



# **The evolution of Responsible Research and Innovation in Europe: The MoRRI indicators report**

Monitoring Report

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## Table of Contents

INTRODUCTION.....	4
OVERVIEW OF THE INDICATORS .....	4
1 RRI in the public sphere.....	8
2 Gender equality.....	11
2.1 GE1 - Share of research-performing organisations with gender equality plans ...	13
2.2 GE2 - Share of female researcher by sector.....	16
2.3 GE3 - Share of research-funding organisations promoting gender content in research.....	20
2.4 GE4 - Dissimilarity index .....	22
2.5 GE5 - Share of research-performing organisations with policies to promote gender in research content.....	24
2.6 GE6 - Glass ceiling index.....	27
2.7 GE7 - Gender wage gap .....	28
2.8 GE8 - Share of female heads of research-performing organisations .....	30
2.9 GE9 - Share of gender-balanced recruitment committees at research-performing organisations .....	33
2.10 GE10 - Share of female inventors and authors .....	36
3 Science literacy and science education .....	38
3.1 SLSE1 - Importance of societal aspects of science in science curricula for 15 to 18-year-old students .....	40
3.2 SLSE2 - RRI-related training at higher education institutions .....	42
3.3 SLSE3 - Science communication culture.....	43
3.4 SLSE4 - Citizen science activities in research-performing organisations .....	44
4 Public engagement.....	46
4.1 PE1 - Models of public involvement in S&T decision-making.....	48
4.2 PE2 - Policy-oriented engagement with science .....	50
4.3 PE3 - Citizen preferences for active participation in S&T decision-making.....	51
4.4 PE4 - Active information search about controversial technologies .....	52
4.5 PE5 - Public engagement performance mechanisms at the level of research-performing organisations.....	53
4.6 PE7 - Embedding of public engagement activities in the funding structure of key public research-funding agencies.....	54
4.7 PE8 - Public engagement elements as evaluative criteria in research proposal evaluations .....	55
4.8 PE9 - Research and innovation democratisation index .....	57
4.9 PE10 - National infrastructure for involvement of citizens and societal actors in research and innovation.....	59
5 Open access .....	61
5.1 OA1 - Open access literature .....	63
5.2 OA3 - Social media outreach/take-up of OA literature .....	67
5.3 OA4 - Public perception of open access.....	70
5.4 OA5 - Funder mandates .....	71
5.5 OA6 - Research-performing organisations' support structures for researchers as regards incentives and barriers for data sharing .....	73
6 Ethics .....	76
6.1 E1a - Ethics at the level of higher education institutions and public research organisations .....	78
6.2 E1b - Ethics at the level of higher education institutions and public research organisations (composite indicator).....	81
6.3 E2 - National ethics committees index .....	83

6.4	E3a - Research-funding organisations' index.....	84
6.5	E3b - Research-funding organisations' index (composite indicator).....	85
7	Governance .....	86
7.1	GOV1 - Use of science in policymaking .....	88
7.2	GOV2 - RRI-related governance mechanisms within research-funding and higher education institutions .....	90
7.3	GOV3 - RRI-related governance mechanisms within research-funding and research-performing organisations – composite index .....	91

## INTRODUCTION

Monitoring the developments of 'Responsible Research and Innovation' (RRI) is concluded with this report. It includes a rich set of RRI indicators that were collected through the study directly or by using available data from previous collection efforts. Bringing together a large number of indicators provides detailed information on a number of aspects. The downside, however, is that not all the collected data is very recent – in particular, data from Eurobarometer and MASIS indicate a situation of 4 to 7 years ago. Not all of it may be outdated but a more recent data collection suggests that there is change. It may be slow as suggested by some gender equality indicators but, nevertheless, an evolution can be seen. In fast-moving areas such as open access (or open science as it is now termed), the changes are even more pronounced. The collection effort has also seen limitations concerning, in particular, 'open data' indicators, but other RRI areas such as 'ethics' and 'governance', were also rather difficult to capture.

Besides the presentation of the data, the report offers an appraisal of each indicator in its methodological annex and – where appropriate – a more detailed explanation (such as for open data).

The report is structured as follows:

- Overview of the indicators. In this table overview, we indicate all indicators, their sources and the year.
- An overview of RRI, the dimensions and how they were taken up in news items on the Internet is updated until 2017. We also include a small analysis on RRI and its appearance in the media.
- The main part provides the overviews by individual dimension and indicators. The situation in the latest available year is explained and where more than one year is available, the evolution is described.

## OVERVIEW OF THE INDICATORS

The following indicators (with breakdowns) are included in this report.

RRI dimension	Indicator code	Indicator title	Year(s)	Source
Gender	GE1	Share of research-performing organisations with gender equality plans	2014-2016	HEI, PRO surveys
	GE2	Share of female researchers by sector	2007, 2014	Eurostat
	- GE2.1	Share of female researchers - all sectors	2007, 2014	Eurostat
	- GE2.2	Share of female researchers - business enterprise sector	2007, 2014	Eurostat
	- GE2.3	Share of female researchers - government sector	2007, 2014	Eurostat
	- GE2.4	Share of female researchers - higher education sector	2007, 2014	Eurostat
	GE3	Share of research-funding organisations promoting gender content in research	2014-2016	RFO survey

RRI dimension	Indicator code	Indicator title	Year(s)	Source
	GE4	Dissimilarity index	2009, 2012	SHE Figures, 2012, 2015
	- GE4.1	Dissimilarity index : higher education sector	2009, 2012	SHE Figures 2012, 2015
	- GE4.2	Dissimilarity index : Government sector	2009, 2012	SHE Figures 2012, 2015
	GE5	Share of research-performing organisations with policies to promote gender in research content	2014-2016	HEI, PRO surveys
	GE6	Glass ceiling index	2010, 2013	SHE Figures, 2015
	GE7	Gender wage gap	2010, 2014	Eurostat
	- GE7.1	Gender wage gap - academic professions	2010, 2014	Eurostat
	- GE7.2	Gender wage gap - technicians and associate professionals	2010, 2014	Eurostat
	GE8	Share of female heads of research-performing organisations	2014-2016	HEI, PRO surveys
	GE9	Share of gender-balanced recruitment committees at research-performing organisations	2014-2016	HEI, PRO surveys
	GE10	Share of female inventors and authors	2005-2016	Patstat, Scopus
	- GE10.1	Share of female authors	2005-2016	Scopus
	- GE10.2	Share of female inventors	2005-2016	Patstat
Science literacy and science education	SLSE1	Importance of societal aspects of science in science curricula for 15 to 18-year-old students	2016	Desk research and interviews
	SLSE2	RRI related training at higher education institutions	2014-2016	HEI survey
	SLSE3	Science communication culture	2012	MASIS
	SLSE4	Citizen science activities in research-performing organisations	2015, 2016	ECSA, Scopus
	- SLSE4.1	Organisational memberships in ECSA	2015, 2016	ESCA
	- SLSE4.2	Citizen science publications	2015, 2016	Scopus
Public engagement	PE1	Models of public involvement in science and technology decision-making	2012	MASIS
	PE2	Policy-oriented engagement with science	2010	Eurobarometer
	PE3	Citizen preferences for active participation in science and technology decision-making	2013	Eurobarometer
	PE4	Active information search about controversial technologies	2010	Eurobarometer
	PE5	Public engagement performance mechanisms at the level of research-performing organisations	2014-2016	HEI, PRO surveys
	PE6	Dedicated resources for public engagement		Not available. Results from HEI and PRO surveys

RRI dimension	Indicator code	Indicator title	Year(s)	Source
				(MoRRI, 2017) inconsistent.
	PE7	Embedment of public engagement activities in the funding structure of key public research-funding agencies	2014-2016	RFO survey
	PE8	Public engagement elements as evaluative criteria in research proposal evaluations	2014-2016	RFO survey
	PE9	Research and innovation democratisation index	2016	SiS survey
	PE10	National infrastructure for involvement of citizens and societal actors in research and innovation	2016	SiS survey
Open access	OA1	Open access literature	2010, 2016	DOAJ list, PMC, the ROAD list, CrossRef, and OpenAIRE
	- OA1.1	Share of Open Access publications	2010, 2016	DOAJ list, PMC, the ROAD list, CrossRef, and OpenAIRE
	- OA1.2	Citation scores for OA publications	2010-2014	DOAJ list, PMC, the ROAD list, CrossRef, and OpenAIRE
	OA2	Data publications and citations		The information lacks credibility. The indicator is omitted (see Annex 2).
	OA3	Social media outreach/take up of open access literature	2012-2015	WoS and Altmetric.com
	- OA3.1	Ratio of OA and non-OA publications used in Twitter	2012-2015	WoS and Altmetric.com. Limited to publications
	- OA3.2	Ratio of OA and non-OA publications used in Wikipedia	2012-2015	WoS and Altmetric.com. Limited to publications
	OA4	Public perception of open access	2013	Eurobarometer
	OA5	Funder mandates	2011	DG-RTD
	OA6	Research-performing organisations' support structures for researchers as regards incentives and barriers for data sharing	2014-2016	HEI, PRO surveys
Ethics	E1a	Ethics at the level of research-performing organisations	2014-2016	HEI, PRO surveys
	E1b	Ethics at the level of research-performing organisations (composite indicator)	2014-2016	HEI, PRO surveys
	E2	National ethics committees index	2012	EPOCH
	E3a	Research-funding organisations index	2014-2016	RFO survey
	E3b	Research-funding organisations index (composite indicator)	2014-2016	RFO survey

RRI dimension	Indicator code	Indicator title	Year(s)	Source
Governance	GOV1	Use of science in policymaking	2012	MASIS
	GOV2	RRI-related governance mechanisms within research-funding and performing organisations	2014-2016	RFO, HEI, PRO surveys
	GOV3	RRI-related governance mechanisms within research-funding and performing organisations – composite index	2014-2016	RFO, HEI, PRO surveys

This monitoring report includes several survey-based indicators. The project team has launched four surveys since 2016, collecting data for the years 2014 to 2016, namely: Science in society stakeholders survey (SiS survey); Research-funding organisations survey (RFO survey), Higher education institutions survey (HEI survey) and the Public research organisations (PRO) survey.

The response rates to these surveys – in particular the HEI and the PRO ones – were varied. For both surveys, two Member States had to be removed from the analysis due to low response rates: France and Poland from the HEI and Latvia and Romania for the PRO one. In order to allow for cross-checking the number of responses per indicator and Member State, the details as well as the surveys themselves are annexed.

## 1 RRI in the public sphere<sup>1</sup>

While the concept of 'responsible research and innovation' originates from the European Commission's Directorate-General for Research and Innovation (DG RTD), in particular during the Horizon 2020 (H2020) Framework Programme (2013-2020), we were interested to see if this concept, which is pushed through the Framework Programme (FP) priority and relevant funding, diffuses beyond the FP-funded community.

How, then, has the RRI concept evolved? In order to analyse its societal uptake, we used a media intelligence tool, allowing us to analyse millions of public news items for the term 'responsible research and innovation'. According to Figure 1, the term first appeared in 2011. In 2011 and 2012, the news items were predominantly about the relevant FP calls or mentioned in the context of developments under H2020. Already in 2012, the term appeared within ongoing research, for example on Communicating nanoethics (nanowerk.com) and a Synthetic Biology Roadmap (EPSRC, UK). In 2013, the first funded FP projects (NanoDiode, Res-AgorA, etc.) as well as the special Eurobarometer results were published.

In 2014, there were a number of workshops and conferences dealing with RRI (e.g. in Estonia, Switzerland, Italy and the Netherlands – the latter during the Dutch presidency). RRI was also discussed in the daily news: 'Beyond Naughty or Nice: Defence research and responsible innovation' (*The Guardian*, UK). In Germany, the visibility of RRI was particularly increased due by attempts by the Fraunhofer Society and its establishment of a dedicated research group and a design competition. In Spain, RRI was taken up for example by universities, now trying to 'collect all science dissemination activities' in order 'for getting closer to society' (University of Barcelona). FP-funded RRI projects were making themselves and the concept visible, for example in science nights (Florence, Italy) or dedicated workshops that received wider attention (NERRI: Neuro-Enhancement Responsible Research and Innovation), and also from legal and medically oriented news.

The concept was also diffusing beyond Europe. In 2014, the first Asia Pacific Responsible Business Innovation Workshop was organised by the University Malaysia Sarawak, a partner of one of the earlier RRI projects, in 2015, Australian debated about RRI in the context of 'Big questions about risk assessment of nanomaterials', and in the USA 'NASA considers public values in its Asteroid Initiative' – pointing toward the RRI concept.

By 2014/2015, RRI moved beyond workshops and conferences to actions. For example, in 2015, six European foundations introduced the European Foundations Award for Responsible Research & Innovation. The Austrian Science Fund FWF signed a Memorandum of Understanding on RRI in order to foster the dialogue between science and society, and the country began the alliance of Austrian research organisations, forming a competence network of science cultures and centres for citizen engagement.

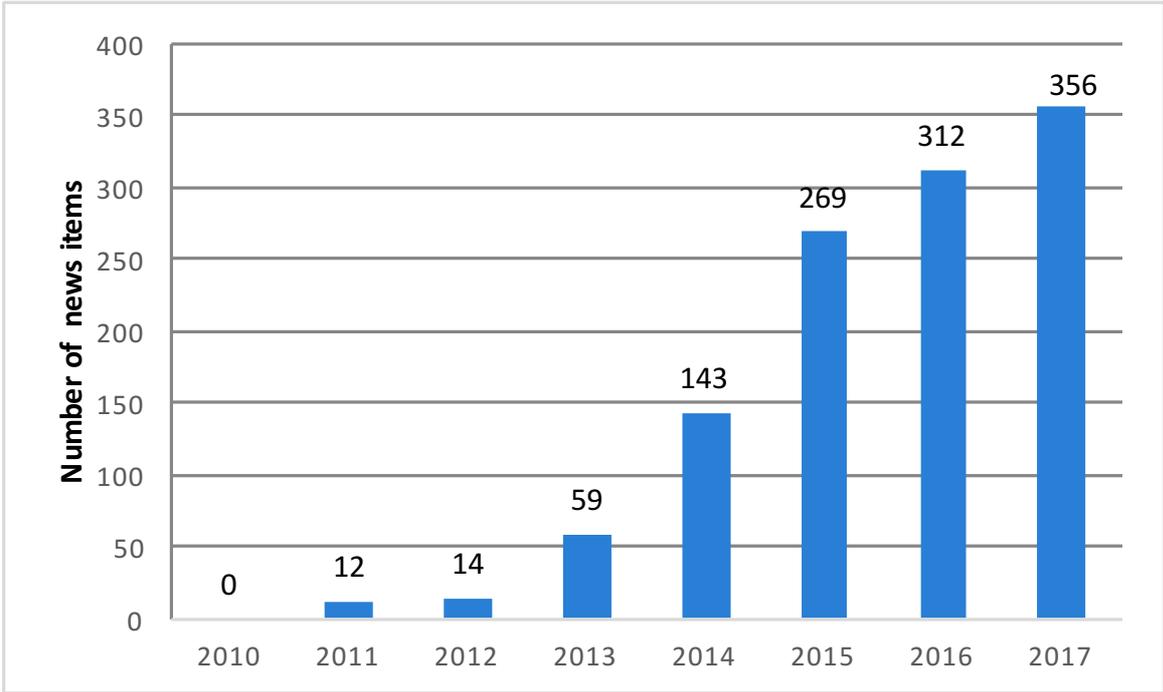
An interesting aspect about the FP-funded RRI projects is that through workshops and the inclusion of good practices and MS examples, the concept is further diffused and 'marketed' widely. Several reflections on and actions about science and innovation policies refer to RRI. The nature of the content of an increasing number of news items suggests that

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<sup>1</sup> This section is based on using the Meltwater.com media-monitoring platform. It uses and analyses data outside company firewalls and can thus provide insights if terms (such as RRI) are used in media coverage, blogs, etc. Here we use it primarily to show if the RRI concept is diffusing beyond the FP sphere.

individual research organisations – performers as well as funding bodies – but also the private sector reflects and develops concepts to make use of the RRI concept.

Figure 1 Evolution of the term 'responsible research and innovation' in news items

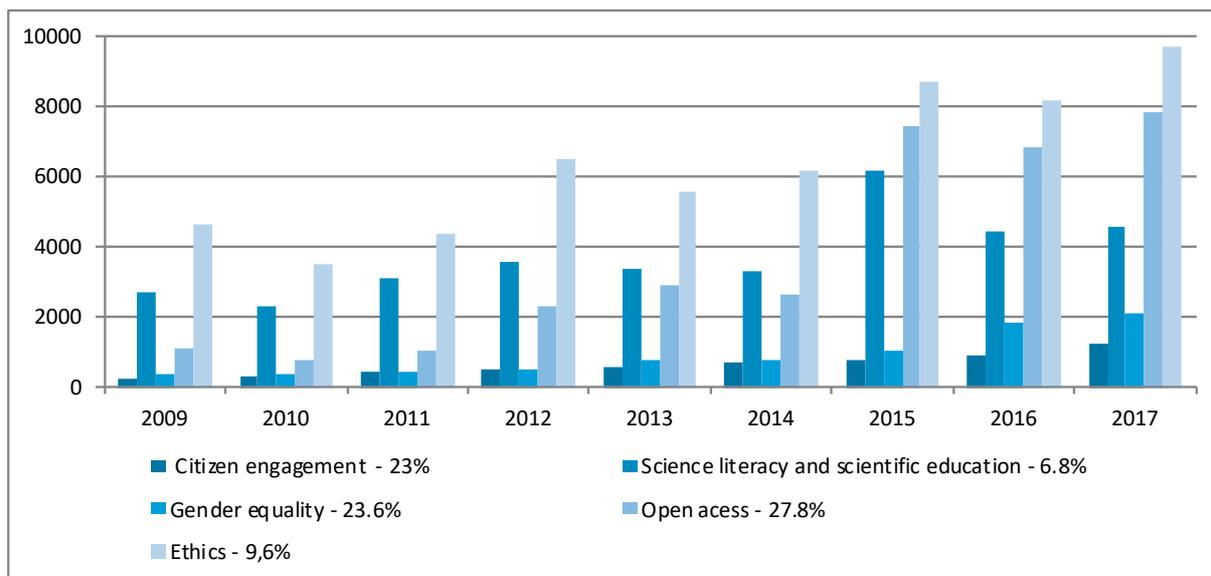


Source: Technopolis Group; Data: Meltwater.  
Note: search in 'all sources', Meltwater news section.

The searches for the other dimensions were done in all EU-Member State (MS) languages in combination to find 'research' or 'innovation' in proximity (near 5 or near 10), meaning that for example 'ethic' or 'ethics' needed to appear with 'research' or 'innovation' with a maximum of five words in-between. This limits the unwanted hits ('noise') since for example 'open access' is a key term in information and communication technologies.<sup>2</sup>

<sup>2</sup> See Annex 6 for the search keys.

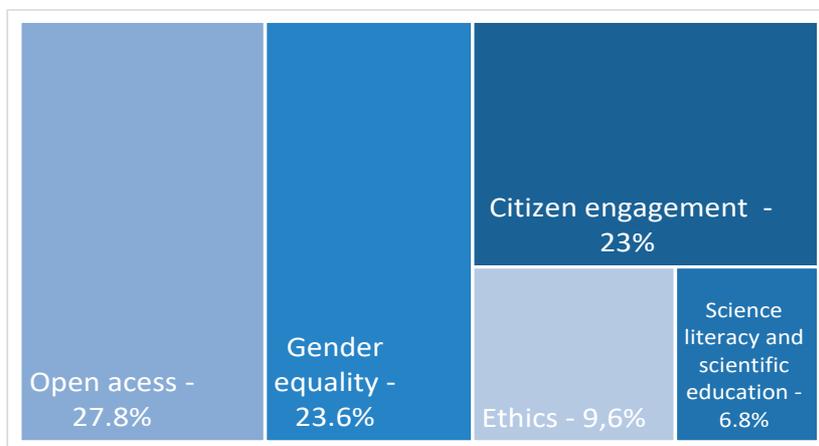
Figure 2 Evolution of the RRI dimensions based on news items, 2009-2017



Source: Meltwater; Calculations: Technopolis Group.  
 Note: the search was limited to European sources.

The individual RRI dimensions were in the news before the concept was further diffused and promoted through FP7. While all the dimensions grew, some grew more than others. The highest growth can be seen for 'open access' followed by 'gender equality' and 'citizen engagement'. The lowest growth can be recorded for 'ethics' and science literacy and scientific education (SLSE) (see Figure 3).

Figure 3 Average annual growth of RRI dimensions, 2009-2017



Source: Meltwater; Calculations: Technopolis Group.

## 2 Gender equality

Gender equality is defined as a three-dimensional construct whereby gender equality is reached when:

- women and men are equally represented in all disciplines and at all hierarchical levels;
- gendered barriers are abolished so that women and men can develop their potential equally;
- when the gender dimension is considered in all research and innovation activities.

The following indicators (with breakdowns) are included:

Number	Name of indicator	Note
GE1	Share of research-performing organisations with gender equality plans	Data available for 2014, 2015, 2016. Indicator based on HEI and PRO surveys of MoRRI consortium, 2017.
GE2	Share of female researcher by sector	Data available until 2014, Source: Eurostat.
- GE2.1	Share of female researchers - all sectors	
- GE2.2	Share of female researchers - business enterprise sector	
- GE2.3	Share of female researchers - government sector	
- GE2.4	Share of female researchers - higher education sector	
GE3	Share of research-funding organisations promoting gender content in research	Data available for 2014, 2015, 2016. Indicator based on RFO survey of MoRRI consortium, 2017.
GE4	Dissimilarity index	Data available for 2009, 2012. Source: She Figures, 2015.
- GE4.1	Dissimilarity index : higher education sector	
- GE4.2	Dissimilarity index : Government sector	
GE5	Share of research-performing organisations with policies to promote gender in research content	Data available for 2014, 2015, 2016. Indicator based on HEI and PRO surveys of MoRRI consortium, 2017.
GE6	Glass ceiling index	Data available for 2010, 2013. Source: She Figures, 2015.
GE7	Gender wage gap	Data available for 2010, 2014. Source: Eurostat.
- GE7.1	Gender wage gap - academic professions	
- GE7.2	Gender wage gap - technicians and associate professionals	
GE8	Share of female heads of research-performing organisations	Data available for 2014, 2015, 2016. Indicator based on HEI and PRO surveys of MoRRI consortium, 2017.
GE9	Share of gender-balanced recruitment committees at research-performing organisations	Data available for 2014, 2015, 2016. Composite indicator based on HEI and PRO surveys of MoRRI consortium, 2017.

Number	Name of indicator	Note
GE10	Share of female authors and inventors	Available years: 2005, 2014, Sources: Scopus, Patstat.
- GE10.1	Share of female authors	Source : Scopus
- GE10.2	Share of female inventors	Source : Patstat

# Gender equality

## Main observations



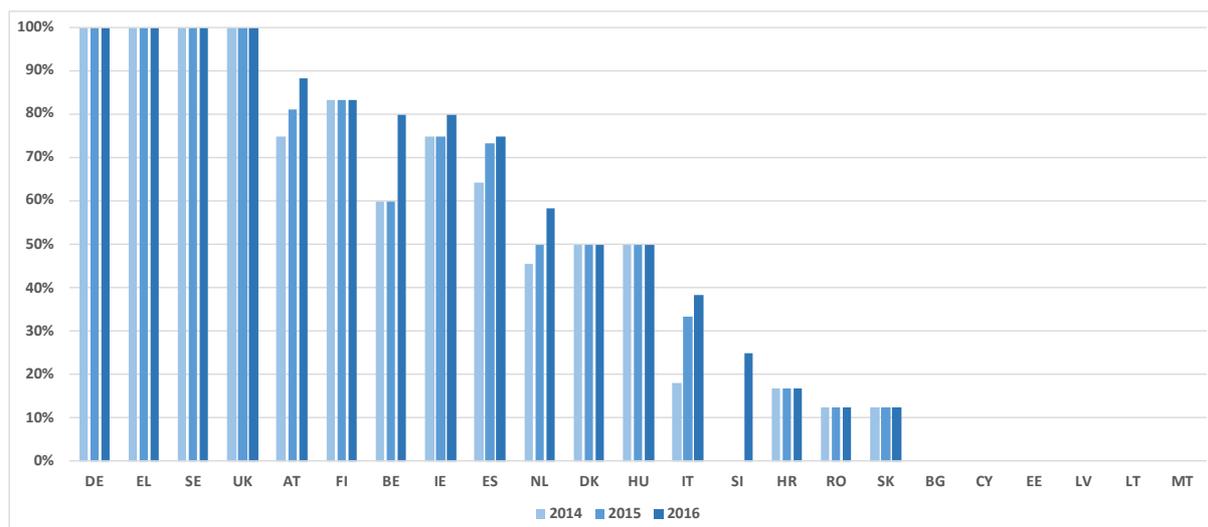
## 2.1 GE1 - Share of research-performing organisations with gender equality plans

### The indicator

GE1 measures institutional engagement in gender equality work. The existence of a gender equality plan (GEP) indicates institutionalised activities for gender equality. A GEP is a consistent set of provisions and actions aimed at ensuring gender equality. The indicator is based on one question in the HEI survey (MoRRI, 2017), namely: 'Does your organisation have a gender equality plan?'

