new national strategy for research and innovation "France-Europe 2020" aims to better address scientific technological economic and societal grand challenges in the coming years. The objectives include dealing with societal, scientific and technological challenges and the challenges of competitiveness, as well as optimising the coupling and coordination with European programmes through enhanced consistency and greater involvement.

Horizon 2020 Italy (HIT2020) outlines the agenda on Italian transnational cooperation on R&D until 2020. HIT2020 supports the inclusion of the EU agenda research priorities into the national framework embracing joint programming through a re-organisation of the national governance of research. The target is to increase the effectiveness of Italian participation in transnational research programmes. It envisages a revision of the governance of cooperation programmes aimed to avoid duplications and it looks to set up joint programmes based on a territorial basis. Another innovation is the introduction of compulsory ex post evaluation for research projects as part of an evaluation pattern based on 3 levels (ex-ante, in-itinere and ex post evaluation).

Group 2: Countries with GBAORD between 1 and 10 billion Euros: 3 distinct subgroups

This group of countries is highly heterogeneous and can be further divided into three sub-groups: a first group of countries with shares of public funding in transnational research above the EU average, a second group of countries below the EU average and a third group without clear data on the share of transnationally coordinated research.

i. The four countries above the EU average: Austria, Belgium, Poland and Switzerland

This group of countries has the highest degree of transnationally coordinated research and, in general, also connects national R&I strategies to the European context and to grand challenges, albeit in different ways. In Austria (2.53%) the national strategy is explicitly embedded in Europe 2020 and contributes to implementing the Innovation Union. The coordination of grand challenges in R&I governance can however still be enhanced, particularly at the horizontal (cross-ministerial) level.

In Belgium (2.21%) there is an evolution towards focusing R&I on broad societal needs and challenges in Flanders and on environmental and health concerns in all regions and in all communities. If R&I policies are to contribute to address a structural adjustment of the economy, an enhanced orientation and focus of the limited amounts of public funding may be required.

Poland (2%) seems to address increasing importance to role of transnational co-operation in the national science system. It doubled its nominal coordinated public national research budget from 2010 to 2011 (Eurostat, 2012), from 29 million euro in 2010 to 58 million in 2011 (including ESA contribution). The government offers co-funding for Polish participation in international initiatives, relying on results of evaluations of research proposals in international programmes and defining a national research infrastructure roadmap in line with the European efforts. Polish government agencies actively support the involvement of researchers in international R&D programmes, offering co-funding, information and specialist support. "National Research Programmes" from 2011 sets guidelines for applied R&D programmes, and corresponds to the grand challenges at the European level. While the availability of funds for national projects restricts the ambitions of researchers to

actively search for international projects, there is a gradual change in focus with the planned support measures for years 2014-2020 likely to assign higher priorities to Polish involvement in transnational initiatives.
Switzerland has a long tradition of participation in international programmes at the European level (e.g. the country is involved in about 25 projects in the context of ERA-NETs and in a number of projects of the ESF, in Eureka and in a number of inter-governmental research infrastructures). Most funding from SNSF and CTI has to be spent in Switzerland (with some exceptions for justified reasons). Swiss additional funding is provided for research in COST actions with Swiss participation. Research funding organisations are generally both willing and adequately funded to participate. With the aim of simplifying the evaluation of transnational projects, the Swiss National Science Foundation (SNSF) has signed two Lead Agency Agreements allowing researchers from the signatory countries to submit a common proposal to only one of the funding agencies.

ii. Five countries below the EU average: Finland, Norway, Spain, the Netherlands and Portugal

Norway has the highest share of coordinated funding in this group with 1.34%, compared to 0.49% for the Netherlands. The other countries fall in between. The latest available Eurostat data for Finland and the Netherlands, however, show a significant increase in the share of the public funding invested in transnational activities between 2010 and 2011 (for Finland the amount of coordinated funding including ESA contributions more than doubled). On the contrary, Norway decreased its share in the same period. Portugal remains stable from 2010 to 2011.

Regarding Spain, the major societal challenges are receiving growing attention in R&I policies, with the EESTI (2013-2020) and PECTI (2013-16) following the efforts of previous measures, increasing the focus on societal challenges. Both national and international coordination of research agendas and activities are also a priority for the Spanish R&D policy system. Recent developments might also improve the coordination of national and regional R&D policies. All Regional authorities "Comunidades Autónomas" have also registered to the Smart Specialisation Platform (S^3P)[28] and the new EESTI includes the concept of "smart specialisation" in one of its 6 priority axes (Priority 5). There is limited evidence on systematic common ex-post evaluation in these countries. However, in Spain, the new EESTI and PECTI aim at promoting ex-post evaluation.

In the Netherlands €120 million of public funds towards transnationally coordinated research in 2010 (€140 million in 2011). The Netherlands Organisation for Scientific Research (NWO) has broad research and action themes that contribute to national and international research agendas for the period 2011-14. Budgetary constraints may however increasingly limit possibilities. The top teams of representatives of the Top Sectors will update in 2013 the innovation contracts and will align these with the EU flagship initiatives which serve as catalysts for the Europe 2020 objectives. Also, alignment will be sought with Smart Specialisation strategies at regional level.

The Norwegian White paper on Research Nr. 18[29] (2012-2013) "Long-term perspectives -knowledge provides opportunity" sets up a goal to increase internationalisation in parts of the research system and ensure more effective coordination in the use of national and international policy and funding instruments and promote further cooperation. Project establishment support, is funded by the Research Council of Norway, and covers up to 50% of costs for Norwegian participants. Researchers from abroad should usually be affiliated with a Norwegian institution to be eligible to seek Norwegian funding. The Research Council of Norway is actively using international peer review in its funding decisions. Recent evaluations have however suggested/revealed that the experts are mostly from

[28] The S3 Platform (S3P) assists EU countries and regions to develop, implement and review Research and Innovation Strategies for Smart Specialisation (RIS3) (http://s3platform.jrc.ec.europa.eu/home)
[29] Norway Ministry of Education and Research (2012).

Nordic countries (Evaluation of the Research Council of Norway, 2012)[30]. The Research Council of Norway also adopted an internationalisation strategy ('International cooperation 2010-2020')[31].

Finland allocated 37 million euro to coordinated public research in 2010, out of which half can be attributed to ESA contributions. The total coordinated amount more than doubled in 2011 (close to 80 billion euros or 3.83% of GBAORD). This is almost entirely due to non-ESA related coordination activities. In 2011 a Finnish expert group preparing a proposal on the overall reform of the national research institute sector proposed increased social effectiveness of research funding, through research supporting governmental decision-making, and also through the establishment of a funding instrument for strategically targeted research, solving significant social challenges and problems. The Finnish Government first proposed this policy in October 2012. The same guidelines set the objective for the engagement in EU funded research and innovation.

The nominal coordinated public national funding of Portugal in 2010 is of €31 million, of which more than half went to ESA. This remained stable in 2011. One of the key objectives of Portugal's scientific and technological (S&T) policy during the past 40 years has been internationalisation which has been pointed out by successive governments. This has been translated namely into several actions aimed at strengthening Portugal's involvement in the successive Framework Programmes (FPs) as well as in the creation of the European Research Area. The programme of the present government includes a specific reference to "encourage the integration of the national scientific system into the European research space" (Presidência do Conselho de Ministros, 2011, p.119).

iii. The two countries with limited information on share of coordinated funding: Sweden and Denmark

No quantitative data on Swedish transnationally coordinated budget is available in Eurostat. Sweden contributed 1.7% of its GBAORD to ESA in 2010. The country played a leading role in the conference resulting in the Lund Declaration, but the Swedish government appears to have made little policy efforts to directly address the challenges named in the declaration. However, several of the recent policy measures adopted by the government are closely related to those actions proposed in the declaration. Policy measures taken indeed are designed partly taking into account the policies of other European countries. It is important to note, however, that the role of the Swedish research and innovation system in strengthening the long-term common European competitiveness is downplayed.

Denmark allocated 1.36% of 2010 GBAORD to ESA. The country is actively cooperating with other Nordic countries in joint programmes and institutions within the Nordic Council of Ministers. The organisation of Nordic collaboration in research and innovation rests on two main pillars, one for research, NordForsk, and one for innovation, Nordic Innovation (formerly The Nordic Innovation Centre, NICE). In 2008 the Nordic Prime Ministers initiated the Top-level Research Initiative (TRI) and it is to date the largest joint Nordic research and innovation initiative that has a research focus within climate change, environment and energy. The Top-level Research Initiative has launched several initiatives which address important global challenges.

Group 3: Countries with GBAORD between 100 million and 1 billion Euros: 5 distinct subgroups

This group contains a high diversity in terms of share of transnationally coordinated budget. Apart from Ireland, Luxembourg and Greece, this group also includes most of the new Member States. Five subgroups can be distinguished.

[30] Technopolis group (2012).
[31] Available at: http://www.forskningsradet.no/en/International_strategy/1253964686548

i. Two countries with a share of public funding far above the EU average: Bulgaria and Slovakia

3.39% of Bulgarian GBAORD is coordinated transnationally. The country does not contribute to ESA, and is thus the country with the highest share of transnationally coordinated research when excluding ESA contributions. In its National Strategy for Scientific Research to 2020 (2011)[32], Bulgaria aims at making science a factor for economic development based on knowledge and innovation. The existing set of priorities of the research agenda are however not yet clearly enough connected to meeting grand challenges.

Slovakia does not contribute to ESA, and has a similar share of coordinated research funding (3.31%) as Bulgaria, thus ranking second. The 12 thematic priorities set in the 2007 Long-term Objective of the State S&T Policy up to 2015, were abandoned completely in the 2011 Fenix Strategy, and replaced by a system that supports top quality research in any field of science. There is anecdotal evidence on efforts geared towards solving grand challenges through transnational R&D co-operation. Joint research agendas addressing grand challenges are however still insufficiently articulated in Slovak research policies. By 2011, Slovakia had joined three joint programming initiatives addressing grand societal challenges[33]. Participation is however limited by low financial and human resources and underdeveloped research infrastructure in Slovakia.

ii. Two countries above EU average: Hungary and Lithuania

The role of research and innovation in addressing societal challenges, and social innovation are generally not perceived as important issues in Hungary. Nevertheless, a horizontal priority of the 2013 "National Research, Development and Innovation Strategy 2020" explicitly addresses the global social challenges and the importance of excellent research infrastructure. According to the quantitative targets of this RDI strategy, thirty major research and technology centres are expected to find their way to the global elite. 2.15% of GBAORD is coordinated transnationally (No ESA funding).

Lithuania has 2% of its GBAORD coordinated transnationally and has recently stepped up efforts to implement joint research agendas through Joint Programming Initiatives, international programmes, and bi/tri-lateral programmes. Nevertheless, financial commitments to joint research agendas are still rather limited and national research programmes are only implicitly aligned with research priorities pursued at ERA. Lithuania was also involved in the drafting and adoption of the European Union Strategy for the Baltic Sea Region, which is the first macro-regional strategy in Europe, adopted by the European Council in 2009. The Lithuanian Ministry of Economy actively seeks participation in the international innovation programmes which support international innovation networks, especially in the Baltic Sea Region.

iii. Three countries around the EU average: Czech Republic, Croatia and Estonia

According to CRDI (2012), the Czech R&D priorities are designed to reflect the priority areas of Horizon 2020. Unlike the previous priorities of applied research, the new areas reflect major societal challenges as concrete goals. Transnational cooperation, however, tends to focus on establishing contacts, networking and promoting mobility, rather than on joint research projects. With regard to JPIs for instance, the main constraints regarding to Czech participation are budgetary restrictions, limited human resources, lack of coordination at the national level and insufficient compatibility of the national and European rules and procedures (Acheson et al., 2012). The Czech Republic spent around €20 million of its GBAORD in a transnationally coordinated way, of which half went to ESA. Its share (ESA excluded) amounts to 1.14%.

[32] ERAWATCH (2012a).

[33] Slovakia participates (September 2011) in the JP Pilot Initiative Neurodegenerative disease research, in JPI A Healthy Diet for a Healthy Life and in JPI Cultural Heritage and Global Change

Croatia has a share of 1.35% and does not contribute to ESA. The country participates in the transnational research programmes that include coordination of research priorities, plans and goals, but do not include cross-border flow of funds. Consequently, each country finances its own research teams. No calls for thematic priories have been launched since science policy is still focused on horizontal measures in order to support harmonised development of all scientific disciplines. The new Energy Strategy of Croatia adopted in June 2009 fully recognised the EU climate and energy targets by 2020 (the "20-20-20" targets). Generally, there is a lack of specialised research programmes aimed at major national and global societal changes and the key enabling technologies (KETs).