### Outcomes

Figure 4 Share of higher education institutions with gender equality plans

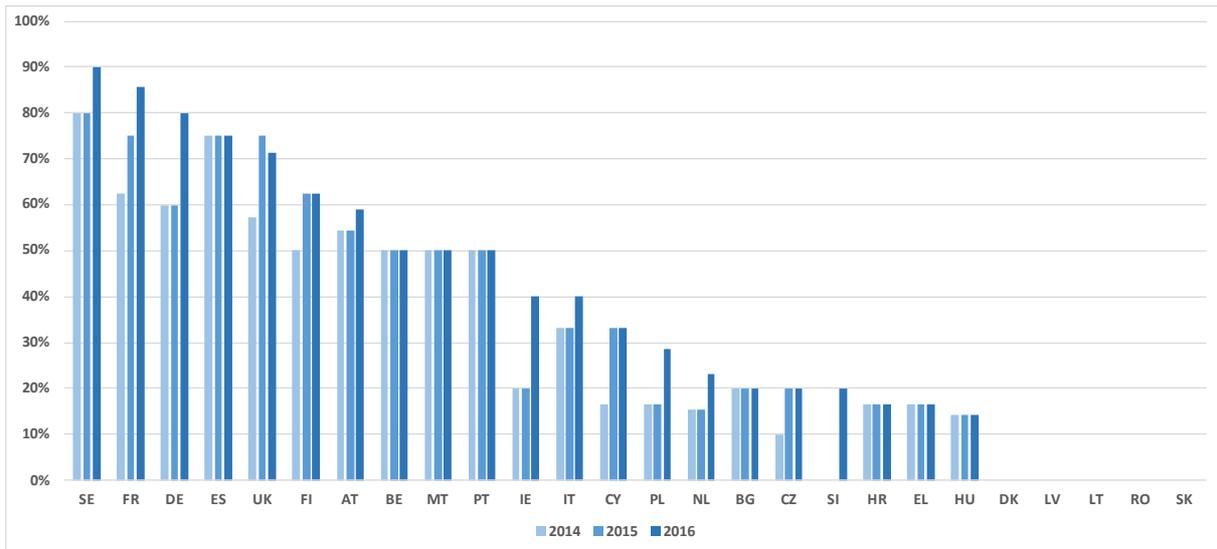


Source: HEI survey, MoRRI, 2017.

Note: Insufficient number of responses for CZ, FR, LU, PL, PT (see Annexes 4 and 5). In the case of FR, 0.75 of responding HEIs reported that they did have gender equality plans in 2016. Respondents for CZ, PL and PT reported not having gender equality plans in any year. No respondents for LU.

Within the EU, respondent higher education institutions (HEIs) in 6 Member States reported not having gender equality plans (Bulgaria, Cyprus, Estonia, Latvia, Lithuania, Malta). A group of 4 MS (Germany, Greece, Sweden, United Kingdom) perform particularly strongly on this indicator across the 3-year monitoring period. A second group of countries of 5 MS also perform strongly, while the Netherlands, Denmark, Hungary and Italy are also making progress on this measure according to the currently available data. The remaining Member States have made a start in establishing gender equality plans. For those MS with variation in the data across the period, the trend is positive in all cases. Higher response rates that allow for more complete information will improve the quality of this indicator in the future.

Figure 5 Share of public research organisations with gender equality plans

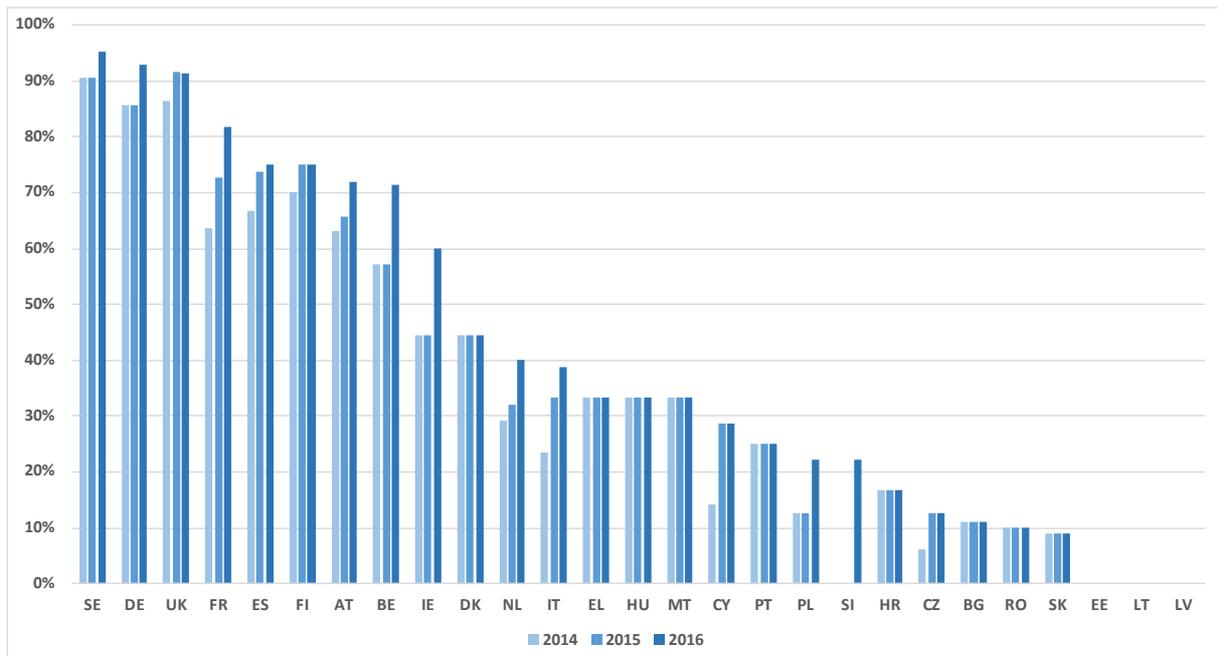


Source: PRO survey, MoRRI, 2017.

Note: Insufficient number of responses for EE and LU (see Annexes 4 and 5).

Within the EU, respondent public research organisations (PROs) in 4 Member States reported not having gender equality plans (Latvia, Lithuania, Romania, Slovakia). A group of 5 Member States (Sweden, France, Germany, Spain, United Kingdom) perform particularly strongly on this indicator across the 3-year monitoring period. A second group of countries of 5 MS (Finland, Austria, Belgium, Malta, Portugal) also perform strongly, while most of the other Member States are also making progress on this measure at lower levels. Many Member States show a positive change in this indicator, suggesting the ongoing implementation of gender equality plans in PROs across Europe. Once again, achieving higher response rates will allow for more complete information and improve the quality of this indicator in the future. However, the current results are very encouraging in the PRO sector.

Figure 6 GE1 - Share of HEIs and PROs with gender equality plans



Source: HEI and PRO surveys, MoRRI, 2017.

Note: Insufficient number of responses for LU (see Annexes 4 and 5).

The combined results for HEIs and PROs show the consistently strong outcomes on this indicator for gender equality plans (GEPs) across different types of public sector organisations in Sweden, Germany and the United Kingdom. The result for France also appears strong, although only relatively small numbers of organisations responded to the HEI and PRO surveys in France. At the other end of the scale, respondents from the Baltic Member States did not report the use of gender equality plans.

## **Evolution**

A 3-year series only allows for a limited insight into the evolution of this indicator, given that introducing policy and process changes to allow for the establishment and use of GEPs can take significant time. Nevertheless, the results for this indicator are very encouraging in terms of the observable changes. Improving scores on this indicator are observable for 15 Member States and a further 9 Member States report stable results across the 3-year series. There is no evidence of reduction in the indicator in any Member State. Also encouraging is that all the MS that perform well on this indicator continue to improve, as do many of the MS that are in the mid-range in terms of performance. Overall improvement on this indicator in the future may well be driven by the increased use of GEPs in those Member States where they are in use in some organisations, but they have not become widespread, such as in Greece, Hungary, Malta, Portugal, Croatia, Bulgaria, Romania and Slovakia.

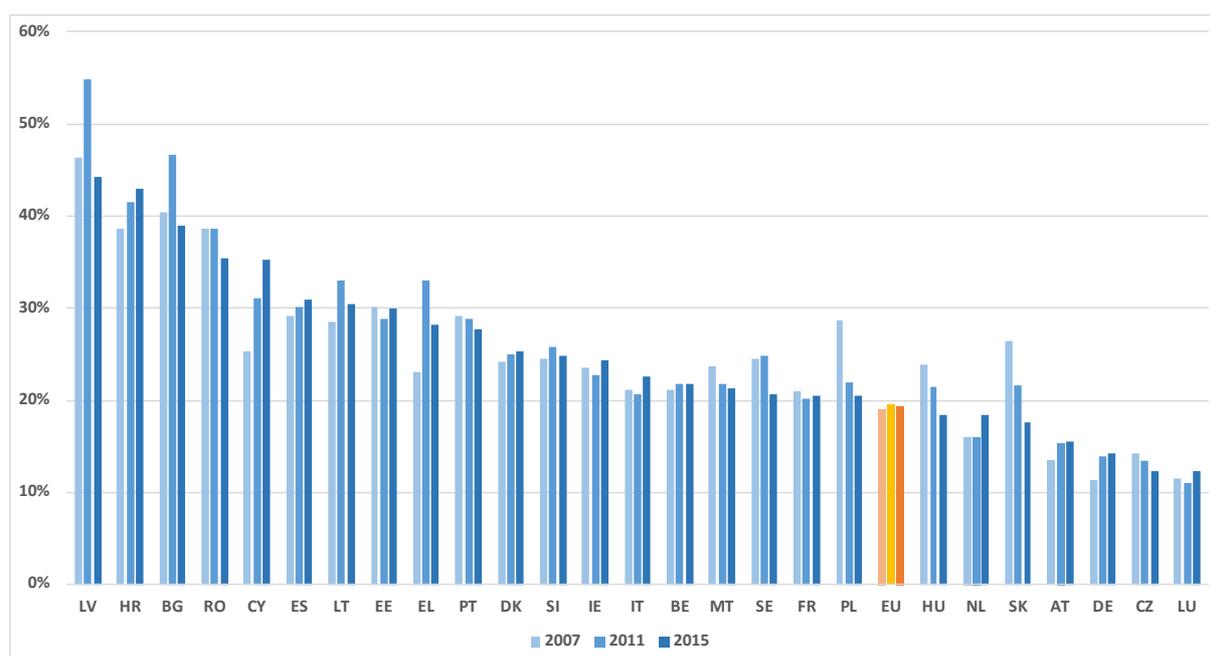
## 2.2 GE2 - Share of female researcher by sector

### The indicator

The share of female researchers by sector is a base calculation of the gender distribution of researchers currently in the labour force. The indicator is available for each of the higher education, government and business sectors at the national level. The availability of sector-specific data will allow for an appreciation of changes in women's participation in research in these various sectors, thus enabling the monitoring of expanding and declining opportunity for women. These data would also be available in both head count and full-time equivalent (FTE) form.<sup>3</sup>

### Outcomes

Figure 7 GE2.2 - Share of female researchers: business enterprise sector (2007, 2011, 2015)



Source: Eurostat.

Note: United Kingdom and Finland missing; EU average based on own calculation (excluding UK and FI); BE, FR: Data of 2015 not available, estimated with closest available year; NL: Data of 2007 not available, estimated with closest available year.

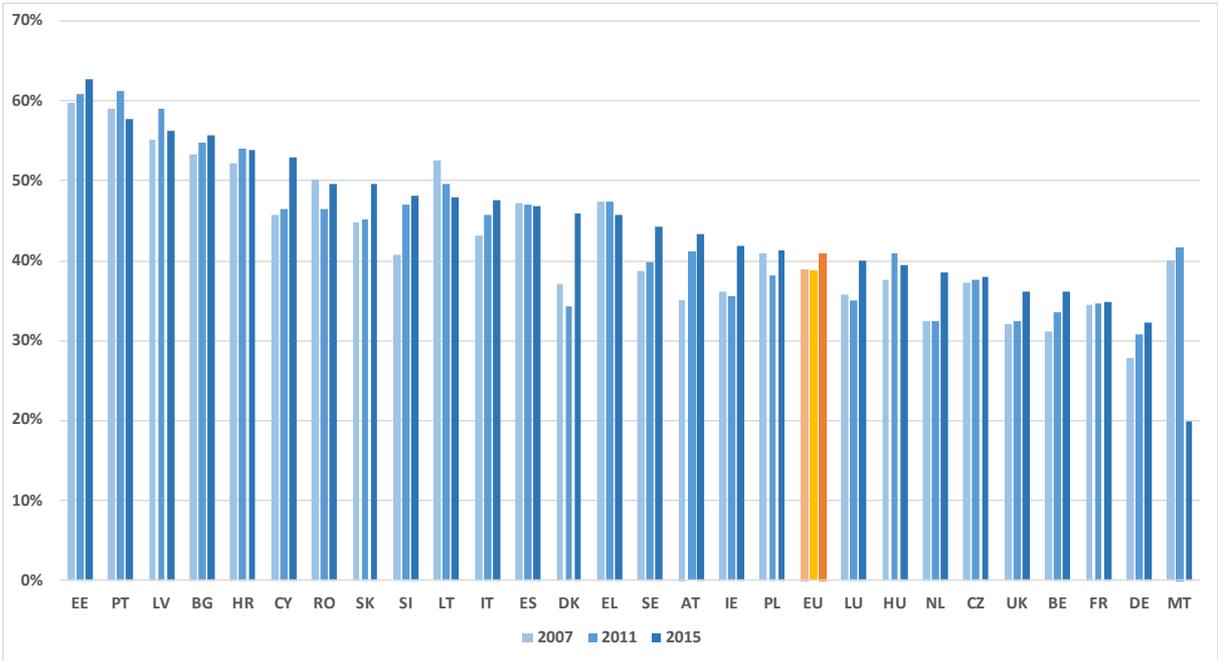
Female researchers are less well represented in the business sector than they are overall (Figure 9). However, a majority of Member States (19) performed better than the EU average for this indicator in 2015 (19.4 %)<sup>4</sup>. A group of MS performed relatively less well on this indicator, including Luxembourg, the Czech Republic, Germany, Austria, Slovakia, the Netherlands and Hungary. By 2015, women made up more than one-third of the researchers in the business sector in a small group of MS, including Latvia, Croatia, Bulgaria, Romania and Cyprus.

<sup>3</sup> In principle, this could in future allow for a comparison of the composition of the research workforce in terms of gender participation rate. This may provide an indication of whether there are differences between men and women in terms of 'underemployment' or in the take-up of part-time or 'flexible' labour market arrangements.

<sup>4</sup> The low EU average can be explained by the low score of countries such as Germany (14.3 %), the Netherlands (18.4 %), France (20.5 %), Sweden (20.7 %) and Italy (22.5 %). These countries combine 71 % of the business sector researches in the EU (excluding the United Kingdom and Finland).

Half of the Member States (13) show an increase in the share of female researchers in the business sector when 2007 and 2015 are compared. In this comparison, relatively large falls in the share of women researchers working in the business sector are also apparent in Poland, Hungary and Slovakia.

Figure 8 GE2.3 - Share of female researchers: government sector (2007, 2011, 2015)



Source: Eurostat.

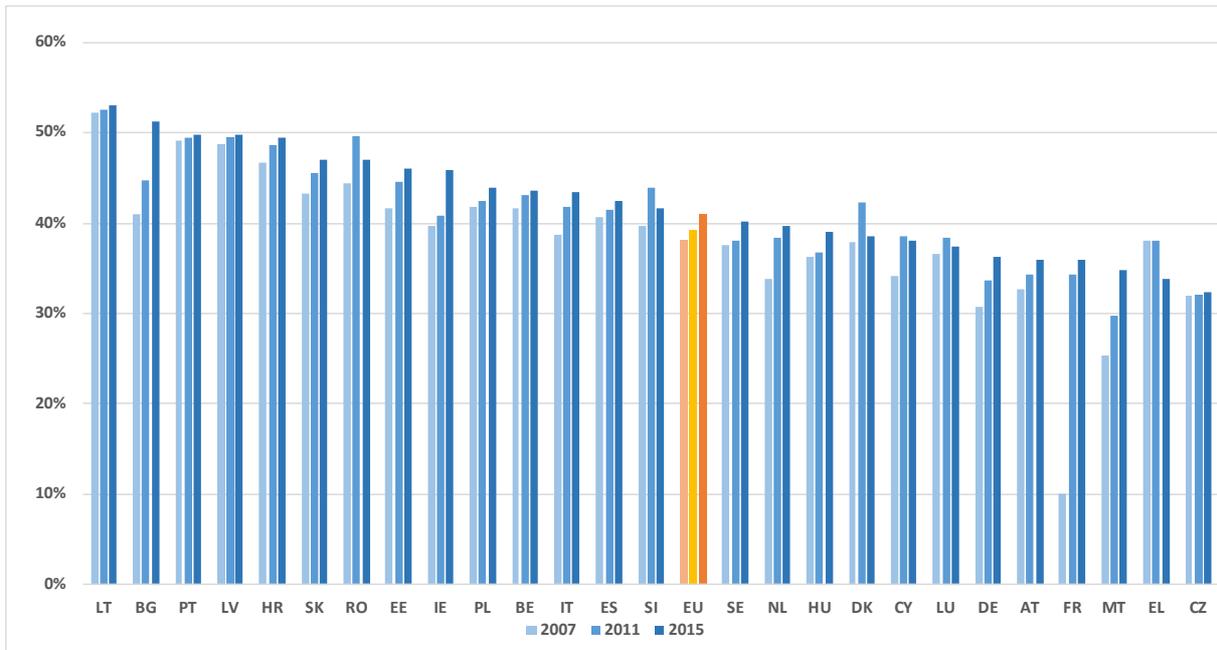
Note: Finland missing; EU average based on own calculations (excluding FI); BE, NL, FR: Data of 2007 not available, estimated with closest available year; FR: Data of 2015 not available, estimated with closest available year.

Women researchers are better represented in the government sector than they are overall (Figure 9). A majority of Member States (18) performed better than the EU average in 2015 (41.0 %). Member States performing relatively less well on the GE2.2 indicator include Malta, Germany, France, Belgium and United Kingdom (33.2 %).

As of 2015, 6 Member States had reached or bettered gender equality in terms of women’s participation in government sector research. These MS include Estonia, Portugal, Latvia, Bulgaria, Croatia and Cyprus. Romania and Slovakia were both very close to reaching parity in gender participation in government sector research.

Encouragingly, a vast majority of Member States (21) show an increase in the share of female researchers in the government sector when 2007 and 2015 are compared

Figure 9 GE2.4 - Share of female researchers: higher education sector (2007, 2011, 2015)

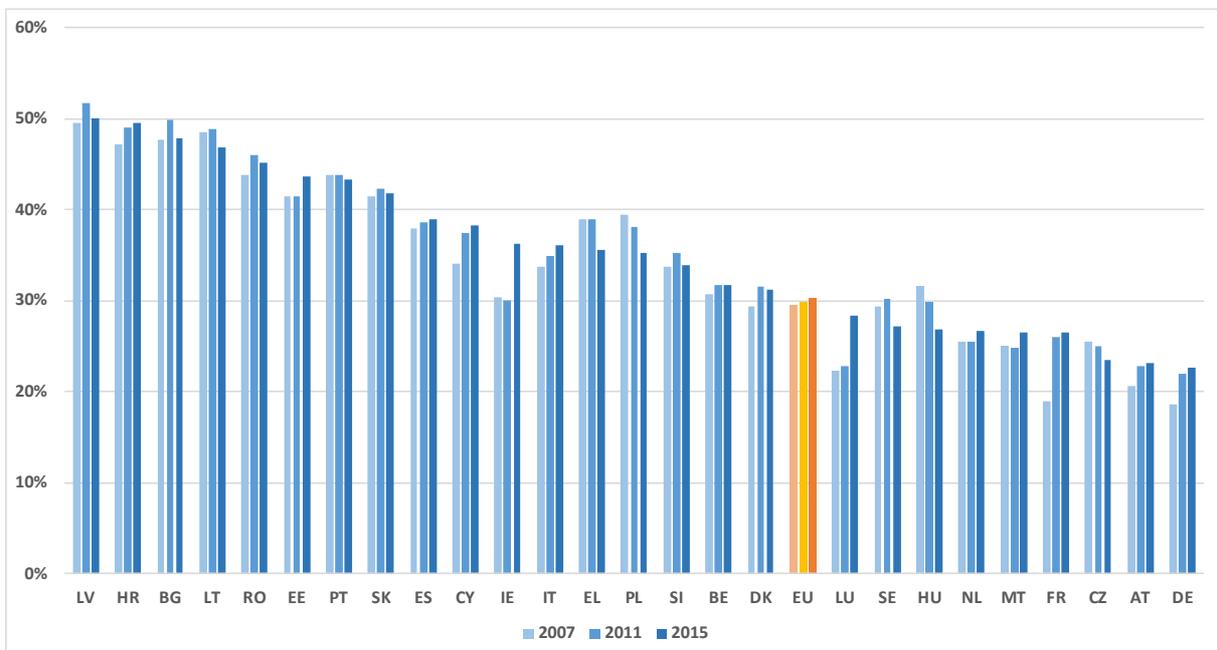


Source: Eurostat.

Note: United Kingdom and Finland missing, EU average based on own calculations (excluding UK and FI); LU, FR, EL: data for 2007 not available, estimated with closest available year; FR: data for 2015 not available, estimated with closest available year.

Female researchers are better represented in the higher education sector than they are overall (Figure 10). A majority of Member States (14) performed better than the EU average for in 2015 (41.0 %). As of 2015, more than half the researchers in the higher education sector were women in both Lithuania and Bulgaria. Encouragingly, most of the MS with the lowest scores on this indicator also showed improvement across the period. In fact, Greece is the only Member State that shows a decrease in the share of female researchers in the higher education sector when 2007 and 2015 are compared.

Figure 10 GE2.1 - Share of female researchers: all sectors (2007, 2011, 2015)



Source: Eurostat.

Note: United Kingdom and Finland missing; EU average based on own calculations (excluding UK and FI); EL, LU, NL, FR: Data

of 2007 not available, estimated with closest available year; BE, FR: Data of 2015 not available, estimated with closest available year.

## Evolution

Overall across all sectors, less than one-third of researchers are women in the EU. However, if we look at the evolution of the indicator, the majority of Member States (17) performed better than the EU average (30.3 %) in terms of share of female researchers by 2015. As of 2015, a group of Member States that was performing relatively less well on this indicator, including Germany, Austria, France, Malta, the Netherlands and Luxembourg, nevertheless showed an improvement when comparing the initial and final years of the indicator. Only Sweden, Hungary and the Czech Republic showed a decline on this indicator among the less well performing Member States. The presence of some of the oldest and most consolidated science and research systems in the group of Member States performing below the EU average suggests that established processes and professional pathways existing in these Member States may remain somewhat resistant to effective change in the area of gender equality. In contrast, a group of Member States, including Latvia, Croatia, Bulgaria and Lithuania, was relatively close to achieving gender equality on this indicator in 2015.

A clear majority of Member States (19) shows an increase in the share of female researchers across all sectors when 2007 and 2015 are compared. This outcome suggests that the positive evolution of this indicator is relatively widespread across Europe.

## 2.3 GE3 - Share of research-funding organisations promoting gender content in research

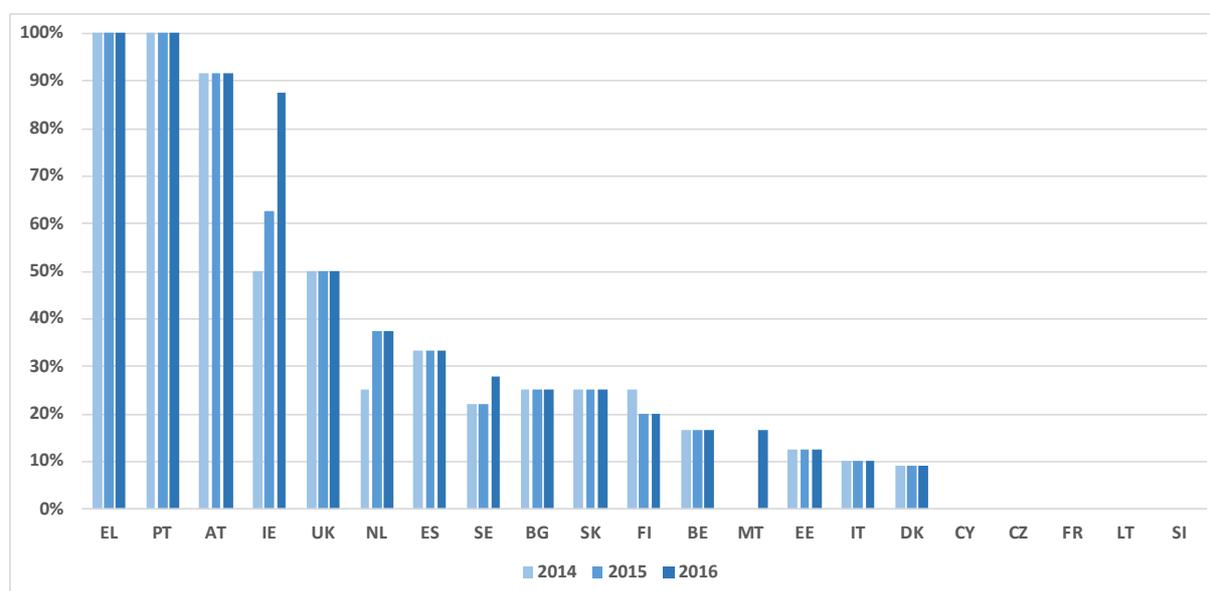
### The indicator

The share of RFOs promoting gender content in research, which is the base calculation of the extent to which RFOs take actions to ensure the integration of the gender dimension in research content. This indicator illustrates the integration of gender as part of research design and the research process. It entails sex and gender analysis being integrating into basic and applied research proposals and/or assessments when allocating research and development funding. Data cover RFOs at the MS level.

The indicator is based on one question of the RFO survey (MoRRI, 2017), namely: 'When allocating research and innovation funding in years 2014, 2015 and 2016, did your organisation include the gender dimension in research content?' Respondents were asked to score 'yes, standard criteria', 'yes, specific criterion', or 'no/not applied'.

### Outcomes

Figure 11 GE3 - Share of funding organisations promoting gender content in research



Source: RFO survey, MoRRI, 2017.

Notes: IE: change in big RFO from 2014 to 2015; FR: the number of responses was very low, however the major RFO of the country did respond; HR, DE, HU, PL: insufficient responses.

In Greece and Portugal, all responding funding agencies reported the gender content in research is promoted for all 3 years surveyed (2014-2016). In the Portuguese case this result is based solely on the response of the largest main public funding agency in the country. In Austria, and in Ireland by the end of the series, almost all RFOs are promoting gender content in research. In the UK, half the surveyed RFOs reported supporting it. Around one-third of funders reported promoting gender content in the Netherlands and Spain. The RFOs' promotion of gender content in research was lower in the remaining Member States, including 5 MS in which no RFO reported supporting it. The number of responding RFOs was insufficient in the cases of 4 further Member States.

### Evolution

Overall, the results suggest that gender content in research is not yet a major priority for the majority of funding agencies. Change to an indicator that may involve significant policy reform is likely to take time, which can explain the limited transformation evident in the

3-year window available. However, the evolution in this indicator during the period has been in a largely positive direction, including in Ireland, the Netherlands and Sweden.

## 2.4 GE4 - Dissimilarity index

### The indicator

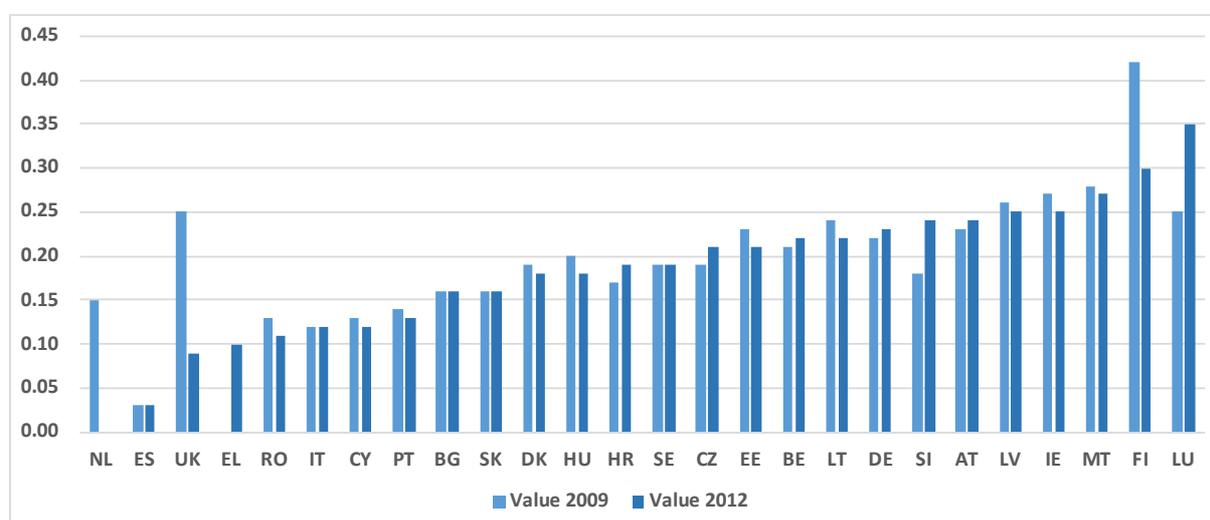
The dissimilarity index comprises information on the degree of horizontal gender segregation within the fields of science. It is calculated by estimating the number of women and men who would have to change the field of science in which they currently work in order to achieve an overall gender-balanced distribution of researchers across all fields. These data are available for the higher education and the government sectors (public sector research) at the national level for the years 2009 and 2012.

Scores on the dissimilarity index (DI) indicator that approach the value of 1 indicate a much higher percentage of researchers who would need to move to achieve gender equality. Thus, the higher the score, the higher the dissimilarity level.

The data is collected through the She-Figures data collection process.

### Outcomes

Figure 12 GE4.1 - Dissimilarity index: higher education sector (2009, 2012)



Source: She Figures, 2012 and 2015.

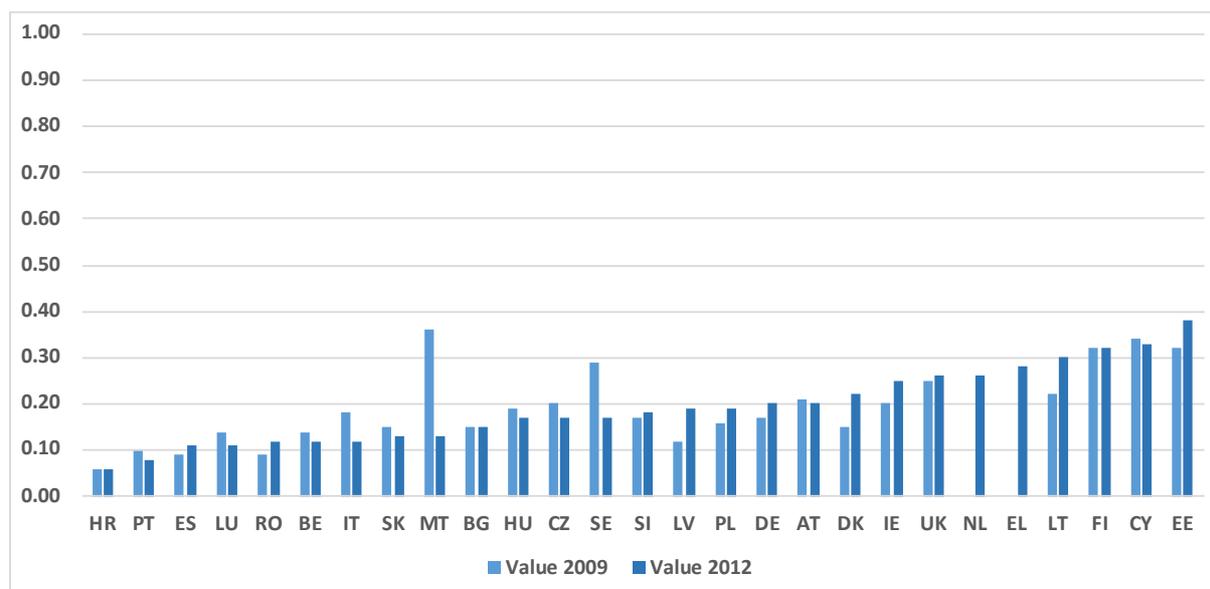
Note: Values 2009: Reference year for PL 2008, UK and FI 2007.

Values 2012: Reference year: 2011: BE, IE, EL, HR, AT, SE; 2010: DK, PL. Data not available for FR.

The dissimilarity index in the higher education sector for 2012 shows that the index is relatively tightly bound between the Netherlands (0.00) and Luxembourg (0.35). As of 2012, the degree of horizontal gender segregation is relatively high in Finland (0.30), Malta (0.27) and Ireland (0.25). The degree of horizontal gender segregation is the lowest in Spain (0.03), followed by the UK (0.09) and Greece (0.10).

Noticeable increases in scores can be seen in Luxembourg and Slovenia on this comparison. Decreases in the scores, indicating a positive change in the degree of horizontal segregation, are most evident in the United Kingdom and Finland, although these changes should also be treated cautiously.

Figure 13 GE4.2 - Dissimilarity index: government sector (2009, 2012)



Source: She Figures, 2012 and 2015.

Note: Values 2009: Reference year for PL 2008, UK and FI 2007. Data unavailable for FR.

Values 2012: Reference year: 2011: BE, IE, EL, HR, AT, SE; 2010: DK, PL. Data unavailable for FR and FI.

The dissimilarity index in the government sector for 2012 shows a similar range to the higher education sector. As of 2012, the degree of horizontal gender segregation was the highest in Estonia (0.38), Cyprus (0.33), Finland (0.32), Lithuania (0.3), Greece (0.28), the Netherlands (0.26), the United Kingdom (0.26) and Ireland (0.25). As of 2012, the degree of horizontal gender segregation was relatively low in Croatia (0.06) and Portugal (0.08). The very substantial changes in the comparison between 2009 and 2012 in the cases of Malta and Sweden should be treated very cautiously.

## Evolution

These two data points provide an initial baseline for monitoring, with better evidence of transformations in the indicator awaiting future results. Values for the dissimilarity index remain largely stable in most cases when 2009 and 2012 are compared, indicating that evolution is likely to be incremental and take time, which will be reflected by the changes in the indicator.

Nevertheless, there are two initial observations that can be highlighted. First, there are sector-specific differences in scores within Member States. There are significant differences in the degree of horizontal segregation between the government and the higher education sectors for many countries. A partial explanation of these patterns may be linked to the differences in age structures of the researchers in the various countries and sectors (She Figures, 2015). In most countries, the share of men in the >55 age group is very high, while women tend to be more strongly represented in the <35 age group. The retirement of older, mainly male, researchers may thus reduce the index down in a number of countries. Where the age structure is different between sectors within a country the dissimilarity index indicator will vary to some extent.

Second, there appears to be more volatility in the indicator for the government sector compared to the higher education sector. This volatility is not consistent in direction, when comparing countries. In several countries, including Portugal, Luxembourg, Belgium, Italy, Malta, Hungary, the Czech Republic and Sweden, a decrease can be seen when comparing the 2 years. In other countries an increase is recorded in Estonia, Lithuania, Ireland, Denmark and Latvia, starting out from a generally higher level. In other countries, changes are relatively marginal.

## 2.5 GE5 - Share of research-performing organisations with policies to promote gender in research content

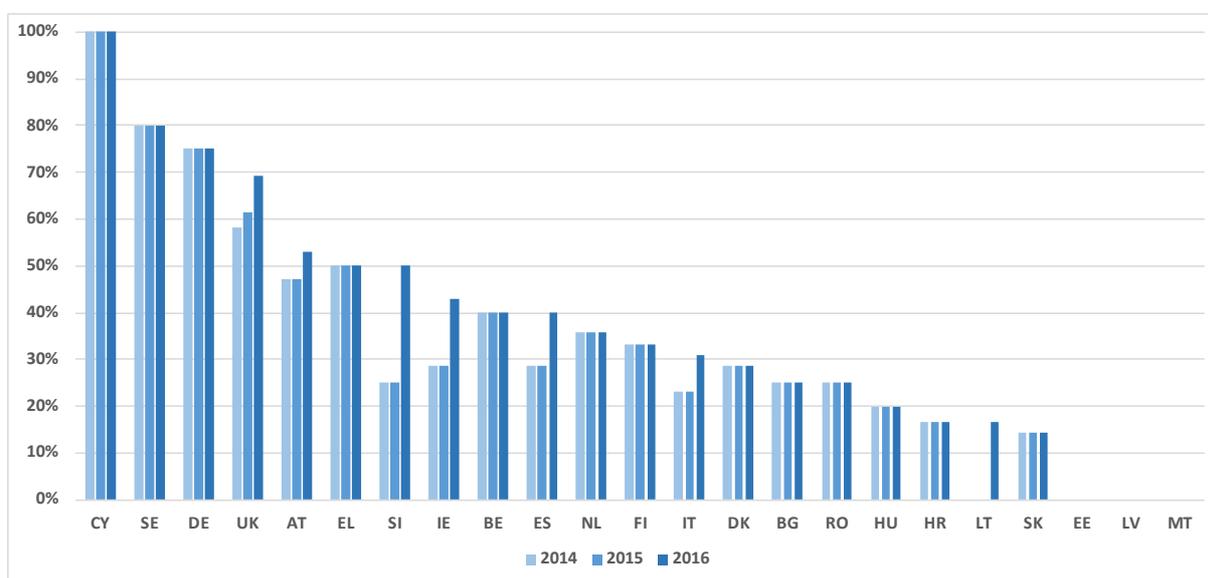
### The indicator

The share of research-performing organisations with policies to promote gender in research content investigate the extent to which they take actions to ensure the integration of the gender dimension in research content. This indicator focuses on the integration of the gender dimension in research programmes and projects.

The indicator is based on one question from the HEI and PRO surveys (MoRRI, 2017), namely: 'Does your organisation have implemented processes to promote the integration of a gender dimension in research and innovation content of projects and studies, for example information and qualification tools or concrete rewards and incentives?' Respondents were asked to choose between 'yes', 'no', 'don't know'.

### Outcomes

Figure 14 Share of higher education institutions with policies to promote gender in research content, 2014-2016

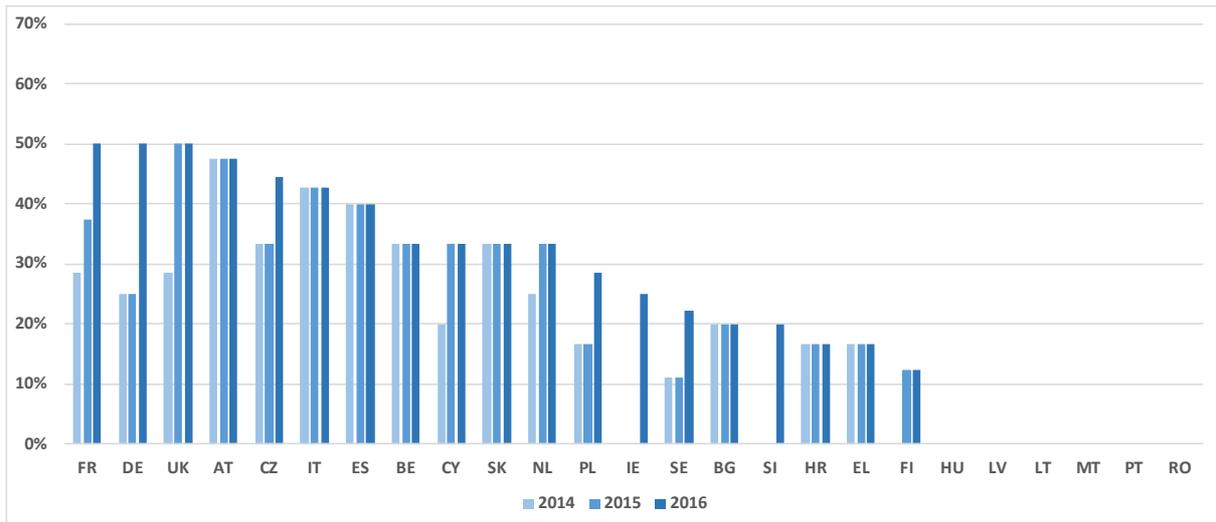


Source: HEI survey, MoRRI, 2017.

Note: Insufficient number of responses for CZ, FR, LU, PL, PT (see Annexes 4 and 5). In the case of FR, half of the few responding HEIs reported having policies to promote gender content in research in 2016. One respondent for CZ reported a policy on gender in research content for 2016. All PL and PT respondents reported no policies for the gender content in research. No respondents for LU.

As of 2016, there were four Member States with a high proportion of responding HEIs that reported having policies to promote gender in research content. These countries are Cyprus, Slovenia, Germany and the United Kingdom. Half of the responding HEIs in Austria, Greece and Slovenia reported having gender content policies. Some volatility is evident in this indicator for a small number of MS, while stable scores across the 3-year period are the norm among countries in the mid and lower-range groups for this indicator.

Figure 15 Share of public research organisations with policies to promote gender in research content, 2014-2016

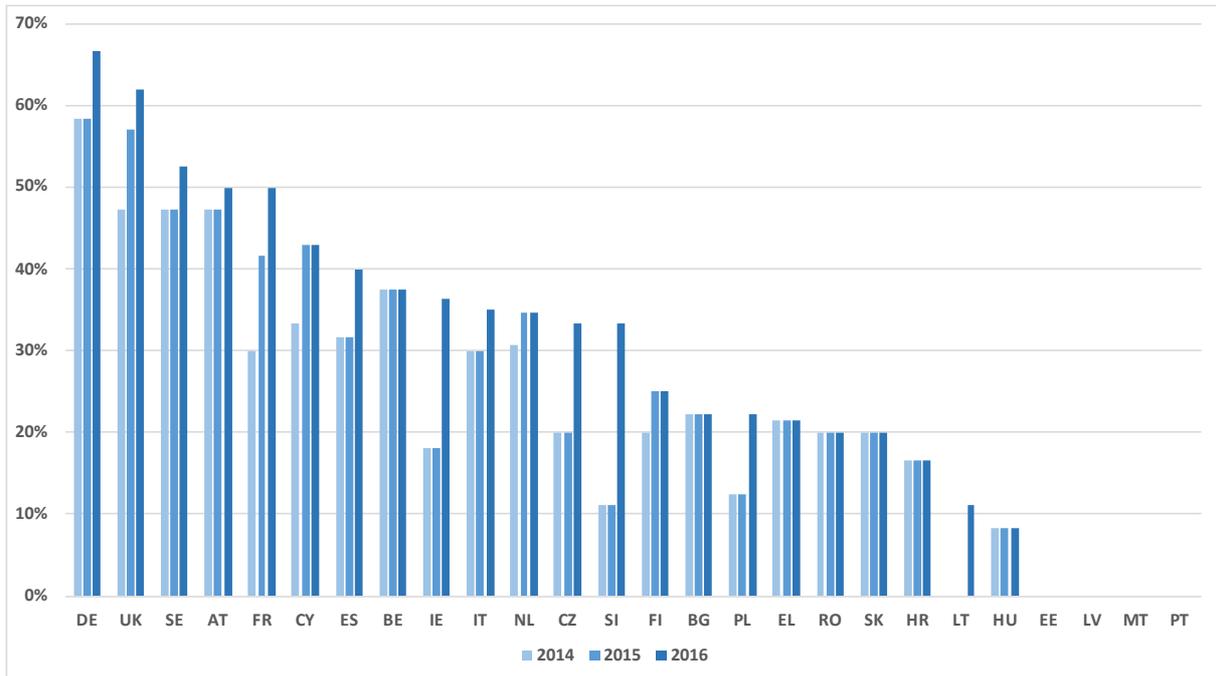


Source: PRO survey, MoRRI, 2017.

Note: Insufficient number of responses for EE, DK, LU (see Annexes 4 and 5).

Overall, a lower rate of respondents in PROs reported having policies to promote gender in research content compared to HEIs. Half of the respondents from France and the United Kingdom reported having such policies. Respondents from a substantial group of Member States, including Denmark, Hungary, Latvia, Lithuania, Malta, Portugal and Romania, reported not having policies to promote gender in research content.

Figure 16 GE5 - Share of HEIs and PROs with policies to promote gender in research content, 2014-2016



Source: HEI and PRO surveys, MoRRI, 2017.

Note: Insufficient number of responses for EE, DK, LU (see Annexes 4 and 5).

## Evolution

Overall, the combined results for HEIs and PROs for this indicator suggest that gender content in research is an emerging priority for public sector research-performing organisations in most Member States. Change in the indicator across the available time series is consistently and quite strongly positive. Only a very small number of Member States' respondents reported not having policies to promote gender in research content. The better performing countries and the mid-level performers all appear to be progressing in a positive direction on this indicator. There are some very large jumps in scores for some MS, notably Ireland and Slovenia, which may be related to data quality issues. Despite such cautions, a widespread positive evolution in the indicator can be observed.

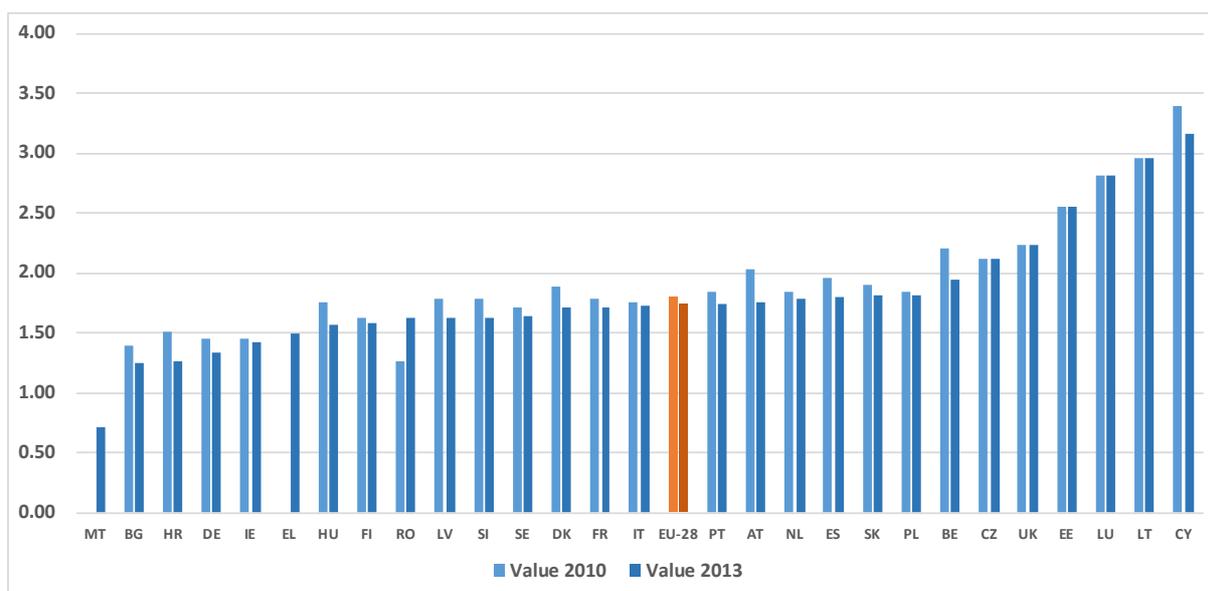
## 2.6 GE6 - Glass ceiling index

### The indicator

The glass ceiling index measures women's chances of reaching the highest academic ranks relative to men's chances. The glass ceiling index (GCI) indicator illustrates the difficulties women have to reach the highest organisational levels within RPOs. The proportion of women at academic levels A, B and C can be compared with the proportion of men at these levels. The share of women at Grade A as a comparison to the share of women in academia overall can be compared with the results for men. These data cover the higher education sector at the national level.