To respond to grand challenges and also optimise research programmes and priorities in Estonia, RDI Strategy 2007-2013 "Knowledge-Based Estonia" focuses on seven key areas: three programmes have a technological focus and the other four focus on societal challenges. All programmes were launched at the end of 2011. The Programme for Internationalisation of Science (introduced in 2011) aims to support joint activities as sharing information, joint research agenda, joint calls, joint programming and also developing ex-post evaluation procedures. Estonia has a share of 1.31% and does not contribute to ESA.

iv. Three countries below the EU average: Slovenia, Romania and Ireland

The R&I Strategy Slovenia (RISS) seeks to increase international bilateral and multilateral co-operation. The second ERA priority is one of the priorities of the Slovenian National Innovation System mentioned in RISS 2011–2020. The idea of implementing joint research agendas is partially addressed in RISS, and no other (adopted) document (or a document in preparation) focuses on this issue. Some individuals/organisations have a nodal role on topics dealing with "Grand Challenges". However, all these activities are developed on an ad hoc basis. A Development Plan for Bilateral International Cooperation (2011–2020) is planned, but has not yet been implemented, partially caused by financial difficulties.

Ireland contributed €15 million to ESA in 2010. When looking at coordinated funds excluding ESA, Ireland has the lowest share of transnationally coordinated funds (0.13%). The Irish National Research Prioritisation Strategy, adopted in March 2012, identifies a number of key priority areas and underpinning technology platforms in which the Government will prioritise competitive research funding. The strategy takes into account key challenges at national, EU and international levels. Ireland has a strong commitment to efforts at EU level to address grand challenges as witnessed by its participation in eight Joint Programming Initiatives and its observer/associate membership of two others. The development of the National Research Prioritisation Strategy was also influenced by discussions in relation to Horizon 2020.

Romania has the lowest degree of coordinated research of all MSs (0.27% of GBAORD) (Eurostat, 2012) when including ESA contributions for all countries. Romania itself does not contribute to ESA. Its share excluding ESA is thus at the same level (0.27%). is participating in six JPIs, has some bilateral and multilateral co-operations, and contributes to the programme Ideas and to research in the Danube region. In total these initiatives still represent a very minor part of the public national research budget.

v. Two countries without information on public funding dedicated to transnationally coordinated research: Greece and Luxemburg

In 2010 Greece contributed more than €16 million to ESA. Beyond this contribution no data are readily available on coordination of national R&D funds. In Greece, common research agendas are mainly driven by EU supported schemes. Greek research teams participate extensively in ERA-nets and other EU initiatives and often play an important role in defining research agendas for grand challenges. However, limitations on national funding and the recent financial crisis have accentuated this problem. No specific research fields have been prioritised for inter-sectoral or cross-border co-operation. Budget

is thinly distributed following a bottom-up approach, rather than a top-down prioritisation. During the crisis research funding has decreased considerably. Grand challenges are practically only pursued in the context of EU policies.

Despite its small size, Luxembourg has always been committed to transitional co-operation. In 2010 it contributed €11 million to ESA. The National research Fund (FNR) actively "encourages research collaboration between researchers in Luxembourg and abroad. Indeed, Luxembourg does not possess a critical mass of researchers that would allow the creation of high-performance research teams in all scientific domains and, in order to achieve international excellence, it is paramount for researchers cross national borders. In order to optimise the visibility of Luxembourg as an attractive site for research activities within Europe, the NRF plans to reinforce collaborations with selected countries as well as its own international cooperation instruments."

Group 4: Countries with GBAORD between 10 and 100 Million Euros: 2 distinct subgroups

This group is composed of only new member states (Baltic countries, Mediterranean islands, and Bulgaria) and represents the relatively small public spenders. All countries are below the EU average in terms of public funding devoted to transnationally coordinated initiatives. However some differences between countries can be highlighted: Bulgaria is closest to the EU average with 3.39% of the GBAORD dedicated to transnationally coordinated research activities while the figure for Malta is 0.81%.

i. Two countries above the EU average: Cyprus and Latvia

For Cyprus, priorities have been determined regarding the major challenges facing society at a high political level. Joint research agendas addressing grand challenges are only evident in the context of ERA-nets and JTIs. The small size of the research budget and the lack of interest from the business sector are the most likely explanations for this. In 2010, transnationally coordinated GBAORD represented €2 million or 2.45%. In February 2013, RPF announced the allocation of about €4m for the funding of national research and business community, in the context of the joint European research programmes that will be implemented in the period 2013-2014.

Latvian organisations are involved in some FP7 ERA-NET actions (e.g. BONUS), EUREKA and bilateral/ trilateral projects and procedures for the Provision of State aid for participation in international collaborative programmes in research and technology are in place since 2008. There are, however, no systematic coordinated policy actions at national level supporting joint activities like sharing information, joint research agendas, joint calls and joint programming or to design national scale joint and open research programmes. In 2010 transnationally coordinated GBAORD represented €0.7 million or 2.50%.

ii. One country below the EU average: Malta

The current draft National R&I Strategy of Malta highlights international cooperation as one of its pillars and includes a number of recommendations with this in mind, including a plan for the development of an international cooperation strategy. However, there is no mention of the ERA Communication in the national strategy and the recommendations do not dovetail with the ERA priority in this area. Malta's participation in joint initiatives is very limited, and appears to be performed on an ad hoc basis rather than in a planned manner. In 2010 transnationally coordinated GBAORD represented €0.1 million.

3.2.2. Effective investment in and use of Research Infrastructures (RIs)

3.2.2.1. Scope and methodological approach for actions covering research infrastructures

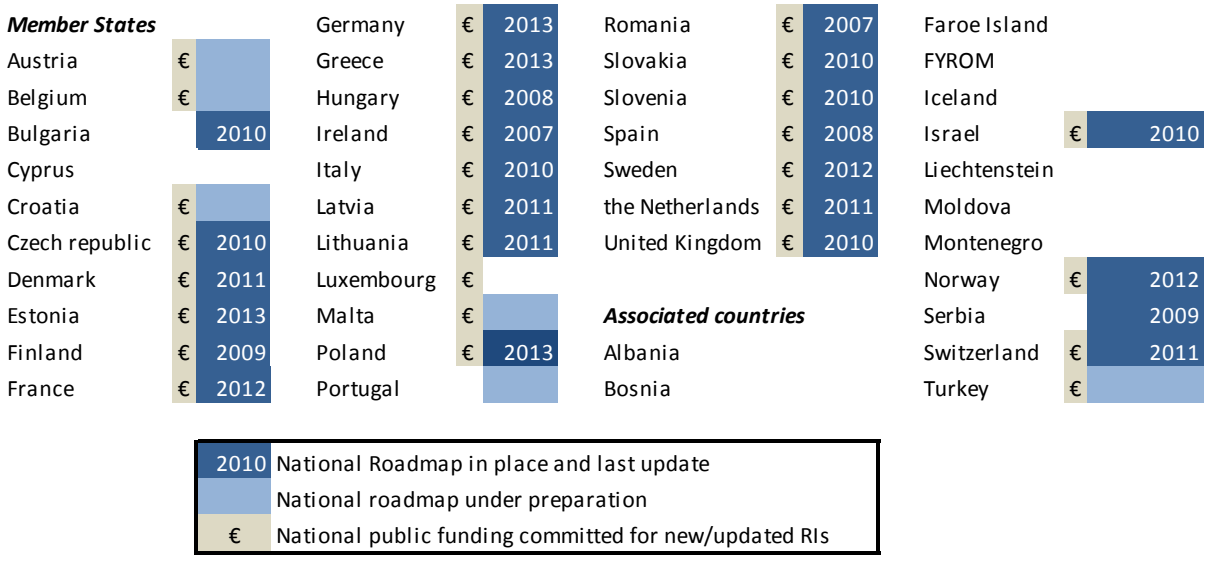
World-class facilities and research infrastructures are of crucial importance regarding excellence of research and attractiveness of the ERA. While Horizon 2020 will support access to RIs as well as the on-going overall integration of EU RIs, particularly those awarded ERIC[34] status, EC will encourage Member States to link their national roadmaps to the ESFRI roadmap and smart specialisation strategies in Structural Funds. In the ERA 2012 Communication, the EC invites Member States to comply with the two following actions:

- Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next Structural Fund programmes; and
- Remove legal and other barriers to cross-border access to RIs.

The current deployment or planning of research infrastructures by Member States and Associated Countries is shown below. The assessment is based on ESFRI information[35], FP7 contracts database (regarding financial commitment in ESFRI) and information extracted from ERA communication fiches for Member States and Associated Countries. Almost all Member States have developed or are developing national roadmaps (Cyprus and Luxemburg are the exception) and are financially committed in ESFRI infrastructures at different degree (see figure 4).

Among the Associated Countries, Norway, Serbia, Israel and Switzerland have developed national roadmaps, and will soon be followed by Israel and Turkey (the national roadmap was still under preparation by the Ministry of Development in 2012).

Figure 7 Deployment and planning of Research Infrastructures for EU members States and associated Countries



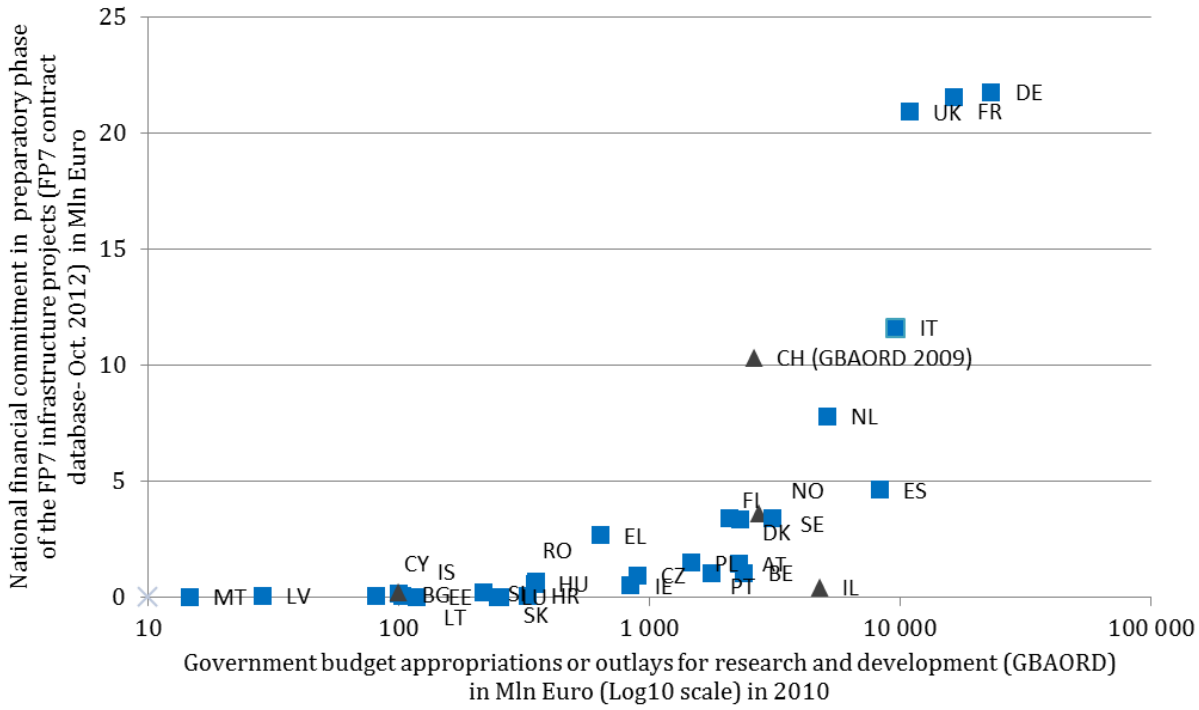
Based on ESFRI assessment and updated by JRC-IPTS based on independent expert contributions

The 48 research infrastructures listed in the 2010 ESFRI roadmap[36] received both an EC contribution from EU FP7 and national public funding in their preparation phase. National authorities of Member

[34] The Community legal framework for a European Research Infrastructure Consortium (ERIC) entered into force on 28 August 2009. This specific legal form is designed to facilitate the joint establishment and operation of research infrastructures of European interest.
[35] http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-national-roadmaps
[36] Strategy Report on Research Infrastructures Roadmap 2010-European Strategy Forum on Research Infrastructures (ESFRI)

States but also associated and third countries are committed to the preparation and implementation of those infrastructures. The analysis of the measures launched by each Member State starts from the financial commitment of Member States in the 48 research infrastructures projects funded under FP7. National financial commitments are calculated using the FP7 contracts database[37]. It appears that 27 of the 28 member states are financially committed in at least one or several research infrastructure projects. The following graph shows the country grouping according to the total national commitment in RI project in the preparatory phase funded partly by FP7. It shows an unbalanced distribution among countries with 80% of the total financial commitment representing 5 countries. As this relates only to the preparatory phase, this picture of financial commitment comes with an important caveat. Financial commitments can change drastically when RI move towards implementation.

Figure 8 National financial commitments in the preparatory phase of research infrastructures projects and 2010 GBAORD



3.2.2.2. Country grouping for actions covering Research infrastructures

The total financial commitment from Member States and Associated Countries rises to €141 million. Four groups of countries can be identified according to their share of this total:

1. More than 10% of the total national commitments in preparatory phases and high GBAORD
2. Between 2% and 10% of the total national commitments in preparatory phases and GBAORD between 1 and 10 billion Euro
3. Between 0.1% and 1.99% of the total national commitments in preparatory phases and GBAORD between 100 and 1000 million Euro
4. Less than 0.1% of the total national commitments in preparatory phases

[37] FP 7 contract database - October 2012 version

The largest contributors in the preparatory phases: Germany, France and United Kingdom (more than 10% of the total national commitments)

Financial commitment in ESFRI and existence of a national roadmap

Germany, France and United Kingdom are the three first countries in terms of the EC contribution received throughout FP7 and are far beyond the other Member States considering their financial commitment in the preparatory phases of infrastructures listed in the ESFRI 2010 roadmap.

These three countries have more or less recently adopted national roadmaps focusing mainly on large facilities, highlighting the dimension of international collaboration opening access to researchers from abroad.

Regarding the UK, a number of the facilities that appear in the ESFRI Roadmap also feature in the RCUK Large Facilities Roadmap, either as potential future facilities that might be constructed in the UK with international collaboration or as overseas facilities.

France adopted a national Roadmap 2012-2020 for research infrastructures with a threefold ambition: to explain the French Government's political orientations regarding infrastructures, to draw up a global governance scheme adapted to the coordination requirements of the various operators; to propose flexible and reactive annual updating procedures for all of the infrastructures.

In April 2013, the German Federal Ministry for Education and Research announced the publication of its Research Infrastructures Roadmap, based on an evaluation. The list entails 24 projects from a large range of scientific fields that are already under implementation.

Synergies with structural funds

For these three countries, it seems to be too early to envisage synergies between national, European and structural funds. Regions are developing their Smart Specialisation strategies which are encompassing the dimension of research infrastructure.

Legal barriers and others to cross-border access to Research infrastructures

Access to research infrastructure seems, in theory, easy for a researcher coming from an EU Member State, without any legal barriers. Direct participation of a country in the construction and implementation of an infrastructure, of course, ease the access for researchers coming from this country. It is clearly stated, for instance, that RCUK contributions to the construction costs enable access for UK researchers.

Access to research facilities for researchers coming from outside the EU depends on individual institutional agreements.

The important contributors in the preparatory phases: Italy, the Netherlands, Spain, Finland, Sweden, Denmark, Greece, Switzerland and Norway

Financial commitment in ESFRI and existence of a national roadmap

The second group contains countries strongly involved in ESFRI infrastructures projects. Nevertheless some disparities can be noted. Italy, the Netherlands and especially Spain seem not to have commitments in the preparation phases of ESFRI projects in line with their respective weight in the ERA. The current economic crisis and the resulting austerity measures may impact directly their involvement. The commitment of the three Nordic countries corresponds more or less to their weight

in the ERA while Greece despite its current economic difficulties manages to maintain its involvement in ESFRI RIs (21 participations).

Italy published a national roadmap in 2010 linked to the European 2010 ESFRI Roadmap for the period 2010-2012. This roadmap has not been apparently updated recently. This is also the case for Spain with a national roadmap published in 2008 within the national research programme for the period 2008-2011).

Following their first roadmap established in 2008, the Netherlands set out in 2012 an updated national roadmap. A total of 29 research facilities have been included. This concerns both Dutch facilities and initiatives for an actual or possible Dutch participation in international projects (mostly ESFRI).

Regarding Nordic countries, the Finnish Research Infrastructure Committee (FIRI Committee) plans to update Finland's national roadmap for infrastructures in 2013 at the latest. Sweden has published in 2012 a roadmap for long term research infrastructures associated to a guide to help researchers from Sweden but also from abroad to find appropriate infrastructure (the document is both in English and Swedish). The Danish Roadmap for Research Infrastructures 2011 presents a complete and prioritised catalogue of the national needs for research infrastructures in the short term and charts a strategic direction for national initiatives in this field. Norwegian authorities published a white paper "Long-term perspectives – knowledge provides opportunity" (Meld. St. 18 (2012-2013)) which sets a goal to promote the establishment of research infrastructure. International cooperation 2010-2020, the programme of the Research Council of Norway aims to secure and strengthen Norwegian participation in international projects, obtain more knowledge, both within and outside Europe.

Greece published a long term roadmap in 2006, which has not been updated since then. However, in February 2013, Greek authorities launched a call for expressions of interest for the creation of a National Roadmap of Research Infrastructures.

The Swiss federal government confirmed its financial commitment to the construction and operation of ESFRI, national and regional research infrastructures of pan-European interest for the period 2013-2016 described in the Swiss Roadmap for Research Infrastructures (SRRI).

Synergies with structural funds

It seems to be too early to envisage synergies between national, European and structural funds. Regions are developing Smart Specialisation strategies encompass the dimension of research infrastructure.

Legal barriers and others to cross-border access to Research infrastructures

No national initiatives are evident regarding removing legal and other barriers to allow cross border access for researchers. Nevertheless, initiatives coming from stakeholders themselves are addressing this issue. For instance, the European Association of National Research Facilities, an organization has a stated purpose to "promote cooperation between individual European national large-scale research facilities laboratories" which includes the removal of barriers to access for researchers.

Low financial commitment in the preparatory phases: Poland, Austria, Portugal, Belgium, Czech Republic, Romania, Hungary, Ireland

Financial commitment in ESFRI and existence of a national roadmap

The third group gathers together countries with relatively low financial commitments by national authorities in ESFRI infrastructure projects. Some of those countries have published national roadmaps such as Poland (in 2011), Czech Republic (in 2010) and Ireland (2007).

In 2008, the Hungarian Government launched the National Research Infrastructure Survey and Roadmap (NEKIFUT) project as a part of its 2007–2013 mid-term science, technology and innovation (STI) strategy. Ireland supports the work of the European Strategy Forum for Research Infrastructures (ESFRI) but has not prepared a roadmap at national level.
For other countries, roadmaps are still pending. For instance, in 2011, Austria collected national data through a RI stakeholders' survey to develop a national roadmap, but no national roadmap has so far been published. A Portuguese national roadmap is under development and no decisions have so far been taken regarding the selection of areas of specialisation for national participation in ESFRI/ intergovernmental research infrastructures.

Synergies with structural funds

The EU Structural Funds (ERDF) are used by most of these countries to develop research infrastructures, but cover only the initial investment. The projects are financed through ERDF priority axis 1 (European Centres of Excellence) and 2 (Regional R&D Centres) of the operational programme. For the 2014-2020 period, the situation is still blurred, regional and national (in some cases) smart specialisation strategies are still under development and should only be submitted at the end of 2013.

Legal barriers and others to cross-border access to Research infrastructures

Only Poland seems to have engaged in a dedicated process to open infrastructures to researchers from abroad. The Act on Foreigners (2003, with amendments from 2011) paved the way to granting access to the RI to foreign researchers, participating in R&D projects, including simplified visa procedures in specific cases. Cross-border access to RI is facilitated by the legal framework, related to IPRs in publicly funded R&D projects - the rights are owned by research performers not the public institutions. The regulation on protecting and managing intellectual property in Hungary ensures a coordinated approach in dealing with scientific research, publications, patents procedures, scientific communications and industrial rights' protection. The patent rights of institutional and employee inventions created in the research centres (or research institutes) belong to the given institutions' sphere of competence. The new patents and types can be registered on behalf of the research centre.

Very low commitment in the preparatory phases: Bulgaria, Croatia, Cyprus, Estonia, Luxemburg, Malta, Slovenia, Lithuania, Latvia

The final group gathers together countries with very low financial commitments to ESFRI projects but do not reflect a common mode of policy implementation.
Two subgroups can be noted:

- A first group of countries with, despite a weak financial commitment to ESFRI project, national roadmaps with a clear strategy for research infrastructures and accessibility for researchers (Estonia, Lithuania, Slovenia, Bulgaria, Malta).

- A second group of countries without roadmaps or any other strategy related to RI. The apparent lack of strategy regarding this last group of country is linked to the size of those countries and the absence of pre-existing research infrastructures (Cyprus and Luxemburg).

3.3. An open labour market for researchers (ERA priority 3)

Box 3 Key findings

- The EU comprises very different national labour markets for researchers, which vary in their degree of regulation/institutional autonomy, as well as career structures. The heterogeneity of labour market structures, together with the inherent language differences and economic differentials across the EU, is an important obstacle to the realisation of this priority.
- In all countries, the importance of merit, open and transparent recruitment, as well as the principles established by the Charter & Code, are being recognised in formal measures. However, it is difficult to assess their level of implementation.
- Whilst EURAXESS portals are available in every country. Much more needs to be done in terms of opening access and portability of grants.
- The principles of Innovative Doctoral Training are increasingly taken into account, though the term itself is not often used in official measures.

3.3.1. Scope and methodological approach for actions covering market of researchers

The third ERA priority, which focuses on improving the labour market for researchers, consists of the following five actions:

- Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers;
- Remove legal and other barriers which hamper cross-border access to and portability of national grants;
- Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network[38];
- Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training (IDT)[39];
- Create an enabling framework for the implementation of the HR Strategy for Researchers (HRS4R) incorporating the Charter & Code[40].

This section summarises the state of the art in Member States and Associated Countries. It describes the various policy and governance configurations that affect the labour market for researchers. It thus provides a snapshot picture of this ERA dimension and identifies critical points for its development.

[38] EURAXESS is a European initiative providing access to a complete range of information and support services to those researchers interested in career opportunities in Europe. As an information and support portal with a broad mandate, national-level policies have little influences on Euraxess. Furthermore the review of the ERA communication fiches and the Deloitte 2012 reports are mainly focused on the use of Euraxess as a labour market intermediary. This indicates that future efforts should be concentrated on analysing and evaluating Euraxess's other functions.

[39] The concept of Innovative Doctoral Training (IDT) has been developed recently by the EC (2011), in the document COM(2011)567. The concept identifies the following 7 principles upon which doctoral training should be based: research excellence, attractive institutional environment, interdisciplinary research options, exposure to industry and other relevant employment sectors, international networking, transferable skills training, quality assurance (European Commission, 2011a).

[40] The European Charter for Researchers and the Code of Conduct for their recruitment are a set of general principles and requirements specifying the roles, responsibilities and entitlements of researchers and their employers/funders. They are (legally speaking) recommendations, thus they are not binding for Member States. The Human Resources Strategy for Researchers (HRS4R) incorporating the Charter & Code is a process in five steps through which the Commission aims to assist those research institutions that would like to incorporate the European Charter & Code (European Commission, 2013a).

For each country the following main sources of information have been consulted:

- JRC-IPTS Country Reports, produced in collaboration with independent national experts;
- The European Research Area Facts and Figures 2013 (European Commission, 2013b)
- The Deloitte Country-Research Reports 2012, available from the EURAXESS website;
- The European University Association Scoreboard on University Staffing Autonomy (Estermann et al., 2011).

In addition, other documents have been consulted to supply contextual information or fill-in information gaps and are duly referenced.

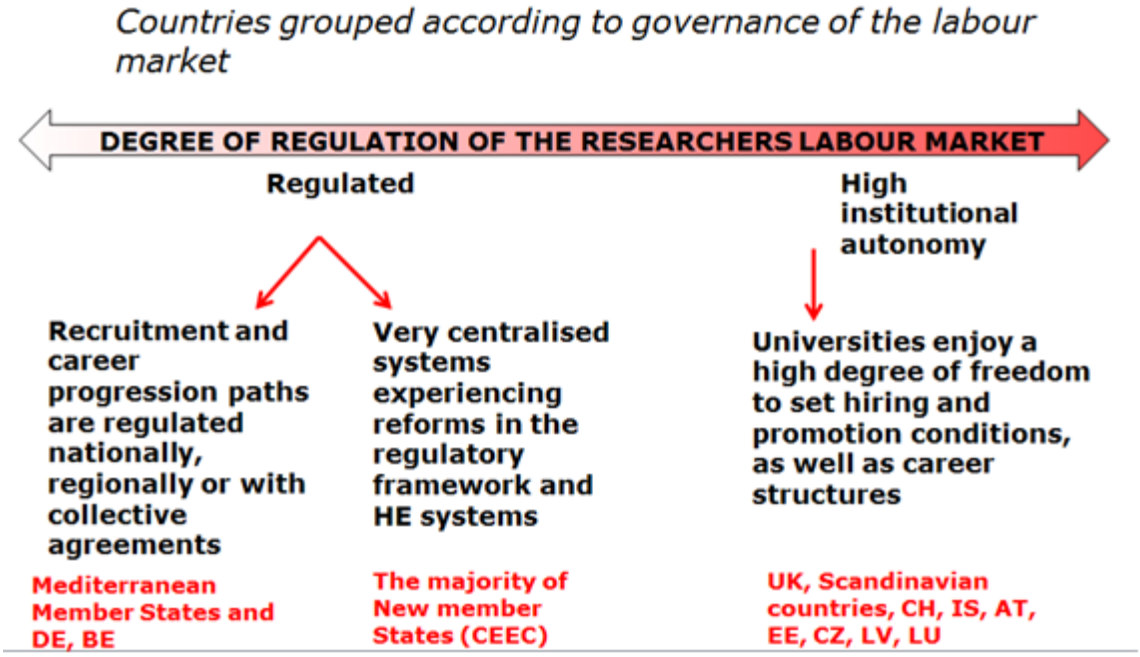
These sources of information have been used to identify patterns of policy-behaviour across countries and, where possible, group them. The creation of a single labour market of researchers is an ambitious target and needs to be framed against the heterogeneity of MS systems, with fragmented career structures. This section aims at describing how policies influence this third ERA-dimension, and thus to provide some insights on how to monitor progress more closely.