### Outcomes

Figure 17 GE6 - Glass ceiling index (2010, 2013)



Source: She Figures, 2012, 2015.

Note: Exceptions to the reference years: AT: 2006-2011; IE, CY, PT, IS: 2010-2012; BE (FL), NL, FI, SE: 2011-2013; PL, SK: 2012-2013; EL, FR: 2012; HR: 2014; MT: 2015; CZ: 2008; EE: 2004 (She Figures, 2012); UK: 2006 (She Figures, 2012); LT: 2007 (She Figures, 2012); LU: 2009 (She Figures, 2012).

A GCI score of 1 would indicate gender equality, but all countries show scores above this value, for all years, with the exception of Malta in 2013. Women encounter a glass ceiling in virtually all countries in relation to promotion to the top rank of academia.

As of 2013, a minority of Member States (13) performed worse than the EU-28 average for this indicator. Aside from Malta, the relatively best performing countries on the GCI for 2013 (less than 1.5) were Bulgaria (1.25), Croatia (1.26), Germany (1.34), Ireland (1.43) and Greece (1.49). Hungary, Finland and Romania also performed relatively well. A group of six MS bounded by the Czech Republic (2.12) and Cyprus (3.16) record values showing relatively poor performance on the GE6 indicator. This group of countries also includes the United Kingdom, Estonia, Luxembourg and Lithuania.

### Evolution

A majority of Member States (20) show decreases in their GCI scores between 2010 and 2013, signalling a positive effect in terms of decreasing inequality. The average in 2010 of 1.95 decreased to 1.81 in 2013.

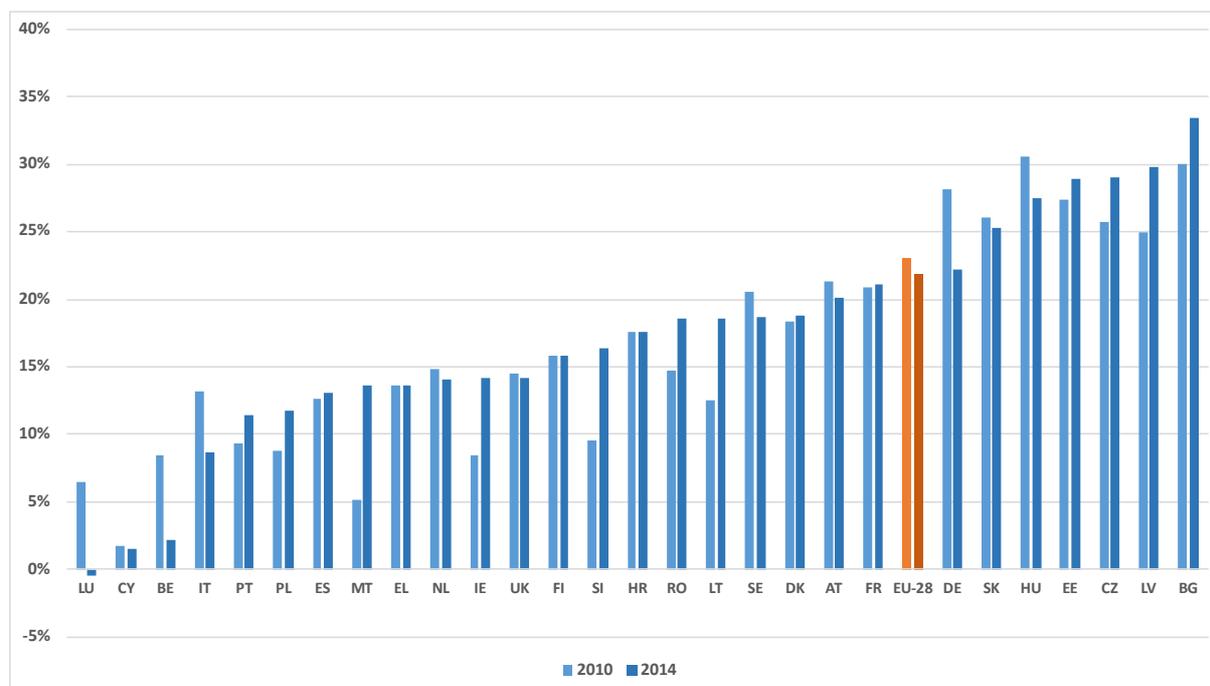
## 2.7 GE7 - Gender wage gap

### The indicator

The gender wage gap indicator measures gender variations with respect to annual and hourly earnings, and is used as a proxy for gender equality in the academic as well as the non-academic research sector. The data is collected via Eurostat.

### Outcomes

Figure 18 GE7.1 - Gender wage gap: academic professions (2010, 2014)

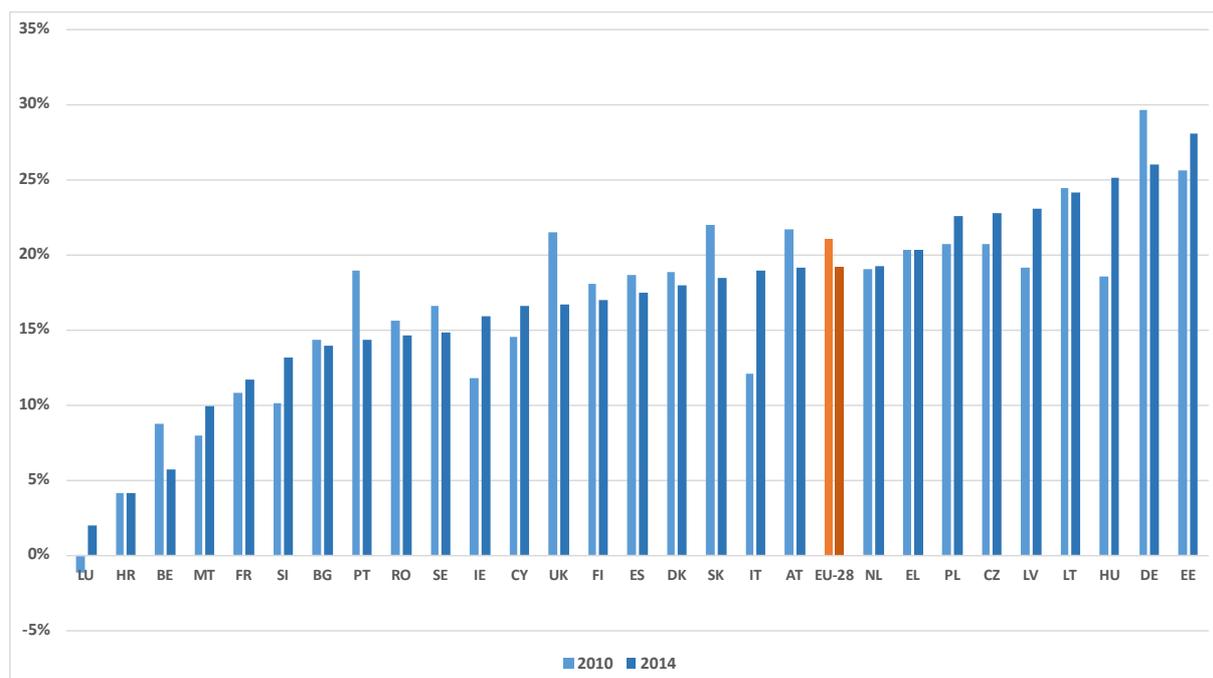


Source: Eurostat.

Note: HR and EL: Values of 2014 estimated with closest available year.

At the EU-28 level, the gender wage gap among academic professionals has decreased slowly, from 23.1 % to 21.8 %, across the period 2010-2014. In a minority of Member States (7) however, the gender wage gap for academics is higher than this average. In Germany, Slovakia, Hungary, Estonia, the Czech Republic, Latvia and Bulgaria, the gap was considerably higher as of 2014. In a large group of MS (13), the indicator suggests the gender wage gap grew over the period. In some MS, the gap increased several percentage points, such as Malta (8.5), Slovenia (6.9), Lithuania (6) and Ireland (5.7). Significant drops can be found in Belgium (-6.3) and Germany (-5.9), and in Luxembourg, the gender wage gap in 2014 dropped below 0 %, indicating a reverse tendency (women in academic professions earn more than men).

Figure 19 GE7.2 - Gender wage gap: technicians and associate professionals (2010, 2014)



Source: Eurostat.

In the group of technicians and associate professionals, the gender wage gap was higher than the average of 21.8 % in 2014 in nine Member States – the largest gap can be found in the Netherlands, Greece, Poland, the Czech Republic, Latvia, Lithuania, Hungary, Germany and Estonia. Only in Sweden is there a consistent trend toward the reduction of the gender wage gap among technicians and associate professionals, although in a number of other MS the gap appears to be relatively stable across the data points available for this indicator.

### Evolution

At the EU-28 level, the gender wage gap among technicians and associate professionals has decreased slowly, from 21.1 % to 19.2 %, across the period 2010-2014. The overall gender wage gap is very similar to that found in the academic workforce, where the average decreased from 23.1 % to 21.8 %

## 2.8 GE8 - Share of female heads of research-performing organisations

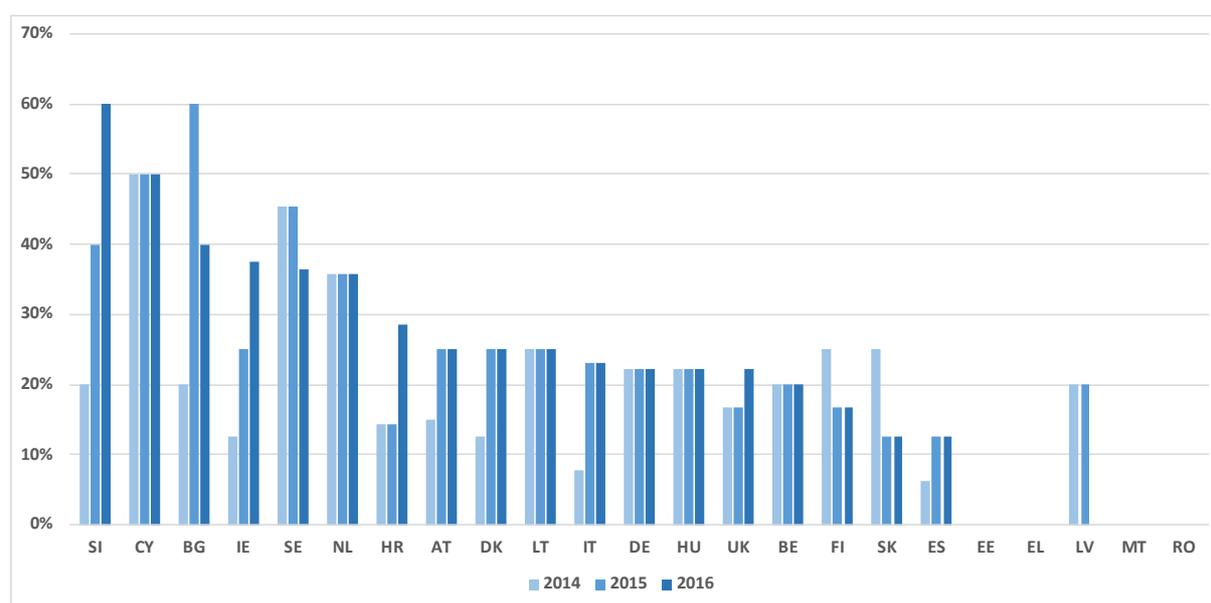
### The indicator

The share of female heads of research-performing organisations captures the share of those headed by women. It can be interpreted as an indicator of gender balance in decision-making and, therefore, the structural setting for gender equality. The following only provides information at the higher education level.

The indicator is calculated from one question of the HEI and PRO surveys (MoRRI, 2017), namely: 'Please specify the gender of the person who was/is head of your organisation in 2014, 2015 and 2016 (Head of organisation: highest decision-making official in the organisation, e.g. rector or equivalent in the academy, president or equivalent in non-academic research organisations).'

### Outcomes

Figure 20 Share of female heads of higher education institutions, 2014-2016



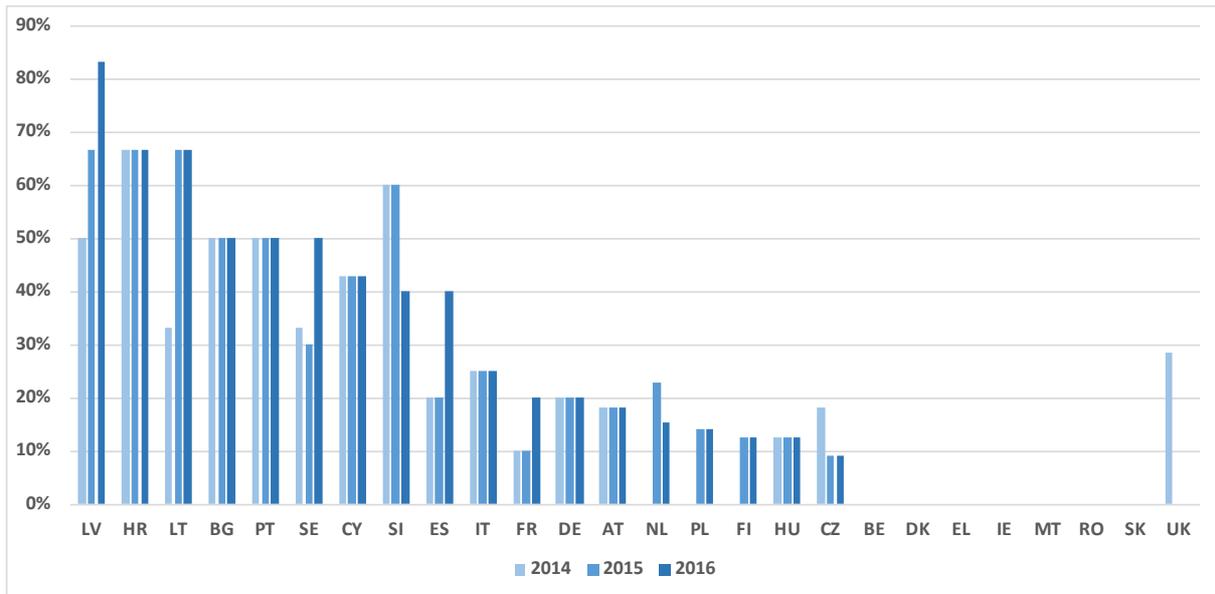
Source: HEI Survey, MoRRI, 2017.

Note: Insufficient responses for CZ, FR, LU, PL and PT. Trend should be assessed with caution; this indicator should be observed for a longer period of time. In countries with a low response rate, a change in the response can translate to significant changes in the country score, which does not translate the real magnitude of the change at country level.

The share of female heads reaches 50 % in just 2 Member States, Slovenia and Cyprus, in 2016. Other relatively well performing countries on this indicator include Bulgaria, Ireland, Sweden and the Netherlands. Respondents from many Member States report that between one-fifth and one-quarter of heads of higher education institutions are female.

Relatively low levels on this indicator are apparent for a group of countries including Latvia, Spain, Slovakia and Finland. For several countries, no female heads of a higher education institution were reported in any years of the series, including Estonia, Greece, Malta and Romania.

Figure 21 Share of female heads of public research organisations, 2014-2016

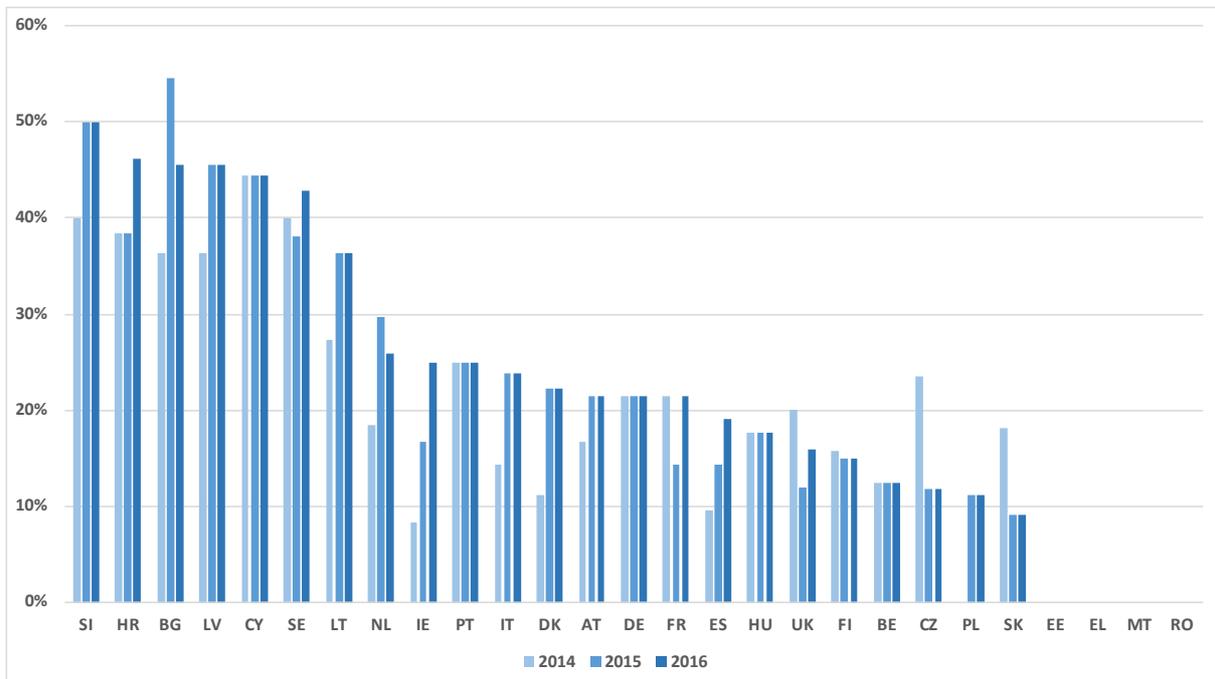


Source: PRO Survey, MoRRI, 2017.

Note: Insufficient responses for EE, DK and LU. Trend should be assessed with caution; this indicator should be observed for a longer period of time. In countries with a low response rate, a change in the response can translate to significant changes in the country score, which does not translate the real magnitude of the change at country level.

The share of female heads in PROs is 50 % or above in a substantial number of Member States as of 2016, including Latvia, Croatia, Lithuania, Bulgaria, Portugal and Sweden. Cyprus and Slovenia also perform well on this indicator. Relatively low rates of female heads of PROs were reported in France, Austria, Netherlands, Poland, Finland, Hungary and Czech Republic. Respondents from another large group of countries report no female heads of PROs for any years in the series.

Figure 22 GE8 - Share of female heads of HEIs and PROs, 2014-2016



Source: HEI and PRO Surveys, MoRRI, 2017.

Note: Insufficient response for LU. Trend should be assessed with caution; this indicator should be observed for a longer period of time. In countries with a low response rate, a change in the response can translate to significant changes in the country score, which does not translate the real magnitude of the change at country level.

## Evolution

The share of female heads of public sector research organisations (HEIs & PROs) is relatively low. A group of 7 Member States has made more progress on this indicator: Slovenia, Croatia, Bulgaria, Latvia, Cyprus, Sweden and Lithuania. Respondents from 4 Member States failed to report a single female head of a higher education institution or a PRO. Encouragingly, however, a positive evolution in this indicator is evident in most Member States. Nevertheless, considerable transformation with regards to this indicator is required to approach a situation of relative gender equality.

## 2.9 GE9 - Share of gender-balanced recruitment committees at research-performing organisations

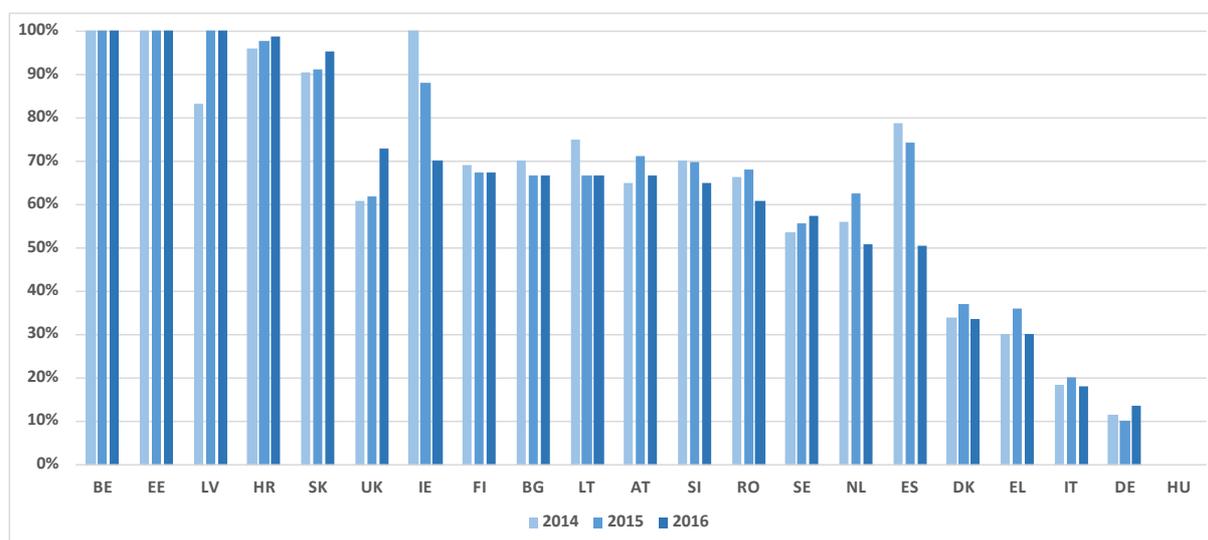
### The indicator

This indicator monitors female participation in decision-making. The indicator captures the share of recruitment committees for internationally recognised researchers that are gender balanced, which can be interpreted as an indicator of the gender balance of the decision-making process. Data cover RPOs at the country level.

This composite indicator is built from two questions of the HEI and PRO surveys (MoRRI, 2017), namely: 'How many recruitment committees for leading researcher positions did your organisation set up in 2014, 2015 and 2016 for the recruitment of researchers?' and 'How many recruitment committees for leading researcher positions in the share of female members was equal or higher than 40 % of the total committee members?' The data were normalised and transformed to an index.

### Outcomes

Figure 23 Share of gender-balanced recruitment committees at higher education institutions, 2014-2016



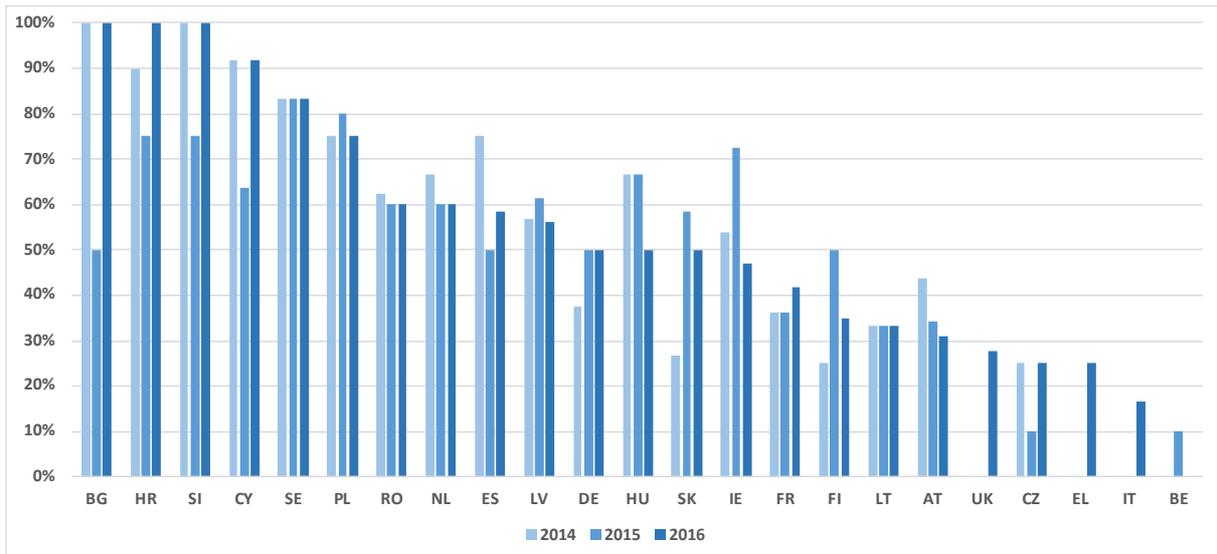
Source: HEI Survey, MoRRI, 2017.