It will first distinguish countries in two groups, especially relevant for actions 1 and 5 of the priority and then discuss the evolution of the other actions.

3.3.2. Country grouping for actions 1 and 5 covering labour market of researchers

Transparent, open and merit-based recruitment, together with attractive career prospects, as identified in the Charter & Code and HRS4R, are essential to the creation of an EU labour market for researchers. It is thus important to understand how the governance of the research labour market is organised across Member States. In particular, it is critical to define whether, or to what extent, the career structure (salary, promotion, etc.) is centrally determined, or whether universities have a high-degree of independence (thus is more flexible).

Figure 9 The different types of governance for the researcher labour market



Remarkable differences can be observed across MS, which can be divided in the following two groups[41]:

1. Countries with a strongly regulated market for researchers, distinguishing between countries in the Western part of the EU and centrally regulated systems in Central and Eastern Europe;
2. Countries with decentralised markets for researchers, where career progression is decided at the institutional level.

The distinction cross two groups has been established by looking at policy documents and validated through the University Staffing-Autonomy scoreboard developed by the European University Association (EUA). In particular, the first group contains (with few exceptions and absentees highlighted in the text) countries than rank 17 or higher in the scoreboard. The second (with few exceptions and absentees highlighted in the text), countries that rank 16 or lower.

Associated Countries in the Balkans, as well as Turkey and Israel are treated separately, as there is no free movement of workers between the EU and these areas.

The importance of transparent and merit based recruitment, as well as the importance of openness and of attractive research careers is –across the ERA countries- formally recognised at the legislative or institutional levels, as is the value of mobility. However, implementation may not be able to keep pace with the formal establishment of norms, especially in countries that have recently changed their education systems; it is difficult to assess the extent to which the new measures are implemented. Furthermore, the heterogeneity of the labour market for researchers, with different procedures being required by different countries (i.e. habilitation/accreditation procedures), may still contain obstacles that make the research career more difficult to access for foreigners. Last but not least, the financial crisis has put a strain on many national budgets for research and innovation, with important effects on the career prospects of local scientists, especially those on temporary research contracts.

3.3.2.1. Member States with a regulated markets for researchers

Member States in the Western Part of the EU

In the following countries, recruitment and career paths of researchers are addressed centrally either in the national legislation or with collective agreements: Belgium, Cyprus, Germany, Greece, Spain, France, Italy, Malta[42] and Portugal. In these countries permanent academics have either the status of civil servants or are in an equivalent category, such as in Malta and Cyprus where their status is governed by a collective agreement that stipulates the salary scales of permanent and temporary posts, and covers issues such as recruitment and promotion. In Belgium, the salary of staff in research organisations are established by law for the federal scientific institutes, for the F.R.SFNRS and for the Flemish research institutions

In these countries, elements of transparent, merit based an open recruitment are generally embedded in national laws. Recent legislation in Italy and Spain is explicitly geared towards openness and meritocracy. The same is true in France, where, *inter alia*, researchers are the only civil servants that are exempt from having to possess French nationality. In Malta and Cyprus, institutions are not bound by law to follow transparent, open and merit based recruitment procedures, although the transparent, open and merit-based (TOM) principles appear, according to the expert country fiches, to be established in practice. In Greece, while the law is overall inspired by TOM principles, the Greek language represents a serious barrier to recruitment of foreign researchers. In Germany the achievement of TOM principles in the recruitment of researchers is formally pursued through a combination of the Lander Higher Education Laws and principles stated in the Constitution (such as the selection of the best).

[41] Whilst Norway, Iceland and Switzerland are included in the above grouping, the other AC are treated in a separate section
[42] Malta does not feature in the EUA scoreboard used to validate the classification.

Within this group, Spain, France, Italy and Portugal, share a common characteristic: a national-level, centralised, evaluation of competences is required before accessing certain (mostly permanent) positions. In Italy a recent law, formally inspired by TOM principles, specifies the procedure to achieve transparency (criteria for admission, criteria for creation of the committee, etc.). The law also requires that candidates for permanent academic positions (i.e. associate and full professorships) pass a national-level evaluation of competences (*Abilitazione*), prior to any actual application. The "Statute of University Teaching Career", regulates the profession in Portugal and it is again inspired to openness, transparency and meritocracy. The latter however maintains as a requirement that those competing for full professorship hold the so called ""*Agregação*", a national title. Spain, where the regulatory framework for researchers is fragmented across the various "Comunidades Autonomas", has no national law establishing criteria for open, transparent and merit based recruitment, however, across the State, to access given positions in a University, the candidate needs first to go through a national evaluation process (*Acreditacion*). Along similar lines, the German system requires a *habilitation* (for which a scientific contribution similar to a PhD needs to be achieved) before accessing permanent high-level positions.[43]

For the majority of these countries, national measures also cover/endorse the implementation of the Human Resources Strategy for Researchers incorporating the Charter & Code. For instance, in Malta, the national R&I strategy encourages applying the Charter. In Spain laws and regulations on higher education impose requirements for Human Resources practices that are in line with the Charter, whereas in Belgium the Wallonia and Brussels Wallonia federation has endorsed the strategy and the current collective agreement for higher education acknowledges its importance and the current collective agreement for higher education refers to the Charter and Code as important principles.

Centrally regulated systems in motion in Central and Eastern Europe[44]

A number of countries, for historical reasons, have faced major reconfigurations of their university sector, from a centralised approach to a more decentralised system. In these countries, the evolution of their hiring and recruiting practices needs to be framed against a scenario of rapidly evolving institutions, where the transition can create generational and cultural frictions.

Bulgaria, Croatia, Hungary, Lithuania, Poland[45], Romania, Slovenia[46] and Slovakia all belong to this group. The remarkable changes in their university sectors are all geared towards increased openness, transparency and meritocracy, however countries vary in how they have advanced in this transition.

For instance, Croatia has adopted, in recent years, two action plans aimed at increasing openness and thus international attractiveness. The measures include the removal of Croatian citizenship as a prerequisite to access research jobs. Similarly Poland, Romania, and Lithuania have enhanced significant reforms of the education system inspired by principles of openness, merit and transparency as well as institutional autonomy. Though the reforms move formally in the right direction, their magnitude and their recent formulation make it impossible to draw conclusions on their implementation. Furthermore, in these countries language and economic barriers (i.e. low salaries), which cannot be affected substantially by policy decisions, play a significant role in not attracting an international labour force.

[43] It is important to acknowledge that, although in an internationalised system such as the ERA, the accreditation/habilitation may represent a barrier to international mobility, it originates from the need to ensure high standard in higher education and research. Furthermore, in Germany the institute of habilitation has been subject to an internal debate and the institution is evolving.
[44] Please note that not all CEEC fall under this category.
[45] Lithuania and Poland rank respectively 10th and 12th in terms of Staffing Autonomy, according to EUA Staffing Autonomy ranking, however, due to the recent introduction of the reforms it is, according to the expert, too early to evaluate progress. For this reason, they are included in this group.
[46] Bulgaria, Croatia, Romania and Slovenia are not ranked by the EUA Scoreboard.

It is common in these countries to require the *habilitation* title to pursue an Academic career. As for Germany, the latter is conferred by a committee upon the publication of a habilitation thesis (or, depending on the discipline/country, other type of publications) and is needed to access professorships. As highlighted above, such country-specific procedures may hinder the creation of a true EU market for researchers. Special attention should be paid to monitor how this institution is evolving.[47]

In certain countries, the Charter and Code and the HRS4R are supported with national measures (i.e. Croatia and Poland), whereas in others it is the conference of rectors (or other body representing universities) that endorses it (Hungary, Bulgaria, Lithuania, Slovakia and Slovenia). In Romania, however, the initiative of joining the HRS4R is left to individual institutions.

3.3.2.2. Member States with a decentralised market for researchers

EU Countries where career paths are not pre-determined centrally and where institutions enjoy a large degree of autonomy are: Austria, Czech Republic, Denmark, Estonia, Finland, Ireland, Latvia, Luxemburg, the Netherlands, Sweden and the UK. In these cases, national policies on researchers' career (if existing) are looser than in more "centralised systems". TOM recruitment may thus be developed through other type of measures (i.e. government strategies, measures by research councils, individual institutions, councils of rectors, institutional endorsement of the Charter and Code etc.).

For instance, in the Netherlands each institution is an autonomous employer with its own policies. Similarly in Ireland, Denmark, Sweden, legislation does not cover in detail matters related to recruiting processes. Institutions in the afore-mentioned countries, are overall putting in practice (or showing interest in) the principles of transparent, open and merit-based recruitment either by subscribing to the Charter and Code or by establishing institutional practices in line with TOM principles. Estonia, Latvia and Austria have also rather autonomous institutions, however, in those countries, Laws determine with somewhat more details, recruiting procedures for researchers.

Switzerland, Norway and Iceland, three associated countries, can also be considered part of this category. They have agreements with the EU whereby free mobility of workers is guaranteed (though it may be restricted temporary for given countries). The universities in these countries are, overall, autonomous in relation to hiring procedures, however, especially in Iceland and Norway important language barriers may exist. [48]

As far as the HRS4R and Charter & Code, countries in this group fall in various categories. In Austria, the UK[49] and Luxemburg, a national level measure/encouragement is in place; in Estonia, Finland and Sweden the conference of Rectors or other HEI representative body endorse or support the process, whereas for the remaining countries the initiative is left at the level of the individual institution.

3.3.2.3. Associate Countries

Associated Countries in the Balkans, as well as Turkey and Israel are treated separately in this section, as there is no free movement of workers between the EU and these areas.

Balkan countries (Albania, Bosnia Herzegovina, FYROM and Montenegro) contain relatively new institutions and currently have low attractiveness to non-nationals. Measures to connect with the scientific diaspora or to engage with international collaborations are in place, though the labour market

[47] The habilitation is also required in the Czech Republic and Estonia, which belong to the group of countries with highly decentralised universities.

[48] EU citizens are free to work in Lichtenstein and the Faroe Island. As the research population is small in these countries. It was not possible to classify their governance system as done for the other countries.

[49] The UK is indeed a peculiar case: as the Charter & Code were strongly inspired to the UK Concordat and QAA Code of Practice, the Commission has agreed that endorsing the principles of the latter was equivalent to adopting the European Charter and Code.

for researchers has basically a national focus. Measures to implement doctoral training with principles aligned to IDT are generally in place.

Moldova also presents less attractive working conditions and suffers from brain drain. Whilst measures are being taken to tackle those issues, the labour market for researchers, cannot be considered open yet.

As for Israel and Turkey, some measures are in place to make these countries attractive destinations for researchers participating in exchange programmes.

3.3.3. Analysis of actions related to portability of grants, Innovative Doctoral Training and Euraxess

The patterns of development of the second, third and fourth actions of this priority, are scattered. As it is not possible to provide unambiguous country-groupings, this section will highlight some relevant trends across priorities.

In all countries Euraxess networks are in place, which aim at facilitating international relocation of researchers by providing information on international job-offers as well as providing other type of support.

As for doctoral training, the term IDT -due to its recent introduction- has still not been commonly introduced in national legislations or other official measures. However, as IDT itself was based on a study of good practice in PhD training across the EU, many elements of IDT are already *de facto* taken into across several MS (for instance, in Germany, PhD training has had, for the last two decades, a strong industrial focus). Furthermore, in the countries where doctoral training has recently being reformed or revisited (i.e. Italy, Poland, Slovenia, Finland), emphasise various aspects of IDT.

According to the EC (2012c) access to grants refers to the conditions researchers have to fulfil to submit a grant proposal for a funding agency in the ERA countries and, if awarded the grant, receive the funding within the framework of that grant. In other words, the focus of *access to grants* is on eligibility criteria to submit and to implement the research. In the majority of countries, access of public grants is restricted to applicants (regardless of their nationality) performing their research in local institutions. In Slovenia, the Research and Innovation Strategy (RISS) proposes to eliminate barriers to grants. In the cases of Denmark and Finland access to their grants is open to foreign researchers in foreign organisations. In Denmark, however, it is required that the research be of national interest. Among the Associated Countries, Switzerland allows open access to its grants. Evidence suggests that access to grants from the other Associated Countries is limited or non-existent. Overall, much more needs to be done to fully achieve this action.

Portability refers to the possibility of transferring what remains of a grant from the institution foreseen in the grant agreement to another one where the researcher (or research group) is moving to. Across the EU and the AC portability appears, with few exceptions, fairly limited. A variety of arrangements emerges across MS, confirming the heterogeneity of the EU system. Without aiming at being exhaustive some relevant examples include: Austria, where portability is considered on a one-to-one basis and Italy and Belgium, where portability is allowed for a specified period of time. Portability is allowed across countries that sign specific agreements (i.e. the "money follows cooperation" line, or "money follows researchers"). Portability of Danish grants is allowed provided it benefits Denmark itself.

3.4. Gender equality and gender mainstreaming in research (ERA priority 4)

Box 4 Key findings

- Member States are, in general, moving, with laws and strategies, towards greater gender inclusion in science and research. However, the level of implementation of such measures cannot be assessed.
- In some countries the parental rights vary remarkably between temporary and permanent researchers' contracts, with the former -for instance- not being extended for the duration of the parental leave. More effort is needed to strengthen the gender dimension in research programmes.

3.4.1. Scope and methodological approach for actions covering gender issues

The fourth ERA priority *Gender equality and gender mainstreaming in research* comprises three actions to be addressed by Member States:

- Create a legal and policy environment and provide incentives to: remove legal and other barriers to the recruitment, retention and career progression of female researchers while fully complying with EU law on gender equality; address gender imbalances in decision making processes; strengthen the gender dimension in research programmes.
- Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender (charters, performance agreements, and awards);
- Ensure that at least 40% of the under-represented sex participates in committees involved in recruitment/career progression and in establishing and evaluating research programmes.

This section summarises the state of the art of Member States and Associated Countries, in terms of policy and governance. The aim of the exercise is to describe the policy and governance configurations of gender equality in the research profession, in order to draw a snapshot picture of this ERA dimension and identify critical points for its development.

For each country three sources of information have been consulted systematically:
- JRC-IPTS Country Reports produced in collaboration with independent national experts;
- The European Research Area Facts and Figures 2013 (European Commission, 2013b); and
- The Deloitte Country-Research Reports 2012, available from the EURAXESS website.

Other documents have been consulted to supply contextual information or fill specific gaps and are referenced as appropriate.

3.4.2. Country grouping

The 2012 ERA Communication pointed out that despite national and EU-level strategies on gender equality, women are still underrepresented in the research profession. This suggests that a large pool of high-skill talent is being underutilised. Such inefficiency should be addressed and in this section examines how Member States are tackling the issue.

Before detailing the grouping strategy, it is worth highlighting that, the vast majority of MS is moving – in formal terms- in the direction of further inclusion of females in the research profession (Hungary, with the recent changes in the general labour law, marks a negative exception to this rule: the positions of women on maternity leave are, indeed, no longer safeguarded). However, this positive trend may hide other forms of discrimination, whereby employees under temporary contracts (including stipends)

may not be granted paternity rights similar to their colleagues in permanent positions. This appears to be the case in Bulgaria, Slovakia, Greece and the Czech Republic (but the list may not be exhaustive). Furthermore, in the absence of evaluation and monitoring activities, it is difficult to assess the degree of implementation of such measures.

The actions taken by MS and AC vary considerably. They range from legislative actions to soft-measures promoting cultural change. As for the latter, in virtually all Member States, activities promoting cultural and institutional shifts towards gender equality are in place. These include gender-focussed events or gender-targeted grants/scholarships. For instance, in Ireland the Women in Technology and Science (WITS) organisation seeks to improve the recruitment and retention of women in Science and Technology roles; in Portugal, L'Oréal sponsors Medals of Honour for Women in Science which funds the study of advanced scientific research at post-doctoral level.

In terms of policy approach, it is useful, for descriptive rather than evaluative purposes, to separate countries across two dimensions, depending on (1) whether there are laws targeting equality and female participation in the labour market in general as opposed to the researcher market in particular; (2) whether measures on gender representation in decision making bodies tackle public institutions in general or whether there is a specific focus on research evaluation and recruiting committees.

3.4.2.1. Equality and female participation in the labour market: general vs. research-specific legislation

Countries where legislation targets gender equality in the general labour market

For the majority of EU countries, gender equality is regulated –legislatively- at the level of the general labour market. In other words, there is no specific parliamentary law addressing equality in research. This is the case for Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, Croatia, Hungary[50], Ireland, Italy, Lithuania, Latvia, Malta, the Netherlands, Poland, Slovakia, Slovenia, Sweden and the UK. All the Associated Countries fall into this category.

In these countries, complementary measures support gender equality and participation in research. For instance, funding agencies may have criteria or grants that take gender into account. This is what occurs in Belgium, Finland, Hungary, Ireland, and the UK. In the UK, for instance, the Funding Councils are committed to equality and diversity in research careers, and the Research Excellence Framework (REF) -which evaluates research quality- was developed taking account of equality issues. In Ireland, Science Foundation Ireland supports the reintegration of researchers after a career break related to paternity or adoption, etc. Government programmes and initiatives are also common. For instance, in the Czech Republic, various working groups advising the government on the topic have been established. In Italy the Ministry for Education, University and Research and the Ministry of Equal Opportunities have set up specific collaborations to explore the issue of gender in research. In Slovenia, the innovation strategy includes comments on gender equality whereas in Finland the action plan on equality pays special attention to research. In Lithuania, the government has issued a specific strategy covering Equal Opportunities for male and female in sciences

Countries where legislation specifically addresses gender and career progression in the research profession

In Austria, Spain, France and Germany, there is legislation that specifically tackles gender issues and career progression in the research profession. For example, the Austrian Federal finance law of 2013 stipulates a balanced representation of women and men in academic leadership positions and boards, as well as in young scientist positions as one of its objectives. In Spain, the Science and Technology Law

[50] In Hungary a worrying trend has emerged: the guarantees of employment after maternity leave have significantly decreased in recent years.

addresses the promotion and overall coordination of scientific and technical research, taking gender into account. At the same it promotes strengthening the gender dimension in research across the whole scientific process. In France the Act on Higher Education addresses gender equality, promotes education on gender equality and encourages gender research in priority areas of research programming. Finally, the goal of realising equal opportunities for men and women, removing existing disadvantages at universities, is firmly established in the Higher Education Laws of the German Länder.

3.4.2.2. Female representation in decision-making committees: research specific rules

Countries where national laws address gender representation for governing boards in public bodies

In Denmark and Ireland, national level measures regulate the participation of women in decision-making boards of public bodies. In Denmark, the legislative goal is to achieve a gender composition of 60/40 of the underrepresented; similarly in Ireland, a government decision introduced a requirement for a minimum of 40% of women and men appointed to all State boards. These measures, however, do not target specifically public PROs or HEIs, or hiring and evaluation committees. Such aspects may, however, be dealt with directly at the level of the individual institution.[51]

In several Associated Countries measures related to women participation are also in place. These include Albania, Bosnia Herzegovina, the Former Yugoslav Republic of Macedonia, Serbia, Iceland and Norway.

Countries where national laws address gender representation with a specific focus on research evaluation and/or recruiting committees

In Austria, Belgium, Croatia, Finland, France, Greece, Italy, Netherlands, Poland, Portugal, Slovenia, Spain and Sweden, laws, governmental actions or research councils' decisions tackle the issue of gender representation in decision making committees, focussing specifically on scientific recruitment and evaluation. In Austria, Poland, France and Spain the laws on higher education or science and technology regulate the participation of women in committees. In Croatia and Italy Government Action Plans or decision sets target for committee participation and, in Finland, the action plan also tackles issues related to hiring. In Greece[52] the law addresses gender participation in decision-making processes in research recruiting. In Slovenia, the government measures targets "expert bodies" at the national level. In Belgium, the Netherlands, Slovenia and Sweden research funding bodies, in their practices, are inspired to principles of gender equality and participation. In Germany there are Equal Opportunities commissioners, under the responsibility of the Federal Ministry for Family, that look after gender representation in recruitment and career advancement.

In Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Portugal, Romania, Slovakia and the UK[53], no national-level measure specifically related to this aspect could be identified. Decisions or common-practices on this issue may, therefore, be left to individual institutions.

[51] Whilst other countries have laws similar to those Ireland and Denmark (including Croatia, France and Italy), they may also have measures targeted specifically to the research community and to evaluation and hiring committees, and are thus included in the following cluster.

[52] Interestingly, in Greece, the national constitution itself encourages gender equality in decision making processes by guaranteeing female representation in all top-level positions and decision-making bodies.

[53] Whilst in the UK there is no measure to enforce equality of representation in decision making committees, the local research council has expressed the need to take the issue into account.

3.5. Optimal circulation, access to and transfer of scientific knowledge, including via digital ERA (ERA priority 5)

Box 5 Key findings

- ERA Priority 5 actions are mostly visible at stakeholder level and not consistently formulated in terms of national policies. These actions are characterized by the high uptake of EU initiatives, thereby confirming the rationale of the ERA when it comes to federating stakeholder initiatives at international level.
- 15 Member States have implemented national Open Access (OA) measures but the results from another study (Science Metrix) indicate that direct national legislation is applied in only four countries. This contrast shows that it is not simple to tell whether there is a national top-down policy or whether some government initiatives are trying to rationalize what are, in essence, stakeholder initiatives.
- The majority of OA measures apply in majority to scientific publications and less frequently to research data.
- OA initiatives are increasingly framed on an international basis, either through massive participation in European projects (e.g. OpenAIRE) or through platforms gathering groups of countries (e.g. German speaking countries). Policies and stakeholder initiatives for research data remain less developed than for publications. The presence of well-functioning stakeholder initiatives is seen in some countries (e.g. EE, IL) to make a national policy redundant.
- Knowledge transfer measures are widely deployed by both governments and stakeholders but with varying levels of efficiency. Here again, EU initiatives have a strong leverage effect. With respects to digital services and researchers e-Identity, little is reported in terms of national policy measures, but the scarcity of information is widely complemented by several international initiatives (e.g. eduROAM, EduGAIN, Research and education networking)

3.5.1. Scope and methodological approach

The fifth ERA priority focused on circulation and access to knowledge through digital ERA. It comprises four objectives that Member States and Associated Countries are encouraged to follow by the EC:

- Define and coordinate their policies on access to and preservation of scientific information;
- Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies;
- Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners ;
- Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services.

In assessing progress against these actions, this synthesis tries to identify some policy patterns or at least commonalities identifying country clusters.

The main source of information for this analysis of activities is the set of documents (ERA Communication fiches and country reports) prepared by JRC-IPTS with the support of independent country experts, complemented by various external sources of information (studies, surveys, reports, etc.).

3.5.2. Analysis and country grouping

3.5.2.1. Define and coordinate policies on access to and preservation of scientific information

New information technology tools have evolved and will continue to change the ways in which researchers can access, share and use scientific information among their peers, as well as disseminate it to the public at large.

Borne on the back of the digital revolution, the Open Access (OA) movement continues to transform the global research communication and dissemination system. Since the pioneering years of OA in the early 1990s, OA literature has come to occupy an increasing share of scholarly research dissemination across diverse publishers, geographical regions and scientific disciplines. The OA movement threatens to disrupt the dominant subscription-based model of scholarly publishing, shifting it from a demand-side, 'reader pays' system to a supply-side, 'author pays' system and, in turn, transforming everything from publication processes to business models.

Repositories play a crucial role in collecting, preserving, and disseminating digital intellectual output from research.

The dominance of "green" and "hybrid" Open Access[54] to publications

Green and Hybrid Open Access are more prevalent than Gold Open Access. Although the gold model accounts for a larger proportion of papers in FYROM, HR, TR, MT, LT, EE, SI, PL, LV, SK, ES, CZ, RO compared to other European countries (Science Matrix, 2013, a).

In addition to these three types, Belgium uses a further variant, the "ID/OA mandate" (i.e. Immediate deposit/Optional Access), also known as the "Liege Model". The underlying rationale for the Liege model is that paid subscription journals can impose an embargo (usually 6 months) in order to keep their subscriptions sustainable. However, denying access can impede research progress. The Liege-model makes it possible for researchers to request - and authors to provide -immediate access with one click each as soon as the final, refereed, revised draft is accepted for publication, irrespective of publication lags or publisher OA embargoes[55].

For the period 2008–2011 eight Member States (the Netherlands, Portugal, Lithuania, Estonia, Denmark, Malta, Ireland, and Belgium) have reached a 'tipping point' of 50% of papers available in Open Access while the EU average stands at 45% (see Figure 10 below).