Note: Insufficient responses for CY, CZ, FR, LU, MT, PL and PT.

As of 2016, two Member States, Belgium and Estonia, reported results at the same level for all 3 years surveyed, whilst Latvia did so for 2015 and 2016. Croatia and Slovakia were also performing particularly well on this indicator. Italy, Germany and Hungary were the least well-performed MS across all 3 years.

A large group of Member States' HEI respondents reported that between 50 % and 70 % of their recruitment committees were gender balanced.

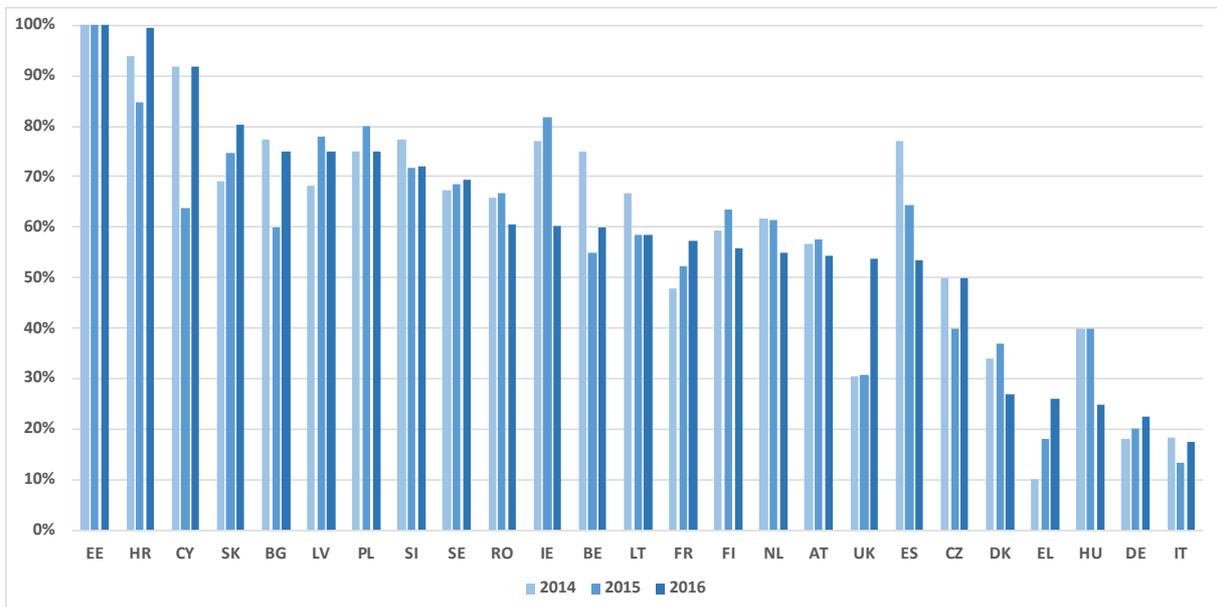
Figure 24 Share of gender-balanced recruitment committees at public research organisation, 2014-2016



Source: PRO Survey, MoRRI, 2017.  
 Note: Insufficient responses for EE, DE, LU and MT.

The reported results for gender-balanced recruitment committees in PROs vary considerably across the years for several Member States. These results likely reflect a rather small number of responses in some cases. Overall, the results for PROs appear slightly lower in comparison to HEIs, and some MS results are very different – with the most extreme example of this being Belgium. Croatia, on the other hand, is a leader on this indicator for both HEIs and PROs.

Figure 25 GE9 - Share of gender-balanced recruitment committees at HEIs and PROs, 2014-2016



Source: HEI and PRO Surveys, MoRRI, 2017.  
 Note: Insufficient responses for LU, MT and PT.

### Evolution

The overall indicator for gender-balanced recruitment still reflects some of the volatility from the small numbers of RPO responses. The best-performed Member State on this indicator is Croatia. (Insufficient responses were received for Estonia for PROs; Figure 21

gives a reflection of HEIs for Estonia.) This volatility makes interpreting the evolution of this indicator largely premature until further data points can be collected.

## 2.10 GE10 - Share of female inventors and authors

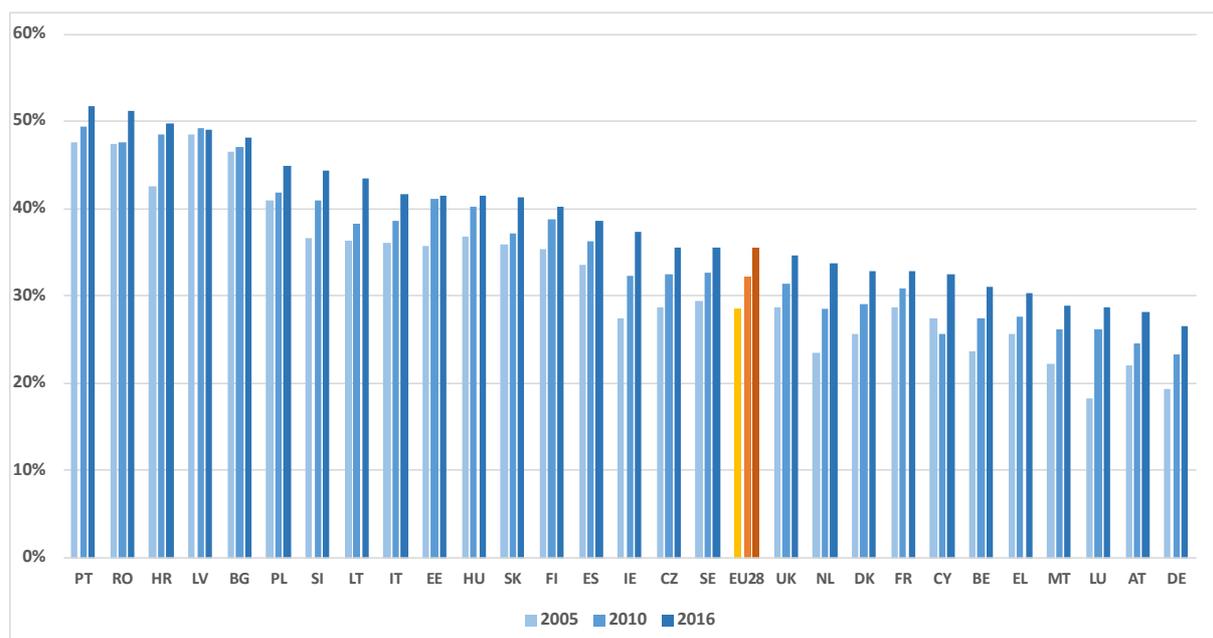
### The indicator

The share of female inventors and authors illuminates developments in women's representation across fields and sectors over time, on the basis of bibliometric data and patent counts. It captures the share of female authors for scientific publications by scientific discipline, and the share of female inventors for patents by sector of activity.

The indicators are based on own calculations within the MoRRI consortium using Scopus for the publications and Patstat for the number of patents.

### Outcomes

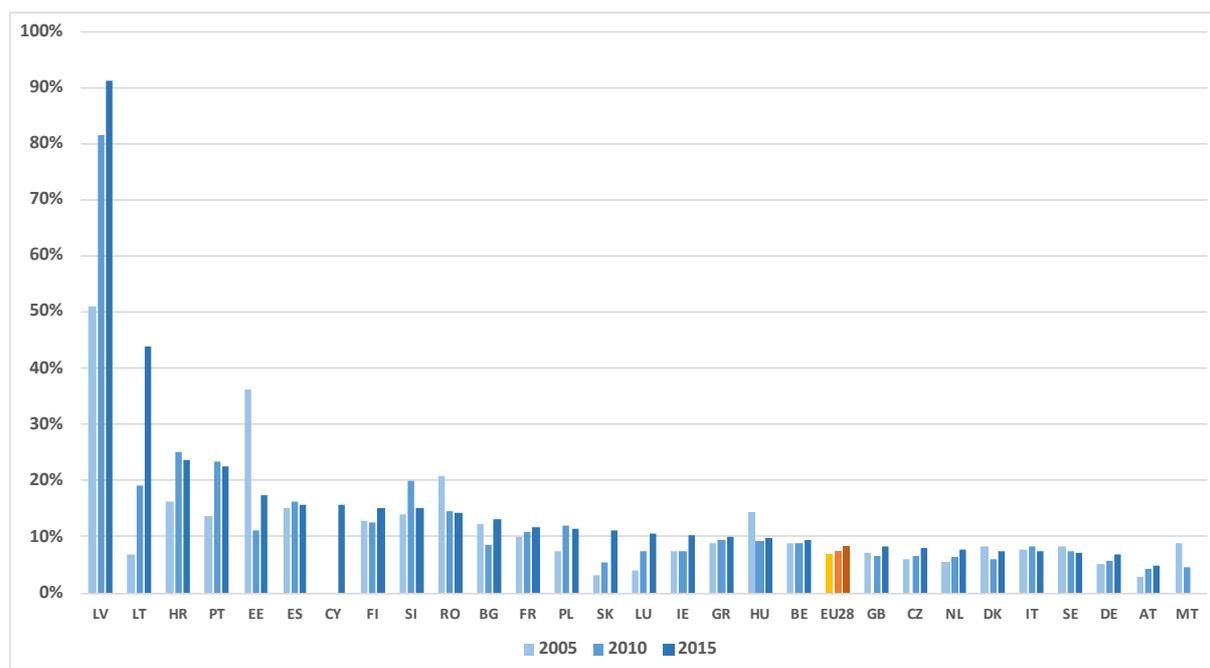
Figure 26 GE10.1 - Share of female authors (2005, 2010, 2016)



Source: Scopus. Calculations: Fraunhofer ISI (see data tables in Annex 7).

At the EU-28 level, the share of scientific publications that include a female author has expanded from 28.6 % in 2005 to 35.5 % in 2016, with the majority of Member States (17) performing better than the EU-28 average as of 2016. In that year, in particular, Portugal and Romania had reached gender parity on this indicator and Croatia, Latvia and Bulgaria were close. Germany, Austria, Luxembourg and Malta were the MS with the weakest outcomes for this measure.

Figure 27 GE10.2 - Share of female inventors (2005, 2010, 2015)



Source: Patstat. Calculations: Fraunhofer ISI (see data tables in Annex 7).

The share of patents that include a female inventor has expanded at the level of the EU-28 from 7.0 % in 2005 to 8.3 % in 2015, with the majority of Member States (19) performing better than the EU-28 average as of 2016. The results for Lithuania, Latvia, Croatia, Estonia, Cyprus, Romania, Bulgaria, Slovakia and Luxembourg are based on total numbers of patents of between 1 and 9 per year. The results for these Member States can thus change substantially with the inclusion or exclusion of just a single patent with a female inventor. Among countries generating more substantial numbers of patents, Portugal, Spain and Finland have the strongest representation of women on this indicator as of 2016.

Overall, the share of patents with a female inventor is much lower than the share of publications including female authors.

## Evolution

A positive change in the female authorship of scientific publications is clearly evident across all Member States, with all MS improving their performance on this indicator in every year of the series. Many of the countries that were relative underperformers grew the share of publications with women authors substantially. The change in this indicator is directly linked to the increased share of women working in the higher education sector in all MS (see Figure 9).

Evidence regarding female inventors at the level of Member States is more mixed. Encouragingly, an increasing number of female inventors is evident among the MS that produce the largest numbers of patents. For example, the proportion of patents with female inventors in Germany increased from 5.1 % in 2005 to 6.7 % in 2015, in France from 9.9 % in 2005 to 11.6 % in 2015, and in the United Kingdom from 7.3 % in 2005 to 8.2 % in 2015. This suggests that, overall, the evolution of this indicator is in a positive direction in that there are more female inventors in the EU-28 in 2015 than was the case in 2005.

### 3 Science literacy and science education

Science literacy and science education (SLSE) is defined as being generated through activities that aim to provide citizens with a deeper understanding of science, to shape their attitudes towards science and to develop their abilities to contribute to science and science-related policymaking. The definition includes three aspects of SLSE, which are based on the main mechanisms through which the SLSE abilities are built: science education, science communication and the co-production of knowledge.

Number	Name of indicator	Note
SLSE1	Importance of societal aspects of science in science curricula for 15 to 18-year-old students	Conducted via desk research and interviews by the pool of country correspondents. Year of reference 2016.
SLSE2	RRI-related training at higher education institutions	HEI survey
SLSE3	Science communication culture	Remained unchanged from 2015 report
SLSE4	Citizen science activities in research-performing organisations	Available for 2015, 2016. Data sources: ECSA, Scopus.
- SLSE4.1	Organisational memberships in ECSA	Source: ECSA
- SLSE4.2	Citizen science publications	Source: Scopus

# Science literacy and science education

## Main observations



### Training in RRI

- Training in the RRI dimensions can be found in almost all of the Member States' higher education institutions.
- Very limited are only Malta and Greece.
- Slovenia and Croatia offer many training opportunities.



### Science communication culture

- An East-West divide was stated in terms of science communication culture.
- Among old Member States, Ireland, Luxembourg, Austria and Greece were labeled fragile.

### Critical science in curricula



- No EU Member State covers societal aspects and the various impact areas of critical sciences in their curricula substantially.
- It is not covered officially in Austria, Italy, Luxembourg, the Netherlands and Romania.

### Citizen science



- Citizen science activities at higher education institutions are gaining in importance in many Member States but the level of activity is still rather low.
- Leading countries are the Netherlands, Ireland, the UK, and Denmark.
- Less developed countries are France, Hungary, and Poland.

### 3.1 SLSE1 - Importance of societal aspects of science in science curricula for 15 to 18-year-old students

#### The indicator

SLSE1 looks at controversial science topics and their coverage in the curricula of 15 to 18-year-old students. The data were collected through a network of 28 country correspondents (one per EU country) and the reference year was 2016.

The following questions were asked: 'Does the curriculum address the controversial character of either one of the two topics GMO and nuclear energy?' This was further broken down to ask for societal, environmental and ethical aspects. Another question was asked on the degree of coverage (substantially/ superficially/ not at all). The information was brought together in this index indicator.

#### Outcomes

Figure 28 SLSE1 - Importance of societal aspects of science in science curricula for 15 to 18-year-old students



Source: Desk research and interviews conducted in 2016 by MoRRI country correspondents (28 correspondents, one per EU country). See Annex 2 for more information about the collection method.  
Key: Green: The lighter the green, the more the aspect is covered; darker green (medium-low coverage); red (no coverage).  
Note: No data for DE.

No EU Member State covers societal aspects and the various impact areas of both critical sciences in their curricula substantially. From a range of between 0 and 1, there are 11

countries that score the mean: Croatia, Denmark, Finland, Latvia, Lithuania, Malta, Poland, Portugal, Slovakia, Spain, and Sweden.

Austria, Italy, Luxembourg, the Netherlands and Romania do not cover these items officially in their curricula.

### 3.2 SLSE2 - RRI-related training at higher education institutions

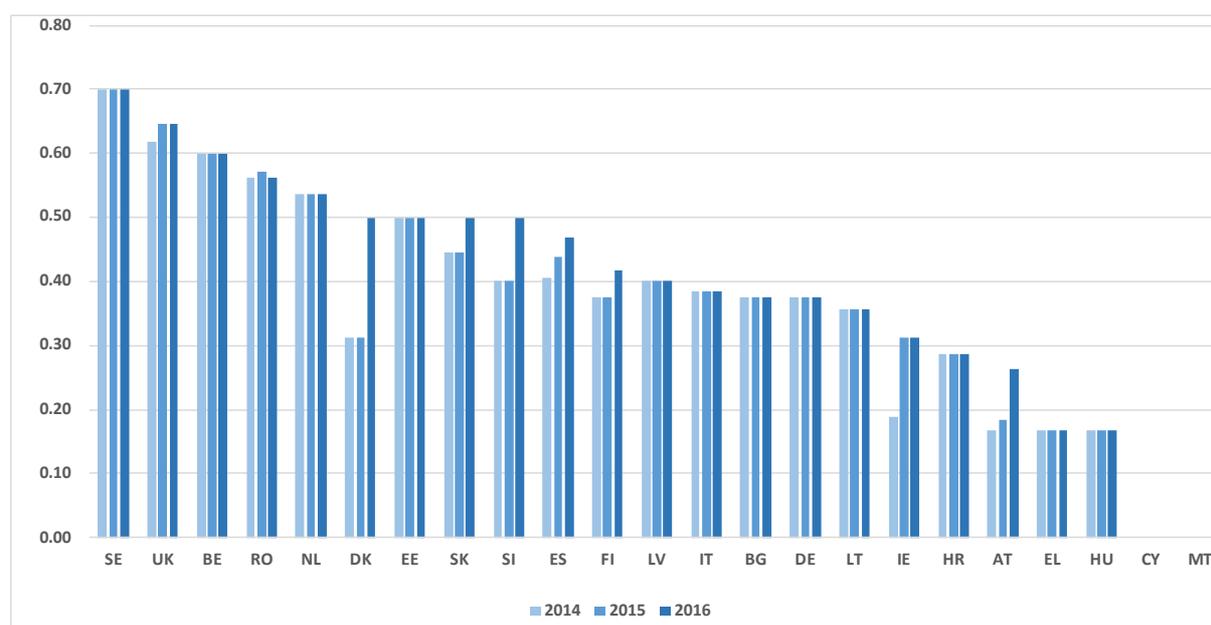
#### The indicator

SLSE2 provides information on the extent that RRI-related aspects, such as ethical, economic, environmental, legal and social aspects (EEELSA), are part of the education of young researchers.

The information for this indicator comes from the survey of higher education institutions (MoRRI, 2017) and is based on the question: 'Did PhD students' training include RRI-related aspects (such as ethical, economic, environmental, legal and social aspects)?' Answer categories were yes, mandatory; yes, voluntary; and no/not applicable.

#### Outcomes

Figure 29 SLSE2 - RRI-related training at higher education institutions



Source: HEI Survey, MoRRI, 2017.

Note: Insufficient responses for CZ, FR, LU, PL and PT.

In 2016, half of the respondents in 9 Member States reported that RRI retraining was available in their HEI. Leading performers on this indicator are Sweden, the United Kingdom, Belgium, Romania and the Netherlands. The majority of MS (16) reported that RRI-related training was available in at least one-third of HEIs. However, less than 1 in 5 HEIs reported RRI-related training in Greece and Hungary, while no RRI-related training was reported in Cyprus or Malta.

#### Evolution

The development of RRI-related training is progressing in a positive direction according to this indicator. Several mid-ranked countries, including Denmark, Slovakia, Slovenia, Spain and Finland, reported that the availability of RRI-related training had increased in the course of the available 3-year time period. Improvements in this indicator were also evident in Ireland and Austria. Introducing RRI-related training in HEIs thus appears to be evolving in a positive direction in many parts of Europe, whilst levels of availability were maintained elsewhere.

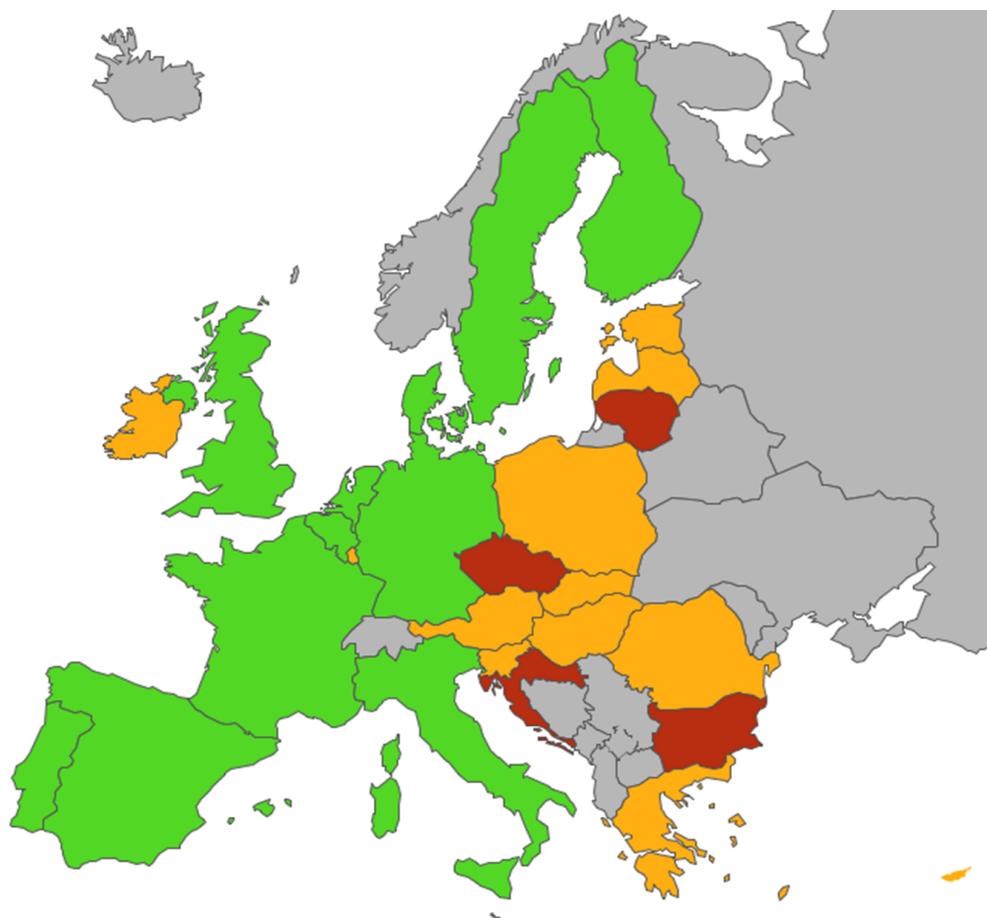
### 3.3 SLSE3 - Science communication culture

#### The indicator

Science communication culture uses secondary data from the MASIS project to monitor national science communication cultures (2012). The data were collected via a network of country experts. Countries were placed in one of three categories: consolidated science communication culture, developing science communication culture, and fragile science communication culture. The categorisation was based on 6 parameters that capture the central elements of science communication cultures: the national science communication infrastructure; political attention to science communication; the number and diversity of actors involved in science communication; academic traditions for dissemination of scientific results; attitudes towards science and the acquisition of knowledge in the public; and the science journalism situation in the country in question.

#### Outcomes

Figure 30 SLSE3 - Science communication culture



Source: MASIS, 2012.

Key: Green: consolidated science communication culture; red: fragile science communication culture; orange: intermediate category indicating a developing science communication culture.

This graphic indicates a rather East-West divide. Almost all of the old EU Member States with the exception of Ireland, Austria and Greece have a consolidated science communication culture, while 9 new MS are developing one and 4 have a fragile one in place.