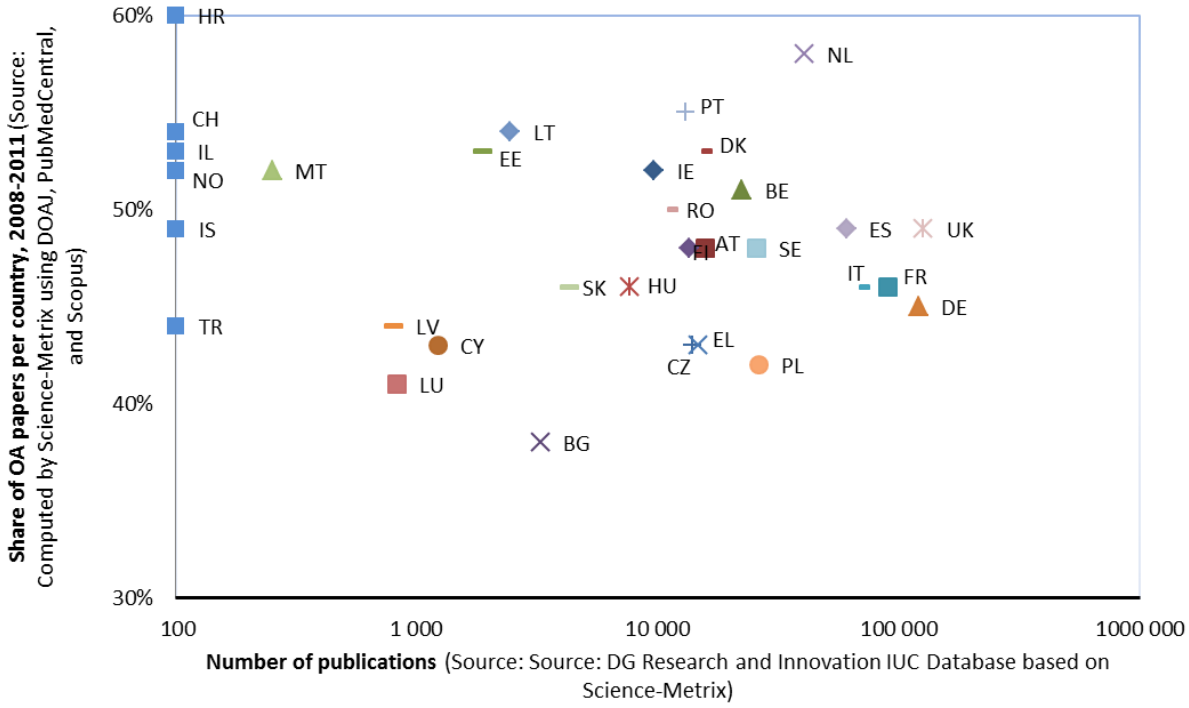
The situation for the largest producers of scientific papers in the EU 28 (United Kingdom, Germany, France and Italy - representing 68% of the EU28 publications- is rather homogeneous with their respective proportions of papers available in OA ranging from 45% to 49%.

Although Member States are not equally advanced in how they support and address the issue of OA, there is a general trend for improvement, confirmed by a report on open access and preservation

54 (i) Gold' open access (open access publishing): payment of publication costs is shifted from readers (via subscriptions) to authors. These costs are usually borne by the university or research institute to which the researcher is affiliated, or by the funding agency supporting the research.
(ii) 'Green' open access (self-archiving): the published article or the final peer-reviewed manuscript is archived by the researcher in an online repository before, after or alongside its publication. Access to this article is often delayed ('embargo period') at the request of the publisher so that subscribers retain an added benefit. The green access model allows for certain variations: The length of the embargo period and the version that may be archived at different moments in time vary, e.g. depending on the agreements between publishers and authors.
(iii) Hybrid open access refers to a publishing model in which subscription-based journals allow authors to make individual articles open access on payment of an article publication fee.
55 See details at http://openaccess.eprints.org/index.php?/archives/71-guid.html

policies (European Commission, 2011b), showing that the situation has improved in many countries that compared to 2009.

Figure 10 Proportion of OA papers per country, 2008-2011 (Source: Computed by Science-Metrix for Open Access Strategies in the ERA study using DOAJ, PubMedCentral, and Scopus)



NB: Publication data unavailable for the countries on the left vertical axis

A blurred line between governmental and stakeholders initiatives

The existence of a national policy can coexist with stakeholder(s) initiatives in a given country, while what are identified as stakeholder(s) initiatives alone means that these initiatives have not yet been accompanied nor channelled through top-down national policies.

National policies on OA can take various forms such as laws, national strategies, or programmes. Encompassing these variations, 15 Member States (AT, BE, DE, DK, EE, IE, ES, FI, FR, IT, LU, MT, PL, SE, UK) are reported to have implemented OA national measures, while stakeholder actions appear in 12 countries (BG, CY, CZ, EL, HR, HU, LV, LT, NL, PT, SK, SI). Most of those Countries which have not yet implemented national Open Access policies are New Member States. In other words, apart from Estonia, Malta and Poland (which have implemented national OA policies), the Member States that deployed national OA policies are the 15 MS group (which joined the EU prior to the 2004 enlargement).

For instance, among the countries having deployed national policies, "Open Access Network Austria" was established as a joint activity under the organisational umbrella of the Austrian Science Fund and the Austrian Rectors' Conference. Its main tasks include the coordination of and recommendations for the Austrian OA-task/ activities of the research institutions, funding organisations and research policies. This "horizontal" Austrian initiative involving all stakeholders, contrasts with other types of measures such as the Belgian "Brussels Declaration on Open Access" (http://openaccess.be/2012/10/22/brussels-declaration-on-open-access/) which is, at least initially, a declaration of intent.

Another example is that of the UK National Reform Programme (UK Government, 2013, p.68). This provides arrangements to make publicly funded research available for anyone to read for free with

around 45% of such research to be available in 2013-14, increasing to over 50% in the following year. Similarly, the appointment by the Danish government of an Open Access Committee under the steering committee for Denmark's Electronic Research Library, publishing in 2011 its recommendations which can be seen as an implementation plan for a four-year period with indication of process, players and finances.

However, this information has to be contrasted with the Science-Metrix (2013, a) results that most governments have not proposed or implemented direct national legislation on Open Access. Instead, Open Access is often addressed through less formal means, such as the production of guidelines for research funding agencies.

Box 6 Conclusions taken from Science Metrix study about national policy measures in favour of Open Access

Only four countries that have instituted national OA policies, programmes and principles:

- The UK is a leader in the development of OA to peer-reviewed publications. The Higher Education Funding Council for England (HEFCE) and the Research Councils UK (RCUK) are encouraging greater public access to publicly supported research.
- In Ireland, the National Principles for Open Access Policy Statement (2012) mandates the deposit of outputs of funded research in OA repositories.
- Sweden has had a national OA programme, OpenAccess.se, which has played a role in the creation of a national search portal for scholarly publications (SwePub), the Directory of Open Access Journals (DOAJ), and a number of institutional and funder policies.
- France's HAL multi-disciplinary open archive was launched by the Centre National de la Recherche Scientifique (CNRS) in 2001.

Source: Science Metrix (2013a)

One possible explanation for this contrasting evidence is that indirect or stakeholder policies are not always clearly distinguished from governmental policies. Instead, Open Access is often addressed through less formal means, such as the production of guidelines for research funding agencies. Another possible explanation for the contrast is that it is sometimes difficult to tell whether there is a genuine national top-down policy on OA or whether some initiatives, even at ministry level, are trying to rationalize what are, in essence, stakeholder(s) initiatives.

Finally, initiatives that are sometimes presented as national statements of intent are not necessarily enshrined in national policies. Declarations of support for Open Access (such as the Berlin Declaration signed by 444 organizations worldwide by August 2013) have been made by several countries (BE, CZ, FR, HR, IT, ES, MT, IE), but they are not automatically reflected in the deployment of binding national Open Access policies. Similarly, strategies are sometimes formulated at national level but are not necessarily immediately materialised through binding legislative measures (for instance the Maltese national R&I strategy recommending that academic institutions adopt an open access policy and set up their own open access repository).

The slower progress of Open Access to research data

Much of the debate revolving around access to scientific information has focused on peer-reviewed scientific publications in journals (publications resulting from research projects partly or fully publicly funded), but further areas are also crucial, for example research data. The data shows, however, that Open Access measures (both at national and stakeholder level) apply in majority to scientific publications (25 MS i.e. all MS with the exception of RO) and less frequently to research data (BG, CY, EL, FI, FR, HR, HU, LV, LT, NL, PL, SK)[56].

[56] Open Access measures involving publications and data are, of course, not exclusive from one another

While policies on Open Access to research data (both at national and stakeholder level) remain less developed than on publications, the general concern for unlocking the full value of scientific data, is growing, as reported by the High Level Expert Group on Scientific Data (2010). Several respondents referred to European projects such as EUROPEANA and e-infrastructures. Some respondents also mentioned activities in the European Bioinformatics Institute (EBI), which is a centre for research and services in bioinformatics that manages databases of biological data and provides free access to all its data resources. Open access to other resources such as doctoral and masters theses is progressing rapidly in Europe and is encountering fewer obstacles than publications and data (European Commission, 2011b).

This slower progress of open access to data can be explained by two factors (Science Metrix, 2013b):

> (i) The heterogeneous nature of scientific data: The emergence of OA scientific data as a valid, citable form of reference is limited by the difficulties associated with the standardisation of data and metadata formats, poor indexation by internet browsers, as well as by the scarcity of directories or registries that could make data more visible. Initiatives from academia and from the non-profit and private sectors seek to address these limitations. The proliferation of data archiving standards indicates that this issue is addressed by communities of researchers, librarians, and database administrators but probably will not be settled in the near future.
>
> (ii) The relatively slow progression of OA data repositories may be due in part to the lack of champions, such as with OA scientific papers repositories which might have developed faster due to the role played by librarians. Whereas the opening up of scholarly publications was welcomed by many in the scientific community, giving away data may be harder to accept. Scientists generally want the results of their research to be as widely known as possible and this may makes the OA scholarly paper movement a natural evolution of the scientific system. However, many scientists spend painstaking time collecting data which can then be used progressively to build a career and a large research team and to derive a competitive advantage vis-à-vis colleagues who do not have access to these data.

The catalytic role of EU initiatives

There is wide participation in the EU OA platform OpenAIRE (http://www.openaire.eu). The participation of stakeholder organisations from 23 Member States, as well as four Associated Countries, indicates the relevance of EU-wide platforms as a catalyst for Member States' involvement.

The Digital Repository Infrastructure Vision for European Research (DRIVER[57]) is another Europe-wide initiative (on which Open AIRE is built). Established to construct a cohesive network of repositories for research and education, the DRIVER network includes over 3,500,000 scientific publications harvested regularly from more than 295 repositories, from 38 countries.

Funding and soft measures have been adopted at EU level to support the development of OA. As a result of FP7, scientific publications resulting from a set of EU-funded projects are now increasingly available. For instance, out of the 42, 100 publications published in FP7, 16,697 were in Open Access and 25,299 were still under embargo[58]. However, despite their relevance, FP-funded measures concern only a limited share of EU's overall R&D expenditure and their impact remains thus limited.

The joint (regional) OA initiatives

Independently of the afore-mentioned EU initiatives that have a strong federating power between Member States stakeholders, various international initiatives on Open Access are emerging on the basis of EU regional areas or linguistic commonalities. These include:

[57] http://www.driver-repository.eu/
[58] Source: http://www.openaire.eu/en/component/openaire/stats/default/393

- Research and funding institutions from Austria, Switzerland and Germany co-operate in a bilateral (German-English) open access platform.[59]
- The Alhambra Declaration signed in 2010 by stakeholders from South European countries (Spain, Portugal, France, Italy, Greece and Turkey) published recommendations for the implementation of policy measures to develop Open access in Southern Europe.
- The initiative taken by Balkan countries, the COBISS.Net platform[60], created in 2003, enables the free flow of bibliographic material throughout Bosnia and Herzegovina, Bulgaria, Montenegro, Macedonia, Slovenia, Serbia and Albania.
- The platforms Latindex and Dialnet aim at collecting and facilitating access to research publications produced in Spanish and Portuguese speaking countries.

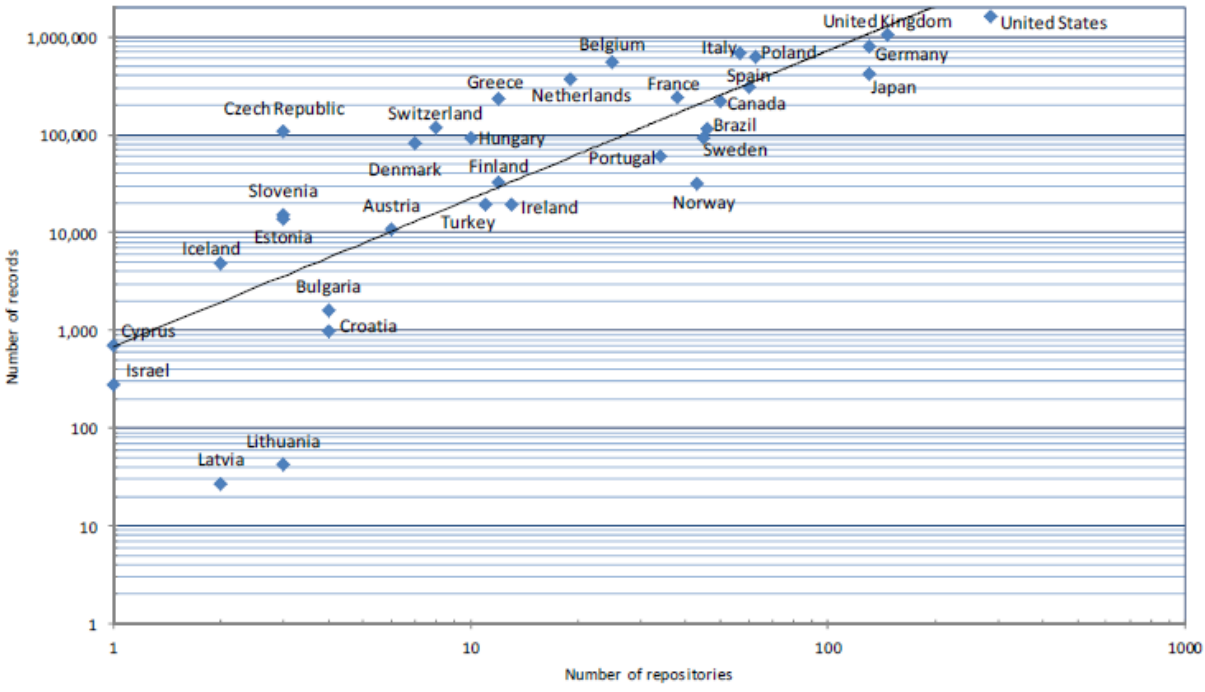
The dominance of stakeholder initiatives for repositories

In the Registry of Open Access Repositories[61] hosted by University of Southampton the worldwide open access repository database , repositories are available in 18 countries (BE, BG, CY, CZ, EE, EL, FI, FR, HR, HU, LV, LT, MT, NL, PL, PT, SE, UK) most of which are stakeholder initiatives. Only EE, FR, MT and UK mention a national policy on Open Access repositories.