### 3.4 SLSE4 - Citizen science activities in research-performing organisations

#### The indicator

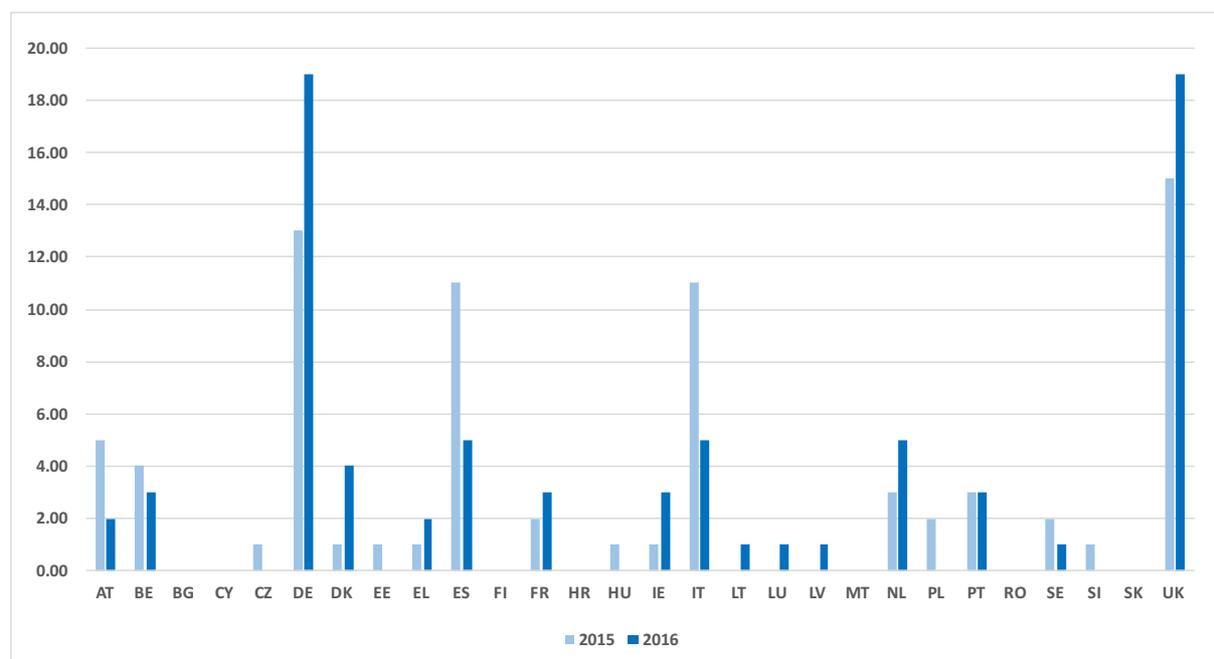
SLSE4 captures whether research-performing organisations are engaged in citizen science in projects or via scientific publications on the subject. Since the indicator basis concerns rather small numbers, the indicator is presented in absolute numbers for the two aspects, namely:

- the number of member organisations in the European Citizen Science Association (ECSA);
- the number of scientific publications concerning 'citizen science'.

Given the low numbers and the fact that there are only 2 years available, it seems premature to discuss an evolution.

#### Outcomes

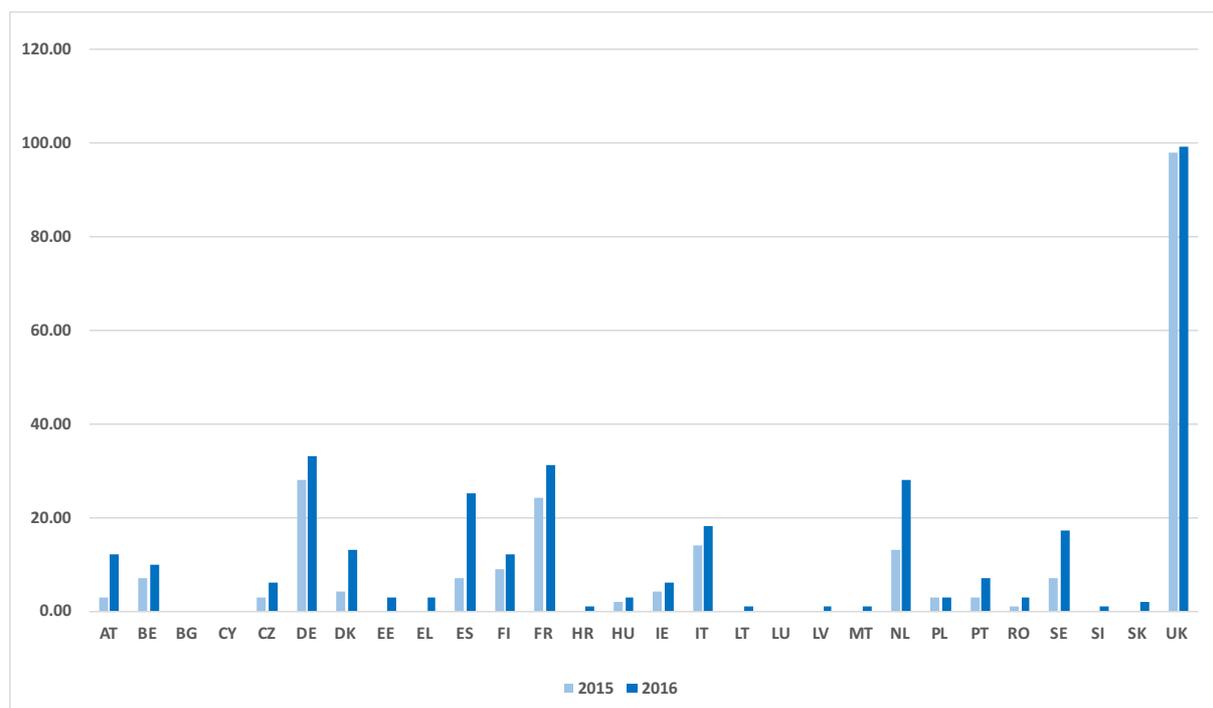
Figure 31 SLSE4.1 - Organisational membership in ECSA, 2015-2016



Source: ECSA, annual reports,

According to the annual reporting data of ECSA, an umbrella organisation based in Germany, the majority of its organisational members are located in the United Kingdom and Germany (both listing 19 in 2016), followed by the Netherlands, Italy and Spain. In 2106, 12 Member States were not represented in this umbrella organisation; several others had 1 or 2 members.

Figure 32 SLSE4.2 - Citizen science publications, 2015-2016



Source: Scopus, calculations: Technopolis Group.

In terms of citizen science publications (Figure 32), one can observe a lead by the United Kingdom with almost 100 publications in 2015 and in 2016, while the other large publishing countries of Germany, France the Netherlands Spain and Italy follow. In many small and eastern MS, the publication numbers are insignificant or zero.

The outcome of this indicator suggests that citizen science activities are currently in an emergent phase of development across Member States. Underlying developments seem positive, with more scientific publications being produced that deal with the topic and a growing number of organisations that are organised in a relevant citizen science association.

## 4 Public engagement

Public engagement (PE) is defined through activities where there is a distinct role for citizens and/or societal actors in research and innovation processes. A defining characteristic is the complexity of objectives for PE and the variation in mechanisms for engagement.

The following indicators are included:

Number	Name of indicator	Note
PE1	Models of public involvement in science and technology (S&T) decision-making	MASIS
PE2	Policy-oriented engagement with science	Eurobarometer
PE3	Citizen preferences for active participation in S&T decision-making	Eurobarometer
PE4	Active information search about controversial technologies	Eurobarometer
PE5	Public engagement performance mechanisms at the level of research-performing organisations	Data available for 2014, 2015, 2016. Composite index based on HEI and PRO surveys of MoRRI consortium, 2017.
PE7	Embedment of public engagement activities in the funding structure of key public research-funding agencies	Data available for 2014, 2015, 2016. Composite index based on RFO survey of MoRRI consortium, 2017.
PE8	Public engagement elements as evaluative criteria in research proposal evaluations	Data available for 2014, 2015, 2016. Composite index based on RFO survey of MoRRI consortium, 2017.
PE9	Research and innovation democratisation index	SiS survey.
PE10	National infrastructure for involvement of citizens and societal actors in research and innovation	SiS survey.

# Public engagement

## Main observations



### Funding structures

- Funding organisations in Spain and Portugal target public engagement to a large extent.
- In Sweden, Latvia, Malta and Greece public engagement is targeted to a much lesser extent.
- Ireland saw considerable change in the past three years.



### Democratisation

- Citizens are involved in research and innovation processes to a high extent in Finland and Sweden and to a low extent in Poland and Spain.
- Most countries experienced a positive change in recent years with the exception of Hungary and Poland.

### Higher education



- Most institutions interact with citizens using various channels.
- A high variety can be seen in Latvia, Lithuania, Portugal, and Poland while Malta uses only a limited number.
- Lots of changes in the past three years can be seen in several countries such as Croatia, France, Italy, Austria, Spain, Belgium and the UK.

### Evaluation criteria



- Public engagement is not an evaluation element in about nine EU Member States.
- In some countries such as Malta, Portugal, Spain or Estonia, a few funders take it into account.

### Infrastructures



- The organisational landscape enabling engagement of citizens is well developed in Ireland, Denmark, Finland, and Belgium but much less so in France, Poland, Italy, Spain and Romania.

#### 4.1 PE1 - Models of public involvement in S&T decision-making

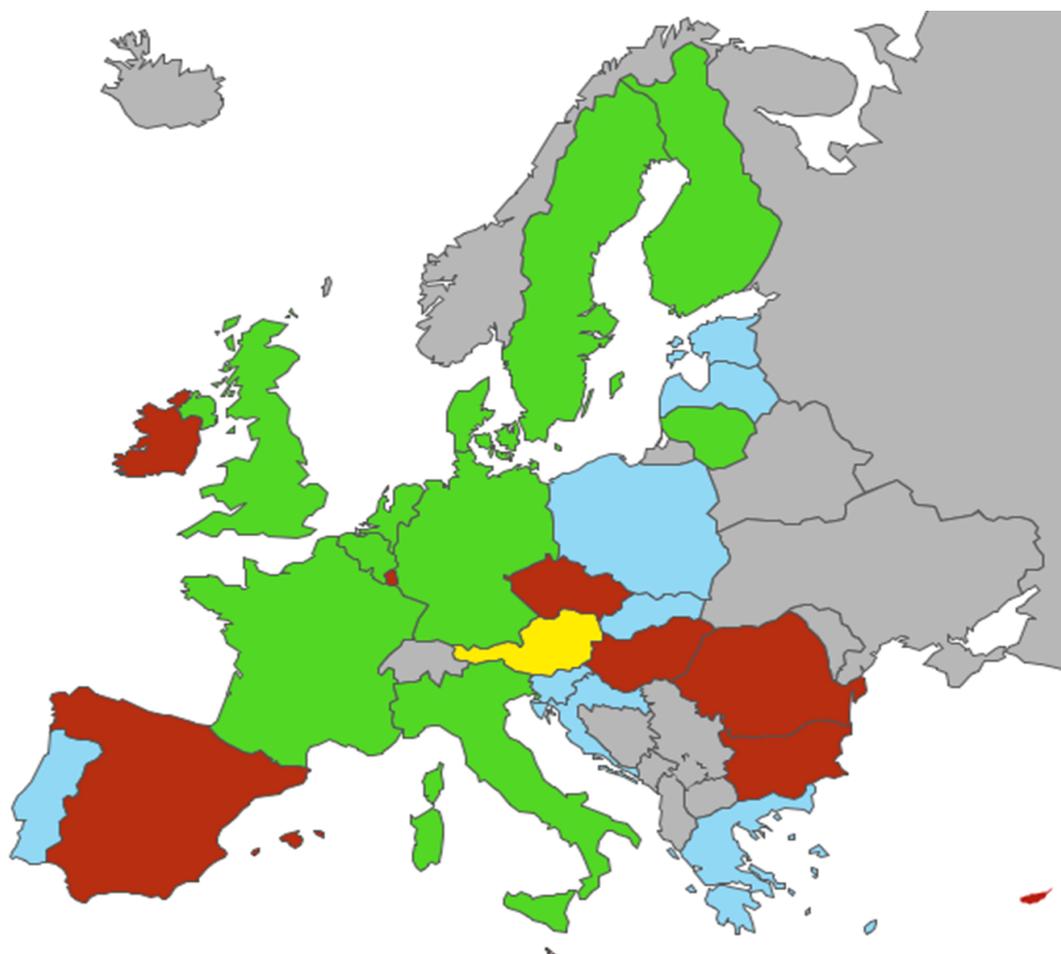
##### The indicator

Models of public involvement in S&T decision-making are a two-dimensional indicator based on secondary data from the MASIS project. The data collected via a network of country experts identify formal procedures for citizen involvement and also assess the actual degree of citizen involvement in science and technology decision-making. On one dimension is the degree of formalisation of structures and mechanisms, at the national level, for the involvement of citizens in decisions about science and technology. On the second dimension is the degree to which citizens are involved in making decisions. The two dimensions are considered to reflect the degree of overall democratisation of science and technology decision-making. On the basis of these two dimensions, Member States are grouped into a four-category typology. Coverage includes the EU-27 except Malta.

This indicator was collected only once and thus the developments since 2012 are not known.

##### Outcomes

Figure 33 PE1 - Models of public involvement in S&T decision-making, 2012



Source: MASIS, 2012.

Key: Green: formalised/ high involvement; blue: formalised/ low involvement; yellow: not formalised/ high involvement; Red: not formalised/ low involvement.

The indicator divides European countries into three even groups. Ten EU Member States from central, western and northern European countries together with Italy are included in the best performing group in which formalisation of participation mechanisms and high levels of citizen participation go together (coloured in green). A second group of 8 countries, including much of eastern Europe, Greece and Portugal have formalised structures in place, but participation can be further raised (light blue). Another 8 EU MS have neither formalised mechanisms for decision-making involvement nor high involvement of citizens in actual decisions (in red). The residual category of low formalisation but high public involvement in decision-making includes only Austria.

## 4.2 PE2 - Policy-oriented engagement with science

### The indicator

Policy-oriented engagement with science is an individual-level indicator of the reported actual engagement of citizens. It combines three items from the 2010 Eurobarometer on 'Europeans, science and technology':

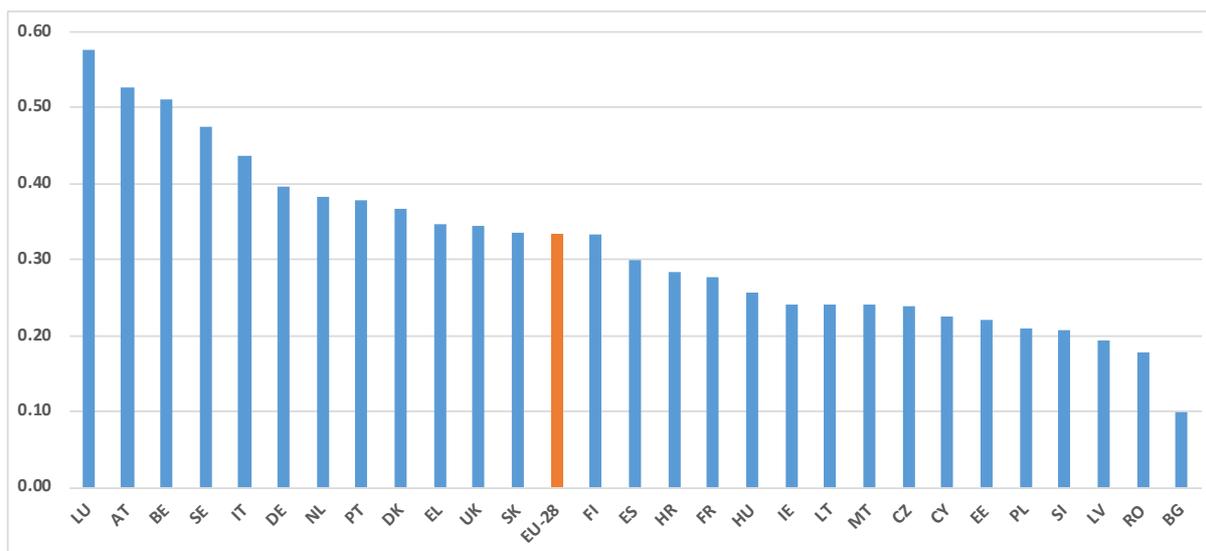
- Do you attend public meetings or debates about science and technology?
- Do you sign petitions or join street demonstrations on matters of nuclear power, biotechnology or the environment?
- Do you participate in the activities of a non-governmental organisation dealing with science and technology-related issues?

The indicator is calculated as a mean national score aggregated from a representative sample of citizens by country. Coverage includes the EU-28 plus.

This indicator was collected only once and thus the developments since 2010 are not known.

### Outcomes

Figure 34 PE2 - Policy-oriented engagement with science, 2010



Source: Eurobarometer 340, (2010).

Note: In this case the EU-28 value corresponds to the mean score of all EU-28 respondents.

A majority of countries (16) perform worse than the EU-28 average (0.3332) on this indicator. Eleven of these countries bounded by Ireland (0.2407) and Bulgaria (0.993) record values that are a considerable distance below this average. Spain (0.2992), Croatia (0.2825), France (0.2759) and Hungary (0.2566) also record values well below the EU-28 average. Another group of 11 countries bounded by Luxembourg (0.5751) and Denmark (0.3961) record values well above the EU-28 average. It is apparent from these results that there is a significant split in performance on the 'policy-oriented engagement with science' indicator.

### 4.3 PE3 - Citizen preferences for active participation in S&T decision-making

#### The indicator

This indicator is derived from the special Eurobarometer on RRI, which reads: 'What is the level of involvement citizens should have when it comes to decisions made about science and technology?' with the following response categories:

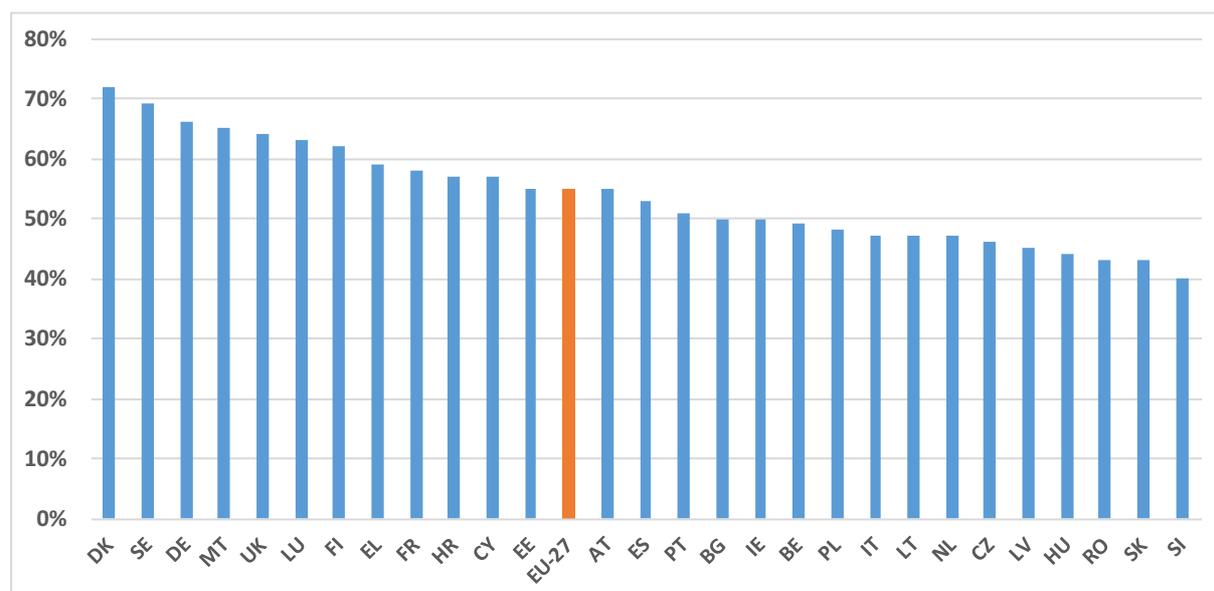
- citizens do not need to be involved or informed;
- citizens should only be informed;
- citizens should be consulted and their opinions should be considered;
- citizens should participate and have an active role;
- citizens' opinions should be binding;
- don't know.

The indicator reports the share of citizens at the national level expressing a preference for active participation. Coverage includes all EU-28 Member States.

This indicator was collected only once and thus the developments since 2013 are not known.

#### Outcomes

Figure 35 PE3 - Share of citizens expressing a preference for active participation in S&T decision-making, 2013



Source: Eurobarometer 401 (2013).

In a majority of Member States (16), the share of citizens expressing a preference for active participation in S&T decision-making is less than the EU-27 average (55 %). A majority of citizens expresses a preference for active participation in 17 countries. A group of 11 countries, bounded by Belgium (49 %) and Slovenia (40 %), recorded values for this indicator, showing that a minority of citizens have a preference for active participation in S&T decision-making. The strongest preference for active participation is expressed in Denmark (72 %) and Sweden (69 %). Germany (66 %), Malta (65 %), the United Kingdom (64 %), Luxembourg (63 %) and Finland (62 %) also record strong values for the indicator.

#### 4.4 PE4 - Active information search about controversial technologies

##### The indicator

This indicator is built as a composite measure based on three individual items from the 2010 Eurobarometer on biotechnology. It divides respondents into three categories depending on their responses to background items concerning genetically modified (GM) food. The three categories of responses are:

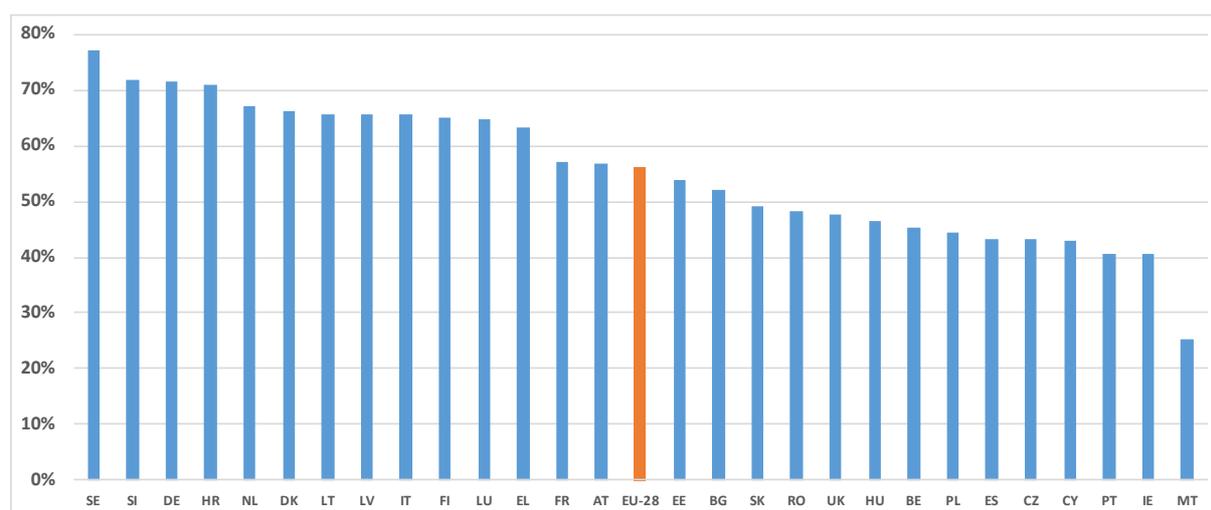
- have heard and talked and/or searched for information;
- have heard but not talked or searched for information;
- have not heard.

The indicator taps into degrees of active information search, or what could be considered horizontal engagement, around controversial technologies.

This indicator was collected only once and thus the developments since 2010 are not known.

##### Outcomes

Figure 36 PE4 - Share of citizens active in information search about controversial technologies, 2010



Source: Eurobarometer 341 (2010).

Note: In this case the EU-28 value corresponds to the mean score of all EU-28 respondents.

In a majority of Member States (14), the share of citizens who have heard or talked about, or searched for information on controversial technologies is higher than the EU-28 average (55.3 %). A majority of citizens expresses a preference for active participation in 17 MS. A group of 12 MS, bounded by Slovakia (49.2 %) and Malta (25.4 %), recorded values for this indicator, showing that a minority of citizens have heard or talked about, or actively searched for information on, controversial technologies. The highest values recorded here are in Sweden (77.71 %), Slovenia (71.7 %), Germany (71.7 %) and Croatia (71.0 %). Malta (25.4 %) is an outlier value on the indicator, with all other countries recording levels above 40 %.