Box 7 Institutional repositories and number of items contained in institutional repositories in the Science-Metrix study on Open -Access

Within the ERA, Brazil, Canada, Japan, and the US, nearly 8 million records are spread across 1,280 institutional repositories. Their repartition is shown below. Countries above the regression line, such as the Czech Republic and Belgium, have larger repositories (more records per repository) while those below the line, such as Croatia and Norway, have comparatively more but smaller repositories relative to other countries.

Figure 11 Uptake of OA by universities, illustrated as the number of institutional repositories and number of items contained in institutional repositories (source: Compiled by Science-Metrix from DOAR and OpenDOAR)



[59] http://open-access.net/de_en/homepage/
[60] http://www.cobiss.net/
[61] ROAR is part of the EPrints.org network http://roar.eprints.org

3.5.2.2. Public research contribution to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies

Knowledge transfer among the issues most actively addressed by governments

Knowledge transfer is among the issues most actively addressed –albeit with various levels of completeness- by governments and stakeholders. This reflects an awareness of its crucial importance for the RTD policy coherence. A recent EC funded study on Knowledge Transfer (Empirica GmbH, Fachhochschule Nordwestschweiz & UNU-MERIT, June 2013, Deliverable 5) shows that high KT policy intensity in countries tends to go together with high national innovativeness (as measured by the European Innovation Scoreboard (European Commission, 2013)) and competitiveness (as measured by the Global Competitive index[62]).

However, the existence of knowledge transfer policy at national level can sometimes be difficult to discern because government action does not necessarily imply a national policy involving all knowledge triangle actors at national level. For instance a ministry measure on researcher mobility to facilitate or rationalise knowledge transfer between universities and the private sector, will not necessarily be replicated with a similar action between public research organisations and the universities and/or the private sector.

Also, similarly to Open Access, the Member States that have a national Knowledge Transfer strategy include various instruments such as strategies, legislation, programmes, or "other types" of initiatives, and further research is needed on whether knowledge transfer (KT) national strategies mentioned in the fiches are the subject of hard or soft legislation.

At stakeholder level, taking the example of licensing, which is one among various aspects intervening in knowledge transfer, it is interesting to note that having a written and published licensing policy has advantages as well as disadvantages. The EC Code of Practice laid down the in 2008 Recommendation on the management of intellectual property in knowledge transfer activities (European Commission, 2008), states -among other requirements going beyond licensing- that Public Research Organisations should develop and publicise a licensing policy, in order to harmonise practices between them and ensure fairness in all deals. According to an EC-funded survey of universities and PROs (Empirica GmbH et al. 2013a, p. 29), only a few PROs have developed such policies. In this study, the Knowledge Transfer Organisations pointed out that the main reason was that without a licensing policy they were more flexible and negotiations could be conducted on a case-by-case basis. In addition, communicating the principles of their licensing practice also to their partners in industry would weaken their position in negotiations.

According to the same survey (Empirica GmbH et al. 2013a, pp. 3-18), a number of factors such as knowledge transfer office staff have a substantial, positive effect on knowledge transfer outputs. Most European KTOs are still developing experience and capabilities with managing the intellectual property produced by their affiliated university or research institute. Many KTOs could also be struggling with a lack of staff. Both of these factors could result in lower performance than expected, in terms of the number of patent applications, patent grants, start-ups, licenses, and license income. Universities obtain more start-ups, license agreements and research agreement per 1000 staff than research institutes, but the latter outperform universities for patent applications, patent grants, and license income.

License income is highly concentrated, with the top 10% of universities participating in the survey accounting for 85.3% of all such income. This could partly be due to a lack of experience or staff at other universities, but additional factors could be equally or more important, such as large differences in the size of public research organisations (larger organisations are likely to produce more intellectual property and therefore earn more license income) or the presence of a hospital or biomedical research faculty.

[62] Correlating KT policy activity with selected national strategy

Moreover, there are schemes addressing SMEs in seven Member States (Belgium, Denmark, Spain, France, Luxemburg, Malta, Poland and United Kingdom) but the figure is likely to be larger, considering that the KTOs survey mentioned above says that "many national policies encourage licensing to either start-ups or to small firms with less than 250 employees".

The role of EU initiatives

In order to maximise impact and speed up the process of open innovation and knowledge transfer in Europe, the Commission has committed in 2012 to developing a comprehensive policy approach to Open Innovation and KT. For this purpose a high level expert group has been established which will deliver recommendations by November 2013.

In order to analyse the current effectiveness of practices, trends and barriers in open innovation and knowledge transfer in Members States and PROs and universities, the Commission has commissioned a study in 2013. The study includes an impact-analysis of MS policies and practices on open innovation and KT on economic performance. Results are expected by 2014.

In order to further strengthen knowledge transfer offices in public research organisations, in line with the Innovation Union, the Commission launched a study in 2012 which examines the role and impact of KTOs and possible measures to strengthen KTOs in Europe. The study includes two stakeholder forums which address optimizing linkages between academia and industry.

The Commission is currently in the process of developing a set of model consortium agreements to facilitate effective collaborative research and knowledge transfer within Horizon2020 and beyond. Stakeholders have been consulted.

In order to address the difficulty of valuing intellectual property in IP related transactions and assess the scope for improvement, the Commission has set up an expert group on IP valuation in 2013, which will assess the need for policy action and deliver recommendations by November 2013.

In 2011, in line with the Innovation Union flagship initiative, the Commission launched the "TTO Circle[63]", an initiative that aims at enhancing collaboration among the TTOs (Technology Transfer Offices) of large European public research organisations, and gathers 25 stakeholders from 11 Members States (IT, FR, DE, BE, UK, SE, ES, NL, FI, IE, DK) and from associated countries (NO, CH, TR, IL).

Box 8 The European TTO CIRCLE

In 2011, in line with the Innovation Union flagship initiative, the Commission launched the "TTO Circle", an initiative that aims at enhancing collaboration among the TTOs (Technology Transfer Offices) of large European public research organisations.

The TTO Circle so far comprises the following organizations (25 in total): CEA, INRIA (France); CNR, ENEA (Italy); Fraunhofer Society, Helmholtz Association, Max Planck Society (Germany); IMEC (Belgium); NERC representing the Research Councils UK (UK); RISE (Sweden); SINTEF (Norway); TECNALIA, CIEMAT (Spain); TNO (The Netherlands); VTT (Finland); CERN, ESA, ESRF, JRC, ILL (International), ETH Board (Switzerland); TUBITAK (Turkey); Yeda R&D representing the Weizmann Institute (Israel); DTI (Denmark); Teagasc (Ireland). The JRC coordinates the TTO CIRCLE and provides its secretariat.

In addition, European associations such as EARTO, ASTP, and Proton are invited to contribute to the activities of the Network. One of the tasks of the TTO Circle is to foster the sharing of expertise, the exchange of best practices and the development of synergies at the European level in the field of IP and knowledge transfer.

[63] http://ec.europa.eu/dgs/jrc/index.cfm?id=6480

3.5.2.3. Harmonisation of the access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners

At least 17 Member States have set out initiatives towards establishing a national e-infrastructure with varying levels of deployment[64]. An example of good practice in e-infrastructure can be seen in Germany where the future development of federal IT will be steered by the inter-ministerial Chief Information Officers Council together with the Federal IT Management Group chaired by the Federal Government Commissioner for Information Technology. Core tasks include framing architectures, standards and methods for IT and providing the necessary infrastructure.

The strengthening of national e-infrastructures in collaboration with industry has been observed in least five countries (UK, BE, DK, EE, IT).

Little information is currently available on the deployment of digital services (computing services, cloud services, scientific software, research collaboration platform, or other digital services), or measures addressing it. However, a broad picture can be drawn based on the eResearch 2020 (Empirica GmbH at al., 2010, p.7): A large majority, 80% of the survey respondents, find it likely or very likely that new resource delivery models such as Software as a Service, Cloud Computing or Utility Computing will spread and have a significant impact in science in the next five years. There is also wide agreement from the respondents to statements about the necessity and benefits of National and international Grid Initiatives. In particular, statements on the necessity for coordination bodies and for optimising operation and support of distributed computing services are acknowledged by at least four out of five respondents.

3.5.2.4. Adoption and implementation of national strategies for electronic identity for researchers giving them transnational access to digital research services

According to the ERA survey 2012[65], over 40% of responding research performing organisations in the EU participates in electronic identity federation schemes for researchers[66]. However, there is little evidence in terms of national policy measures on researcher's e-Identity. However, the scarcity of information is widely complemented by several international initiatives:

- The success of an eduROAM[67] illustrates the relevance of initiating EU-wide platforms as a catalyst for Member States' involvement. Having started in Europe, eduROAM has gained momentum throughout the research and education community worldwide and is now available in 60 territories worldwide including all the EU Member States. Complementary to EduROAM, the EduGAIN service is intended to enable the trustworthy exchange of information related to identity, authentication and authorisation between the GEANT (GN3plus) Partners' federations[68]. Currently 15 Member States (BE, CZ, DE, DK, EL, ES, FI, FR, HR, HU, IT, LV, NL, SE) are members of EduGAIN.
- Another international initiative is the Research and education networking (REN) which is the provision of computer networks for interconnecting research and educational institutes in order to

[64] It should be noted that some measures relevant to e-infrastrcutres have been reported as OA repositiories. The use of similar terminology within distinct priority actions can lead to confusion in monitoring.
[65] available at http://ec.europa.eu/research/era/survey2012_en.html
[66] Respondents were asked: "Can researchers from your organisation access digital research services in other organisations by using their own user account (i.e. federated electronic identify)?"
[67] eduROAM (education roaming) is a world-wide access service that enables students, researchers and staff from participating institutions to obtain Internet connectivity across campus. With authentication handled by the home institution and authorisation by the visited institution, eduroam also allows academics and researchers to go to any other participating institution and access the network without reconfiguring their laptop or requesting new passwords.
[68] The eduGAIN service will deliver this through co-ordinating elements of the federations' technical infrastructure and a policy framework controlling the exchange of this information. The initial goal is to enable Pan-European Web Single Sign On (Web SSO) to both GÉANT services and to those provided by other communities represented by, or associated with, the GN3plus Partners.

facilitate exchange of information for research and teaching purposes. Research and education networks can exist at local and regional levels, although in most countries they are formally organised as National Research and Education Networks (NRENs)[69]. Also, REFEDS (Research and Education Federations), a collaborative body of research and education identity federations worldwide has, among its members, federations from 16 EU Member States[70].

Table 7 Country participation in the main initiatives related to e-identity

	GEANT (GN3)	EduROAM	EDUGAIN	REFEDS
Austria	X	X		X
Belgium	X	X	X	X
Bulgaria	X	X		
Croatia	X	X	X	X
Cyprus	X	X		
Czech Republic	X	X	X	X
Denmark	X*	X*		X
Estonia	X	X	X	X
Finland	X*	X*	X	X
France	X	X	X	X
Germany	X	X	X	X
Greece	X	X	X	X
Hungary	X	X	X	X
Ireland	X	X		X
Italy	X	X	X	X
Latvia	X	X	X	X
Lithuania	X	X		X
Luxembourg	X	X		
Malta	X	X		
Poland	X	X		X
Portugal	X	X		X
Romania	X	X		X
Slovakia	X	X		
Slovenia	X	X		X
Spain	X	X	X	X
Sweden	X*	X*	X	X
Netherlands	X	X	X	X
United Kingdom	X	X		X
Iceland	X*	X*		
Israel	X	X		X
Montenegro	X	X		
Moldova	X	X		
Norway	X*	X*		X
Switzerland	X	X		X
Serbia	X	X		X
Turkey	X	X		X

* Through nordunet gathering Nordic regions

[69] These networks are usually interconnected with other research and education networks. Continental networks (e.g. GÉANT) also exist to interconnect NRENs in certain regions, and to other parts of the world. These networks typically utilise high-capacity infrastructures

[70] Source: https://refeds.org/resources_list.html

4. CONCLUSIONS

This report provides a broad overview of the governance of the ERA: a snapshot of how the MS and AC are dealing with the five priorities articulated in the 2012 ERA Communication (EC, 2012).