#### 4.5 PE5 - Public engagement performance mechanisms at the level of research-performing organisations

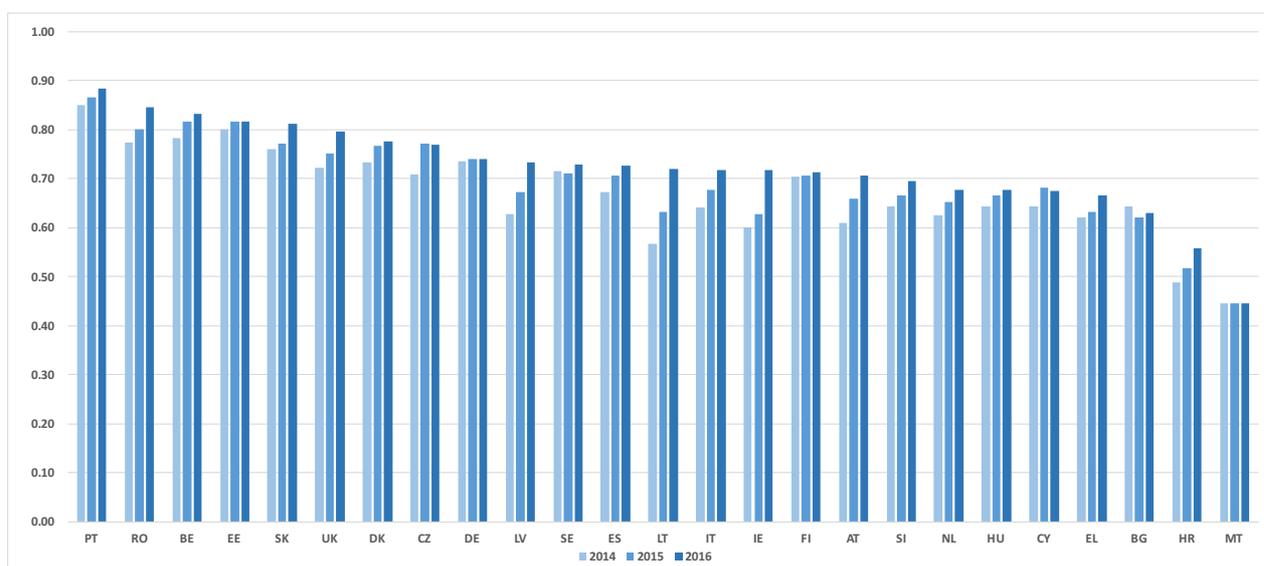
##### The indicator

This is a composite indicator based on two questions in the survey on RRI conducted for higher education institutions and public research organisations (MoRRI, 2017). The survey asked for information about the situation for 2014, 2015 and 2016. The values are between zero and one.

The questions concerned: 'Which mechanisms does your institution apply in order to interact with citizens and societal stakeholders?' (14 answer categories provided) and 'Which level of strategic priority has public engagement at your research institution?' (high/moderate/ no priority).

##### Outcomes

Figure 37 PE5 - Public engagement performance mechanisms at higher education institutions and public research organisations 2014-2016



Source: HEI and PRO surveys, MoRRI, 2017.

In this composite index, the country values can lie in the range of zero to one. All EU Member States except Malta are above the midpoint of 0.50.

In 2016, Portugal, Romania, Belgium, Estonia and Slovakia were above the 0.80 mark, indicating that in those countries more than 80 % of the research-performing organisations had public engagement performance mechanisms.

##### Evolution

In 2014, the average of the EU Member States covered obtained a value of 0.67; by 2015, an increase to 0.70 was recorded and in 2016, a further increase to 0.72 occurred. In almost all countries, there was progress or stability. Sweden and Bulgaria experienced a small decrease between 2014 and 2015, and between 2015 and 2016, Portugal and Cyprus decreased mildly.

#### 4.6 PE7 - Embedding of public engagement activities in the funding structure of key public research-funding agencies

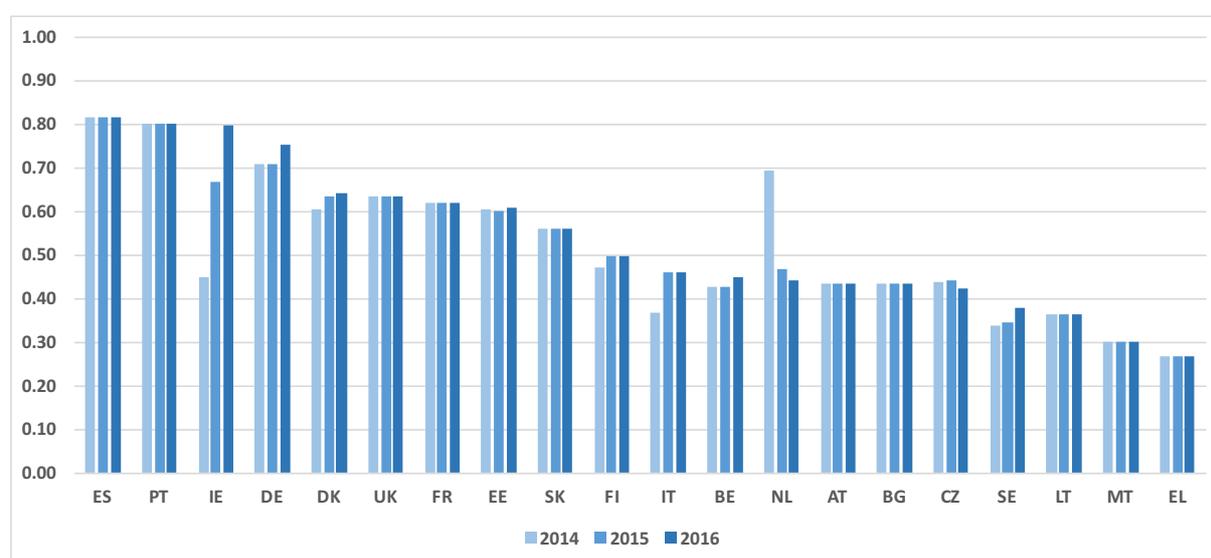
##### The indicator

The indicator describes whether a country's largest and most prominent funding organisations allocate competitive funding to activities where public engagement elements are explicitly targeted.

This composite index indicator is constructed based on two questions from the survey of research-funding organisations (MoRRI, 2017), namely on 'activities supported by targeted funding schemes' and 'the extent to which the funding agency has engaged with citizens and societal actors when developing its funding strategies'. The responses were collected through the dedicated survey of funding organisations (MoRRI, 2017).

##### Outcomes

Figure 38 PE7 - Embedding of public engagement activities in the funding structure of key public research-funding agencies, 2014-2016



Source: RFO survey, MoRRI, 2017.  
Note: LU and RO missing.

This index, which allows a spread of the Member States between zero and one, actually disperses them in a much smaller range. For 2016 for example, the range was between 0.27 (Greece) and 0.82 (Spain). The median for 2015 and 2016 was almost 0.50; for 2014 it was slightly lower with 0.47.

##### Evolution

For the period covered, 10 Member States remained quite stable, such as Spain and Portugal in the leading group, as well as Malta and Greece at the lower end. In most other countries, the annual changes were moderate but positive. Only 3 MS have a somewhat divergent development: in Ireland, we can observe the highest year-to-year increases; in the Netherlands, there was a significant drop from 2014 to 2015; and in the Czech Republic there is a small decrease from 2015 to 2016.

It is interesting to note that Member States with an already limited uptake of public engagement activities in funding structures do not even see a moderate change. Beside the Czech Republic and Hungary, the funding agencies remain with their limited embedding of public engagement activities.

#### 4.7 PE8 - Public engagement elements as evaluative criteria in research proposal evaluations

##### The indicator

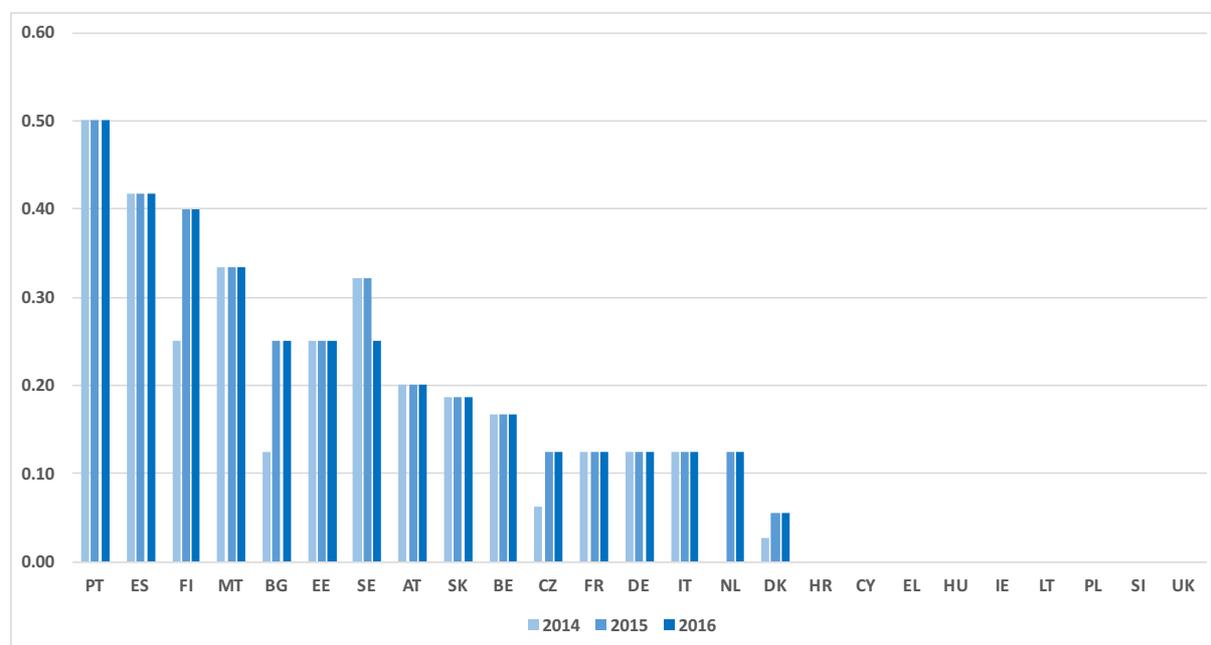
This indicator describes whether a country's largest and most prominent funding organisations take public engagement elements into account for the evaluation of research and (to some limited extent) innovation projects.

This indicator is derived from one question of the research-funding organisations' survey (MoRRI, 2017): 'Please indicate the extent to which public engagement has been a criterion for the appraisal of research applications.' (A five-point scale from very small or no extent to very large was used). The responses were weighted and normalised (0 to 1).

The responses were collected through the dedicated survey of funding organisations (MoRRI, 2017).

##### Outcomes

Figure 39 PE8 - Public engagement elements as criteria in research proposal evaluations, 2014-2016



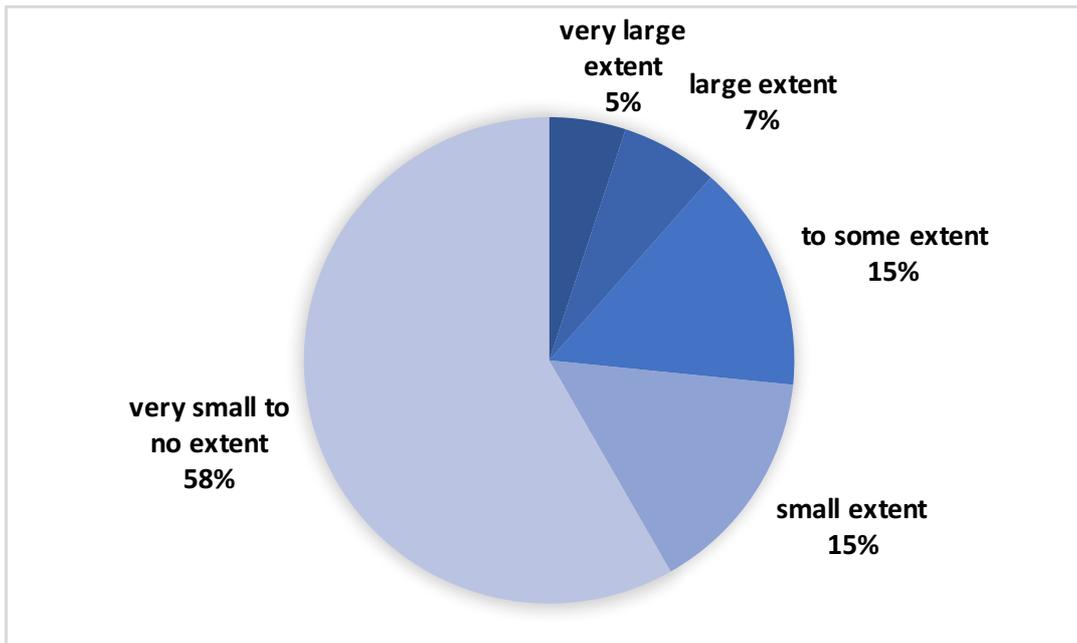
Source: RFO survey, MoRRI, 2017.  
Note: LU and RO missing.

Public engagement elements are only marginally used as criteria in research proposal evaluations in Europe. In 9 Member States it is not a criterion at all and for the remaining ones, almost 60 % of the responses were 'to a very small to no extent'. In a few cases, the criterion is used to a 'large' or 'very large' extent – these funding agencies are predominantly in the Nordic countries.

##### Evolution

This indicator is characterised by stability and a very low uptake. Public engagement has not been introduced in several countries' funding organisations as a criterion, and where it is a criterion the use is predominantly limited. In the 2014-2016 period, about 60 % of the responding funding agencies used it to a 'very small to no extent' while the share of 'large' or 'very large' extent remained with 7 % and 5 % limited.

Figure 40 Extent to which public engagement has been a criterion in research proposal evaluations, 2014-2016



Source: RFO survey, MoRRI, 2017.

## 4.8 PE9 - Research and innovation democratisation index

### The indicator

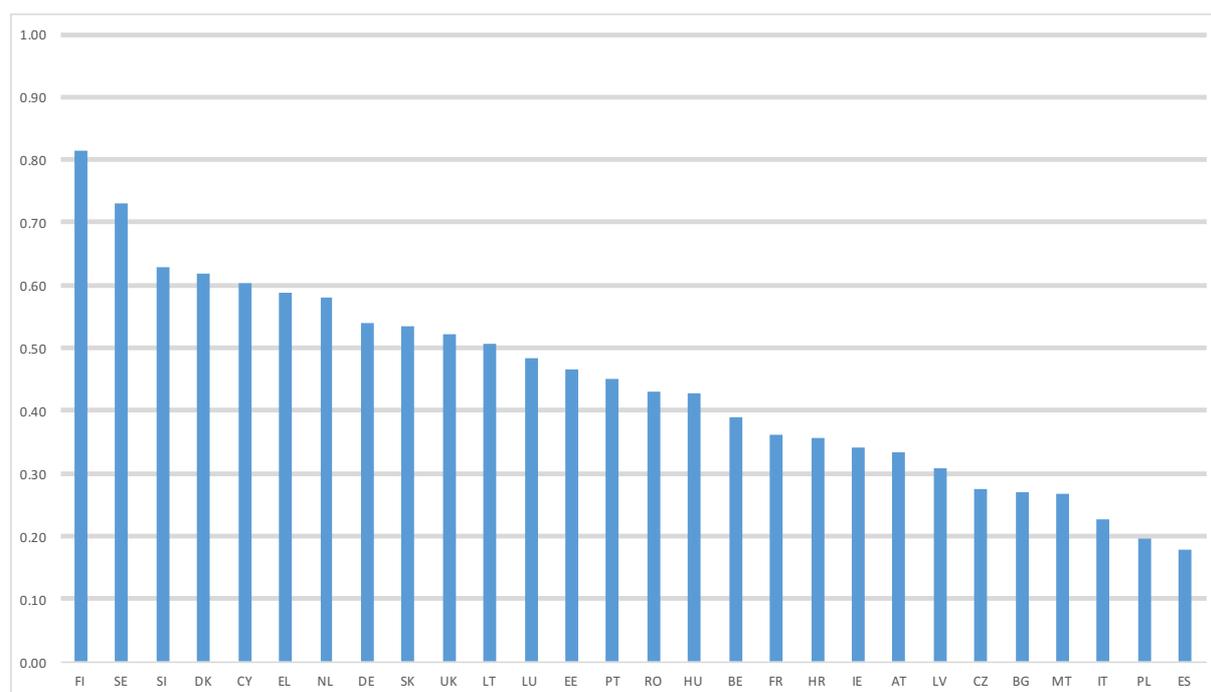
This indicator is based on opinions from public stakeholders on the degree of engagement by citizens and societal actors in research and innovation processes.

This composite indicator is based on two questions in a dedicated Science in society (SiS) survey (MoRRI, 2017), which asked for the present situation as well as opinions on changes during the previous 2 years. The questions were set as statements for citizens and civil society organisations (CSOs), namely if they were (1) informed, (2) consulted, (3) if their opinions had a significant impact on political decisions on research and innovation (R&I), and (4) if their values and expectations played an important role in R&I agenda setting. To all these questions, respondents were asked to what extent they agreed and whether or not the situation had improved/ worsened/ remained unchanged. The second question asked about awareness of legal frameworks in a given country, requiring citizen and CSO participation in S&T decision-making.

The data was weighed and normalised. It was collected through a dedicated SiS survey within the MoRRI consortium (2017).

### Outcomes

Figure 41 PE9 - R&I democratisation index, 2016



Source: SiS survey, MoRRI, 2017.

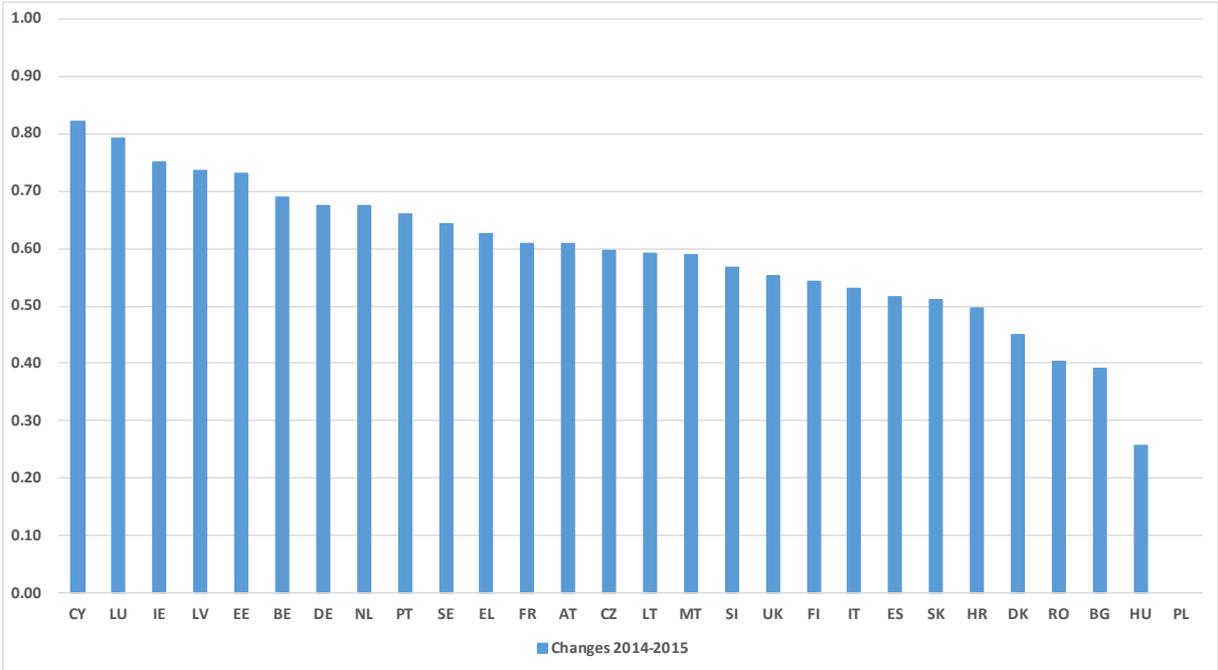
Figure 41 indicates the situation of a broader involvement of citizens and CSOs in science, research and innovation policy decisions in 2016.

Since this is an index, there are marked differences between the Member States. There are 13 MS that are equal to or above the mean of 0.50 with Nordic countries leading: Finland leading at 0.77, followed by Sweden (0.67) and Denmark (0.61). At the lower end, Italy (0.22), Spain (0.19) and Poland (0.16) suggest a rather low level of involvement of citizens and CSOs in political procedures within science, research and innovation policies.

**Evolution**

The survey also asked about the changes during 2014 and 2015. If one compares the perceived changes, there are about 15 countries that did not see a change in the situation. These are the countries whose columns are between 0.4 and 0.6. The countries that saw the situation improving are those closer to 1.00 and here, in particular Cyprus, Luxembourg, Ireland, Estonia and Latvia, they indicated positive changes. Negative changes are signalled by shorter columns, i.e. Bulgaria, Hungary and in particular Poland.

Figure 42 R&I democratisation index: changes, 2014-2015



Source: SiS survey, MoRRI, 2017.

#### 4.9 PE10 - National infrastructure for involvement of citizens and societal actors in research and innovation

##### The indicator

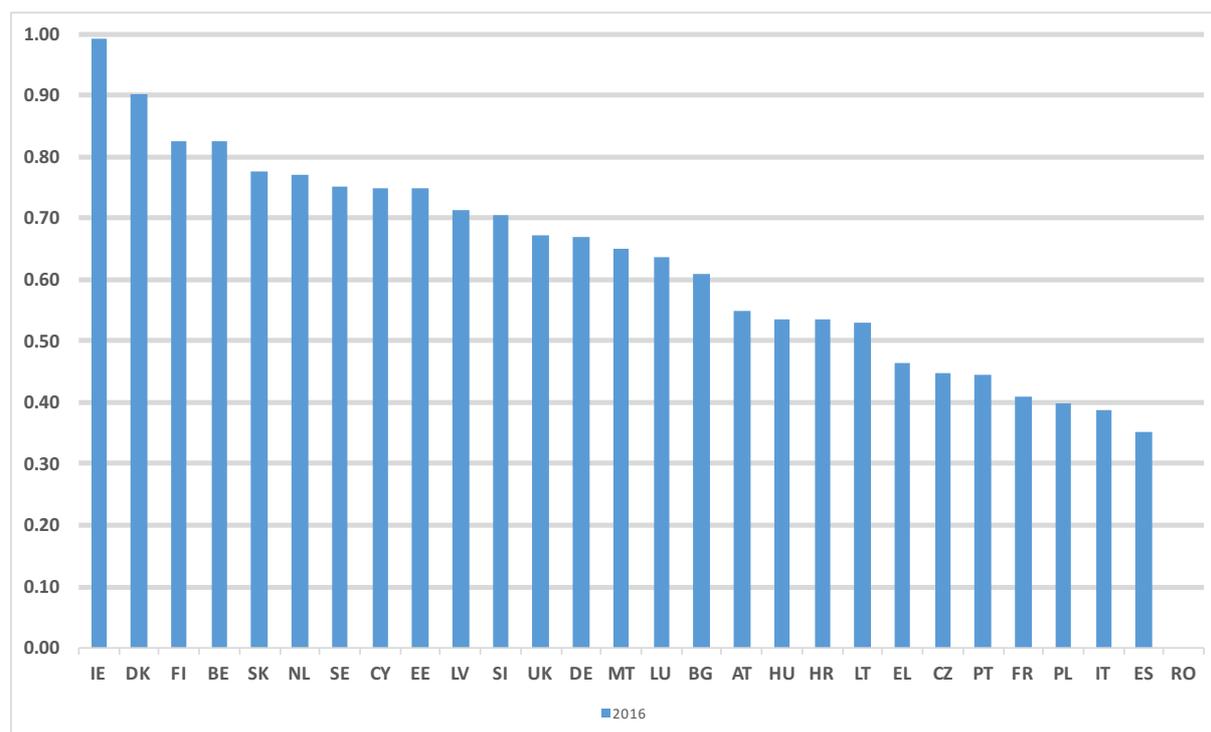
This indicator is based on opinions from public stakeholders on the organisational landscape, which enable the engagement of citizens and societal actors in research and innovation processes.

This indicator is based on one question in the dedicated SiS survey (MoRRI, 2017), which asked for the present situation as well as opinions on changes during the previous 2 years. The following statements on citizens and civil society organisations were taken into account for calculating the indicator: (1) access, (2) representation, (3) availability of multiple channels for interaction. To all of them, respondents were asked to what extent they agreed and if the situation had improved/ worsened/ remained unchanged during the previous 2 years.

The second question asked about awareness of legal frameworks in a given country, requiring citizens and CSO participation in S&T decision-making. The data was weighed and normalised. It was collected through a dedicated SiS survey within the MoRRI consortium (2017).