Overall, it emerged that, in formal terms, ERA is being taken seriously, with relevant measures being adopted by Member States and Associated Countries. However, it also emerged that adoption does not necessarily or immediately lead to implementation, especially in the current financial context, where increasingly scarce resources need to be allocated across policy priorities. It follows that for a more accurate assessment of the progress towards the ERA, it is critical to identify solid criteria to fully measure implementation and to evaluate whether the measures proposed by governments or other relevant bodies can exert the desired effects.

The analysis presented in this report is subject to limitations regarding the quality and availability of country data, as well as the refinement of the underlying methodological approaches. Building on the experiences in organising the expert information collection process and the subsequent drafting of this report, this concluding section reflects on methodological issues for future monitoring on the progress towards ERA in each priority. Overall, it suggests that significant additional analytical and methodological effort is required. Such effort, taking into account the differences across national research and innovation systems, should better identify –for each ERA priority:

1. the current situation and the emerging trends;
2. the common elements towards which ERA countries should converge; and
3. Appropriate metrics to monitor such convergence processes.

4.1. Methodological issues by priority

4.1.1. Methodological issues for ERA Priority 1

Methodological issues in monitoring competitive versus block funding

As signalled at the beginning of this report, systematic and comparable information across countries on the quantitative importance of the different instruments is lacking. Beyond the technical aspects concerning data collection, the design of R&D statistics is still not well adapted to produce indicators on the volume and composition of project funding. Consequently, a quantitative analysis of allocation models/funding instruments is still not yet in place.

Complexity of funding mechanisms: there are significant measurement issues in calculating the share of competitive funding in more complex systems (i.e. France, Germany). Funds allocated as block funds to large research organisations are often further dispersed to individual research centres based on projects competition.

Statistics do not adequately take into account the degree of competition: in a highly heterogeneous R&I EU landscape, the share of competitive funding differs considerably; researchers, universities and research institutions face very different levels of competition in accessing national public funding.

When considering the efficiency of R&D expenditure one should bear in mind direct expenditures (direct subsidies, grants) but also the indirect expenditures (fiscal incentives, legal/regulatory framework, knowledge transfer, access to research infrastructures).

R&D input vs. output. R&D spending and the allocation modes are used as the measure of effectiveness of the R&D system. However, R&D expenditure is a measure of the inputs rather than of output. A measure of R&I effectiveness and performance should include scientific and innovation outputs rather than the amount of effort going into developing them. While the total number of triadic patents is related to GBAORD volume, the picture changes when discussing the number of patents and ISI publication per EURO invested in R&D.

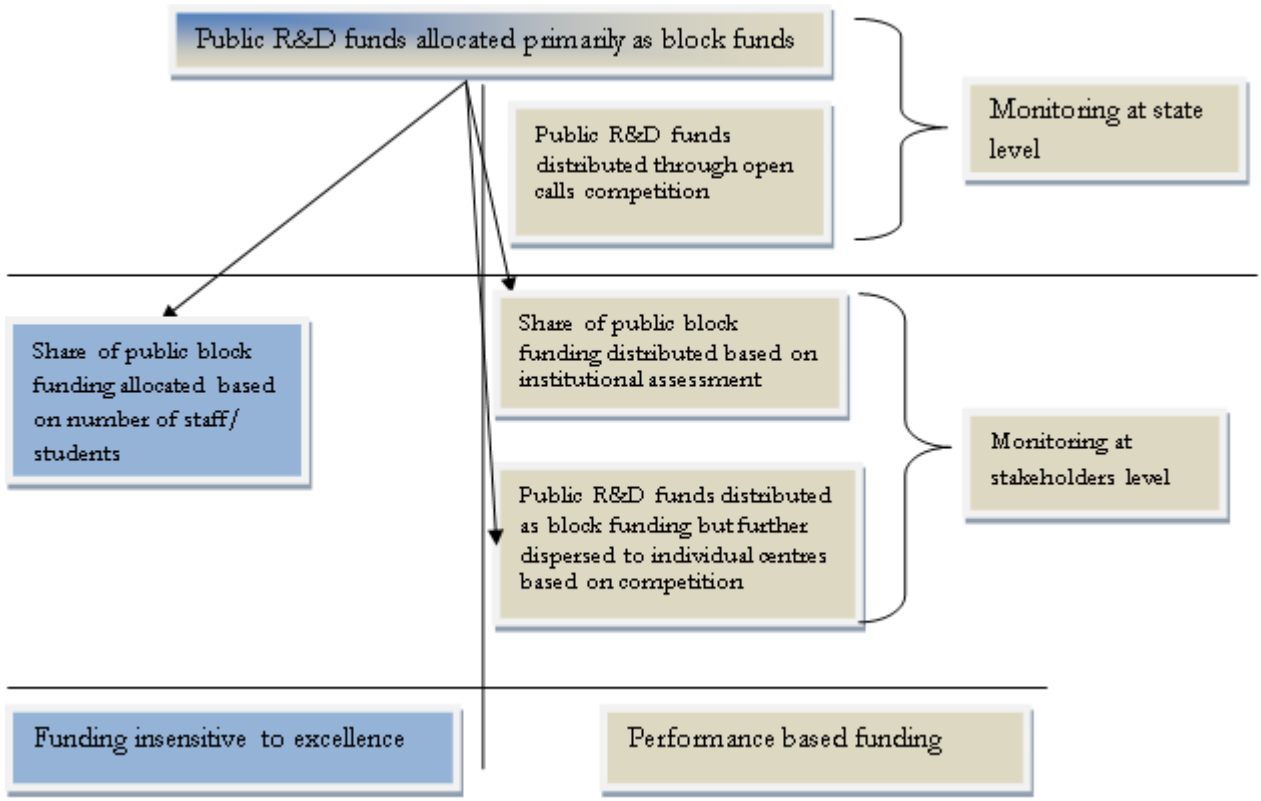
When assessing the effectiveness of the R&D system, one should consider a broader and more complex picture that should include:

- GERD. While herein only public funds are under discussion, the access to private R&D funds may trigger different behaviour patterns;
- Share of competitive (level of competition) + institutional based budget allocation
- Scientific output
- Quality of the local research infrastructure
- Education of the workforce
- Macroeconomic and political stability
- Framework conditions (intellectual property rights, KT policies, product and labour market regulations; financial systems, especially equity-based ones)

While there is a clear need for a more complex indicator, monitoring should be performed at two levels:

- At State level: regulations, laws which enforce the distribution of R&D public money via competition and institutional assessment; the indicator which gives the overall share of budget allocated based on competitive and institutional assessment vs. block funding allocated based on number of staff etc.
- At stakeholder level: given the complexity of some RDI systems, the share of institutional vs. competitive funding is an indicator which can be calculated only in a bottom-up approach.

Figure 12 Overview of monitoring issues



Methodological issues in monitoring evaluation procedures

Monitoring issues appear at two levels:

- At State level: Some countries have formal provisions for the involvement of international experts and application of peer review criteria. Nevertheless, such formal regulations at state level exist mainly in the countries with less tradition, recently implementing new funding schemes and evaluation mechanisms. In the countries with tradition in evaluation, although the international peer review criteria are followed, the responsibility of evaluation is delegated to the funding agencies and therefore not regulated at national level.
- Stakeholder level: Different national funding institutions apply different evaluation rules; therefore in many countries the monitoring should be performed at the individual stakeholder level. This situation is particularly true in the case of those countries where there is a tradition in evaluation.

4.1.2. Methodological issues for ERA Priority 2

For Priority 2, data availability is suboptimal both for quantitative and qualitative data. Quantitative analysis of the share of transnationally coordinated public national research currently builds on assumptions and estimations for many countries, although good efforts have been made by Eurostat to fill data gaps. Available qualitative data is very scattered, and the detail of information obtained varies substantially among countries, especially for Actions 7 and 8. More systematic monitoring or reporting on those actions is required. With regard to removing barriers related to Priority 2, different sets of indicators can be developed that take into account different dimensions of policy coordination in transnational research programming and the barriers related to each of them (Haegeman et al., 2013). This would make more explicit that, for transnational programming to be successful, a wide range of

conditions need to be fulfilled, and would allow for a systematic approach to measuring progress to removing barriers.

Regarding the synergies with structural funds, monitoring is still difficult and blurred, regional and national (in some cases) smart specialisation strategies are still under development and should be submitted by the end of 2013.

4.1.3. Methodological issues for ERA Priority 3

For Priority 3, it is of foremost importance to be able to assess the current attractiveness of the scientific labour market across the EU (status, conditions of work, career options). Indeed, an important barrier to a truly open labour market for researchers is constituted by the very different career structure across MS. This may hinder the creation of a single labour market for at least three reasons:

- Competences are not immediately recognised from one country to another (this is the case, for instance, where someone tries to access academic positions in countries where a lengthy mechanism of accreditation or authorization is necessary);

- Barriers may be hidden, engrained in less formal but nevertheless well-established practices, which cannot be identified by looking at policy measures; and

- The evaluation of the impact of scientific mobility becomes more difficult, since it is not easy to assess the motives that lead researchers to move (i.e. scientific preference, vs. economic necessity due to barriers to entry).

To evaluate and monitor progress, it could therefore be useful to devise a template of how an optimal common career-structure would look (in terms of the different positions, the processes to access them and the related working conditions). Countries could then be evaluated against such a framework, taking better into account both the formal and informal institutions and practices that shape research careers.

4.1.4. Methodological issues for ERA Priority 4

Understanding career structures is also critical for Priority 4. Indeed monitoring is necessary to assess how the proliferation of temporary contracts is affecting gender balance. In this respect, it is suggested that a systematic comparison of temporary versus non-temporary contracts is carried out. This could monitor both the rights attached to different positions, and their take up and implementation. Furthermore, metrics to evaluate whether actions related to gender mainstreaming in research topics are in place also need to be developed. An avenue for evaluation is to explore whether gender mainstreaming of research topics features among the criteria to access grants. Lastly, an in-depth dialogue with female professors could help further understand informal barriers to career advancement and thus provide relevant policy input.

4.1.5. Methodological issues for ERA Priority 5

The initiatives taken are mostly visible at stakeholder level and therefore are not consistently formulated as national policies. This is why the line between these two dimensions (stakeholder initiatives and national policy) is not always clearly defined when experts complete the fiches. For

instance, independent national experts working with JRC-IPTS have reported 15 Member States deploying Open Access policies while a 2013 study Science-Metrix concludes that very few governments have implemented direct national legislation on Open Access which is often addressed through less formal means, such as the production of guidelines for research funding agencies.

Indeed, there are too many initiatives in Europe to be reported in an exhaustive manner, and creating country groupings could be misleading. For instance, as mentioned by some respondents in a questionnaire to the ERAC (European Commission, 2011), several countries have created national repository infrastructures, but this is both a complex and dynamic situation since the infrastructure is provided and supported by a number of independent organisations, including funders and universities. There are many important initiatives that are growing fast, but considering the various stakeholders involved, these initiatives can easily remain "islands" that are not sufficiently interconnected. All in all, as mentioned in the Science Metrix study, the number of policies alone is a not such a robust indicator of commitment to Open Access in a given country.
There are also possible terminological confusions, with measures relevant to e-infrastructures as reported as OA repositories. Indeed, terminological clarity is an important horizontal methodological issue.

4.1.6. Horizontal methodological issues

Measurement of progress could also consider further the interlinkages between the different ERA priorities, in order to capture synergies between them (Haegeman et al., 2013). For example, transnational research programming networks can contribute to international mobility, to gender equality, etc. Sets of indicators can be developed to measure such synergies, and future partnering instruments can be designed in such way that they also support progress in other ERA priorities[71].

Whilst the priorities as defined in the ERA Communication overall capture the essential features of the ERA, they are broader than reflected in the actions defined. Additional areas for future policy attention in each of the priorities could be considered, as well as related monitoring needs. In line with this, the second edition of the ERA Fabric Map (Marinelli at al., 2013) distinguishes between a narrow description (focusing on the actions defined) and a broad description (going beyond the actions defined) for each priority, and takes stock of the current state of play according to both descriptions.

[71] In addition there is an opportunity to connect partnering instruments better to non-research related policies that are relevant to research and innovation, such as standardisation, support to SME's, addressing social exclusion and poverty, etc. (Haegeman et al, 2013).

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Abstract

This report is a synthesis of progress towards achievement of the ERA, based on an analysis of country data on the five ERA priorities (as defined in the 2012 EC Communication) collected with the support of independent country experts in the first semester 2013, complemented by other relevant indicators and study results (taking into account in some cases limitations regarding data availability and quality). It offers a synthetic and cross-country analytical overview by ERA priority of relevant policies and related policy support measures adopted and implemented (including necessary legal changes enacted) in EU Member States. It covers the 28 EU Member States and 13 Associated Countries. This report aims to identify behavioural patterns across countries, take into account progress in relation to the ERA baseline indicators, and contribute to the ERA Monitoring Mechanism.

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