##### Outcomes

Figure 43 PE10 - National infrastructure for involvement of citizens and societal actors in research and innovation, 2016

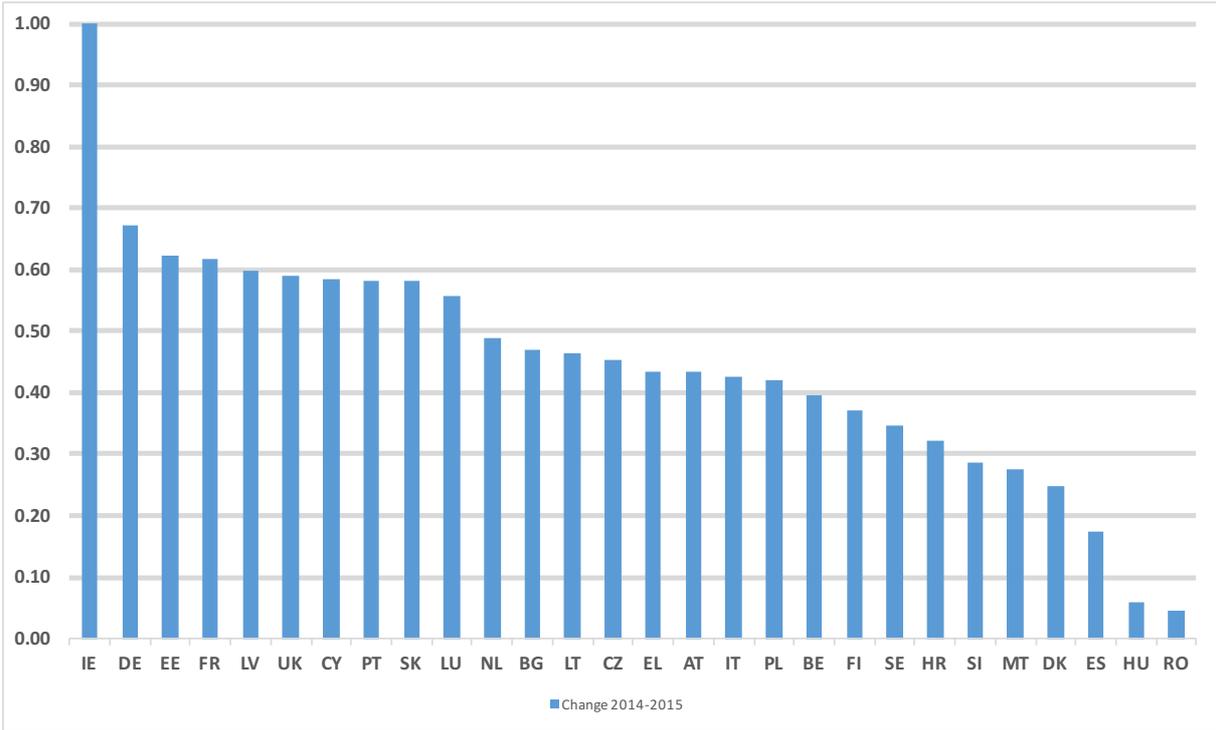


Source: SiS Survey, MoRRI, 2017.

Among the EU Member States, Ireland was the only country for 2016 where respondents highly agreed that citizens and civil society organisations had resources (infrastructures) enabling them to be taken into account for research and innovation processes. In countries such as Denmark, Finland and Belgium, the level of agreement was also high. In the majority of EU Member States, resources for engagement seem to exist. It was only in a few countries that agreement was clearly more limited, namely in France, Poland, Italy, Spain and Romania. In the latter, these resources seem to exist only marginally.

## Evolution

Figure 44 National infrastructure for involvement of citizens and societal actors in research and innovation: changes 2014-2015



Source: SiS Survey, MoRRI, 2017.

It is interesting to note the perceived changes: here, the majority of countries did not experience a big shift – this is signalled by the columns ‘around’ the 0.50 mark (i.e. between 0.40 and 0.60). However for Ireland and Germany, the situation has markedly improved, while for about 10 Member States the situation worsened, particularly in Spain, Hungary and Romania.

## 5 Open access

Open access (OA) is the idea of making research results freely available to anyone who wants to access and re-use them (e.g. for full text mining). One of the main drivers of the impetus behind OA is to make publicly funded research accessible to the general public. In the academic sense, the term 'open access' referred originally to the provision of free access to peer-reviewed academic publications. OA is separated into 'gold' and 'green' where gold indicates OA journals and green indicates OA through self-archiving.

Open access was initially treated within MoRRI with two dimensions, namely open access publications and open data. However, for the latter, the concept needs further clarification in order to develop data sources and relevant indicators (Robinson-Garcia et al., 2017)<sup>5</sup>.

The following indicators (with breakdowns) are included:

Number	Name of indicator	Note
OA1	Open access literature	Developed by CWTS within the MoRRI consortium.
- OA1.1	Share of Open Access publications	
- OA1.2	Citation scores for OA publications	
OA3	Social media outreach/take up of OA literature	Developed by CWTS within the MoRRI consortium.
- OA3.1	Ratio of OA and non-OA publications used in Twitter	
- OA3.2	Ratio of OA and non-OA publications used in Wikipedia	
OA4	Public perception of open access	Unchanged indicator based on Eurobarometer (2013).
OA5	Funder mandates	Unchanged indicator based on EC data (2011).
OA6	Research-performing organisations' support structures for researchers as regards incentives and barriers for data sharing	Data available for 2014, 2015, 2016. Composite index based on HEI and PRO surveys of MoRRI consortium, 2017.

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<sup>5</sup> See reference: <https://www.sciencedirect.com/science/article/pii/S1751157717300834?via%3Dihub>

# Open access

## Main observations



### Publications

- Journal-based 'gold' OA publishing is on the rise while self-archiving 'green' OA decreased.
- In most EU Member States, OA increased between 2010 and 2014 at a rate of 5 % to 10 %.
- Exceptions are the Netherlands, Ireland, Croatia, Cyprus and Malta.
- The share of OA publications among all publications varies between 16 % in Malta and 41 % in Croatia.
- It is higher in countries that publish a lot (between 26 % and 3 %).



### Citations

- The citation scores in 16 Member States increased for OA publications, while in 12 it decreased for the period 2010-2014.
- The only MS with an increased gold OA citation score was the United Kingdom

### Social media



- OA publications are more likely to be tweeted compared to non-OA publications.
- OA publications are more widely used as references in Wikipedia entries than non-OA publications.

### Open data



- There is a clear need to develop the setting for open data and its reuse before valid indicators can be developed.

### Data sharing



- Higher education institutions provide incentives and infrastructures for data sharing to varying degrees.
- The Czech Republic leads here, followed by the UK and Lithuania.

## 5.1 OA1 - Open access literature

### The indicator

The indicator informs about the number and shares of sustainable and legal open access publications, instead of the mere identification of publications whose full text can be retrieved online. Differentiation was made between the access paths (green, gold) for the years 2009 to 2014.<sup>6</sup>

The main data sources used were the DOAJ list (Directory of Open Access Journals), PMC (PubMed Central), the ROAD list (Directory of Open Access scholarly Resources), CrossRef, and OpenAIRE, which all fulfil the requirements of sustainability and legality. Sustainable, in this context, means that it should, in principle, be possible to repeatedly reproduce the OA labelling from the various sources used, in an open fashion, with a relatively limited risk of the source disappearing behind a pay-wall. Legal relates to the usage of data sources that represent true open access evidence for publications, and does not offer open access to rogue or illegal open access publications. Other popular 'apparent' OA sources such as ResearchGate and SciHub fail to meet these two principle requirements. Thus, this approach aims at informing policies of open access based on the above-mentioned principles, in contrast with other approaches that provide a picture of overall online access to the full text of scientific publications.

### Outcomes

The share of open access publishing among the total number of scientific publications is shown in Figure 45 and Figure 47. The total number as well as the share of publications is based on fractional counting, i.e. giving equal weight to all co-authors of a publication.

The total number of publications in the EU-28 increased from ~370 000 publications in 2009 to around 434 000 publications in 2016. In this period, the average share of OA publishing in the EU-28 increased from 21 % to 31 % in 2014, remaining stable in 2015 and 2016. In the last 3 years (2014, 2015, 2016), the relative share of gold open access has increased more strongly in relation to the share of green open access.

The share of OA publishing in the EU Member States in 2016 was between 15 % (Latvia) and 46 % (United Kingdom). In comparison, OA publishing in the USA, Japan and China is 34 %, 24 % and 23 % respectively. In general, it is higher in countries that publish a great deal. Among the high publishing countries, the share of OA is the lowest in Italy and highest in the United Kingdom.

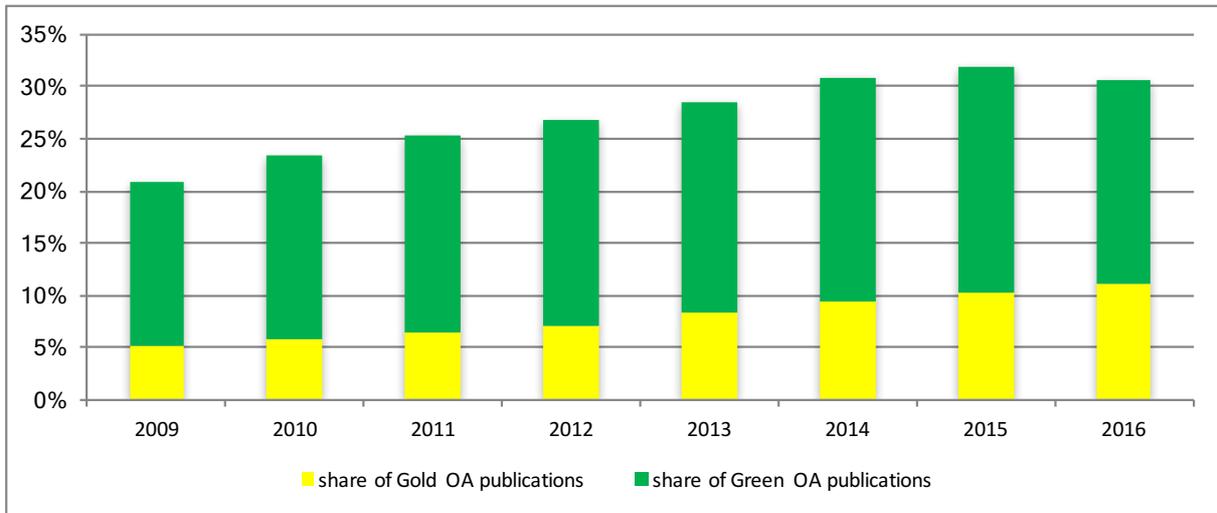
Between 2010 and 2016, the share of OA publications increased in most countries. From 2014, the share slightly increased in 2015, and decreased in 2016 (as also shown in Figure 45). Exceptions from the EU Member States are Austria, Luxembourg, the United Kingdom, Lithuania and Slovakia. Internationally, China and Japan continually increase their share of OA publications. The explanation for the slow increase in OA publishing in 2015 and 2016 is most likely that it is not almost at a standstill, but is related to delays in the updating of the underlying databases. This means that when the years 2015 and 2016 are analysed again, say in late 2018, the shares will probably be higher due to the progressive

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<sup>6</sup> The methodology is identical to the one used for data collection of OA under a current study contract with DG-RTD 'Key Technology domains'. OA is defined by the various sources used for the labelling of Web of Science covered publications. Gold OA is defined by the appearance of a journal on the DOAJ or ROAD journal list. Green OA is defined by the presence of publications in CrossRef, PubMedCentral or OpenAIRE. Hierarchically, Gold OA is set above Green OA, in a sense that whenever publications are found through Gold and Green, Gold has priority over Green. Gold and green thus are mutually exclusive in the dataset.

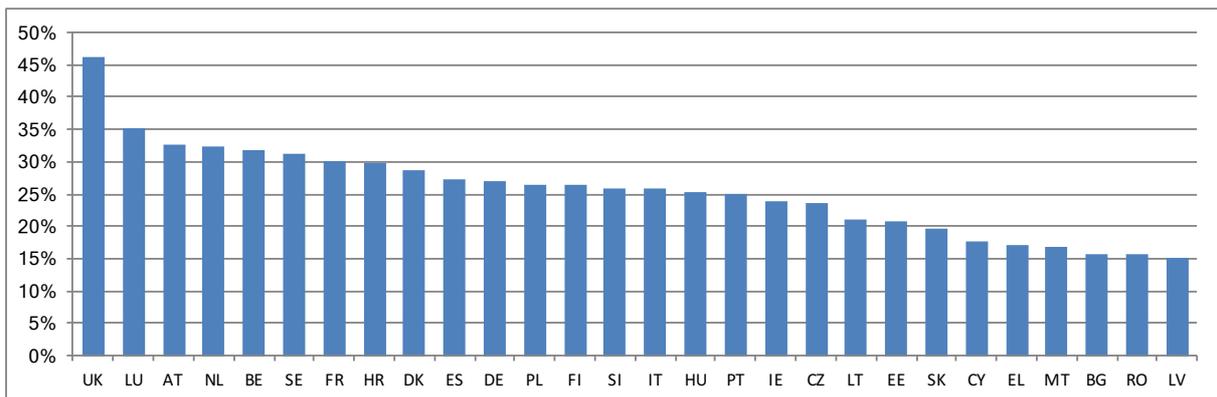
completion of previous years. This also strongly suggests that the most recent years should not be included, in order to avoid interpreting inaccurate preliminary data.

Figure 45 Share of OA publishing, 2009 to 2016 (EU-28)



Source: CWTS, MoRRI, 2017.

Figure 46 OA1.1 - Shares of OA publishing in 2016 (EU Member States)

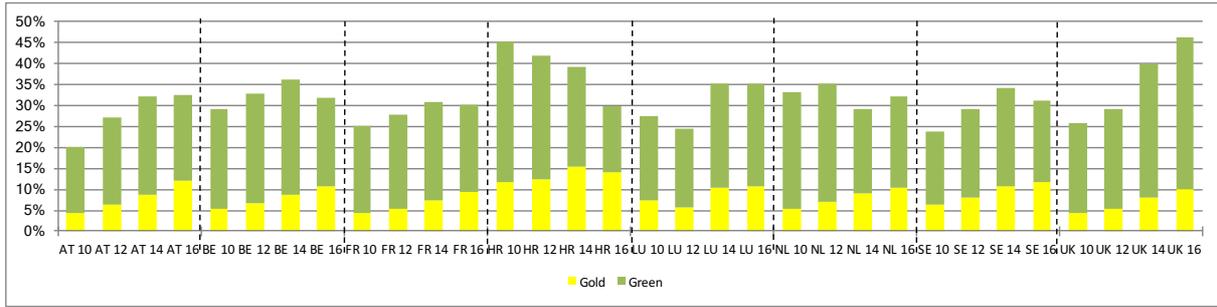


Source: CWTS, MoRRI, 2017.

The share of gold open access in EU Member States ranged between 8 % and 14 % of all publications. For the share of green open access publishing the range is wider: the lowest can be found in Latvia with 7 % while the United Kingdom had the highest with 36 %.

The EU-28 Member States were divided into 3 groups to further analyse the evolution of gold and green open access publishing. Figure 46 shows the EU-28 Member States with the highest share of OA publishing (>30 % in 2016). In this group of countries, gold open access is the highest in Croatia (14 %), Austria and Sweden (both 12 %). In the United Kingdom the share of green OA publishing is relatively high (36 %). Overall, there is a gradual increase in gold open access publishing.

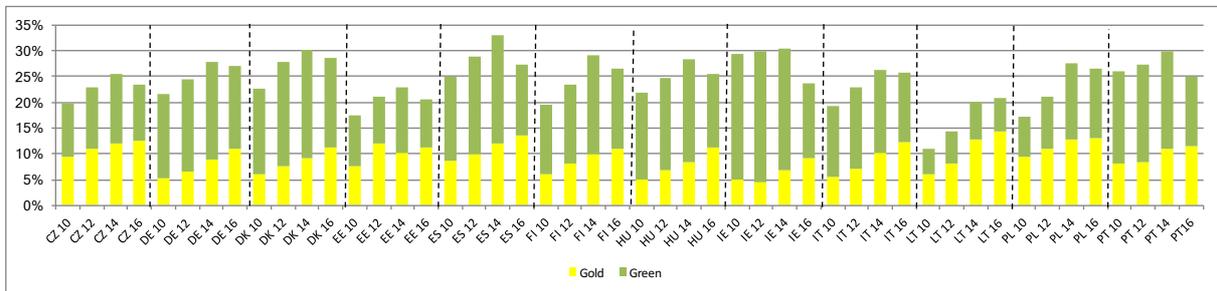
Figure 47 OA1.1 - Shares of OA publishing by type and Member State, 2010-2016



Source: CWTS, MoRRI, 2017.

Figure 47 shows the EU-28 Member States with an average share of OA publishing. Similar to the group of highest shares of OA, this group sees a similar trend in increased gold OA publishing. This increase is particularly strong in Lithuania.

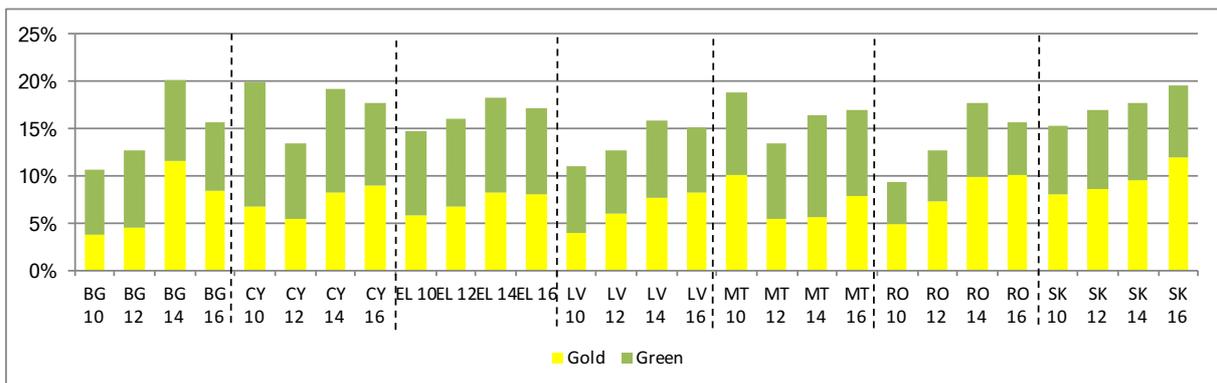
Figure 48 OA1.1 - Share in OA publishing by type and Member State, 2010-2016



Source: CWTS, MoRRI, 2017.

Figure 49 shows the evolution of green and gold open access publishing in the countries where OA publishing is less than 20%. Also in this group, gold OA is increasing, except for Bulgaria.

Figure 49 OA1.1 - Share in OA publishing by type and Member State, 2010-2016



Source: CWTS, MoRRI, 2017.

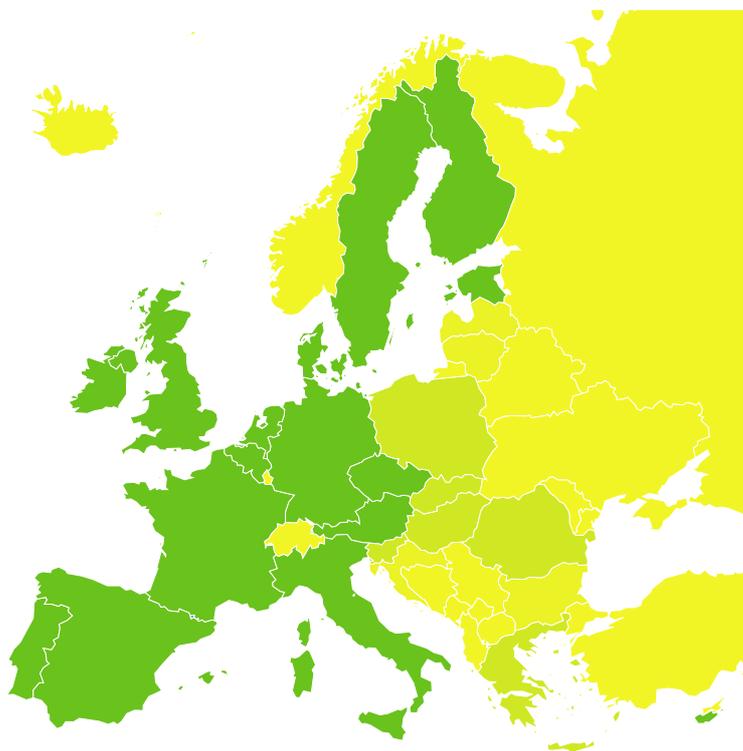
The indicator 'mean normalised citation score' (MNCS) is used as a field-normalised scientific impact indicator.<sup>7</sup> Annex 8 provides an overview of this impact indicator for the years 2010 and 2014 for all open access publications, as well as green and gold OA routes.

<sup>7</sup> To know more about field normalisation of citation indicators, see Waltman & van Eck (2018): <https://arxiv.org/ftp/arxiv/papers/1801/1801.09985.pdf>

A score of 1 reflects world average, a score of >1.2 is considered above world average, and a score below 0.8 is considered below world average.

This impact indicator differs among EU Member States. In 16 out of the 28 MS it increased between 2010 and 2014, whereas in the other 12 it decreased. With regard to all OA publications, the indicator was above 1.2 in 17 MS in 2014 (indicated as dark green in Figure 50), close to the world average in 5 of them, and below in the remaining 6 MS. The high open access mean normalised citation score (MNCS) is almost entirely related to green OA. The gold OA publishing is not linked to a higher MNCS with the exception of the United Kingdom in 2010. In fact, in 2014, 15 EU Member States were below the world average for gold OA publishing. The MNCS is generally accepted as an indicator of citation impact that corrects for field differences. It does not take into account citation practices of researchers across Europe.

Figure 50 OA1.2 - Citation scores for OA publications



Source: CWTS, MoRRI, 2017.

Key: Dark green: field normalised citation score above 1.2; light green: below 0.8. All others, around world average.

## 5.2 OA3 - Social media outreach/take-up of OA literature

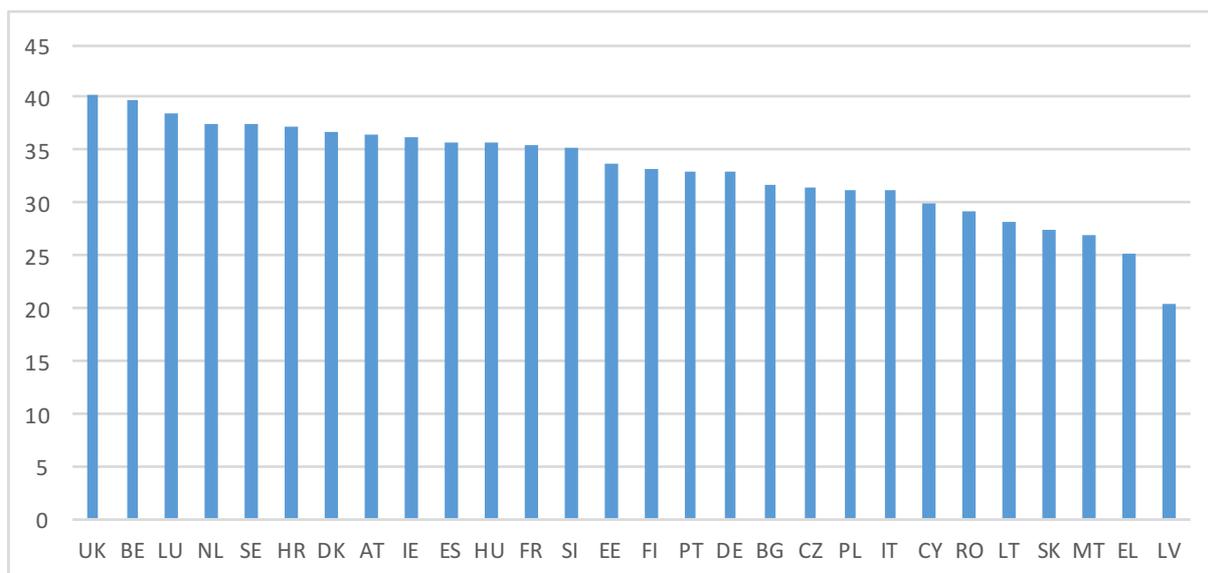
### The indicator

The indicator is built on data retrieved from altmetric.com on Twitter and Wikipedia mentions. The coupling between (open access) publications and altmetric data depends on digital object identifiers (DOIs). This means that only publications with a DOI are included in the analysis. The two channels measure different aspects of outreach but they share a crucial caveat: their use is limited to people with digital access, which is skewed mainly by countries and age groups. Twitter has a much broader outreach function but it captures a lower engagement between the users and publications (Haustein, Bowman and Costas, 2016<sup>8</sup>; Robinson-Garcia et al., 2017)<sup>9</sup>. Wikipedia articles are written by digitally connected ones, but since Wikipedia entries are consulted by the 'average' user (and thus not only researchers), it indicates a direct, wider benefit. In order to measure a real impact, it is necessary to calculate the share of OA publication sources compared to other sources.

### Outcomes

Figure 51 indicates the shares of OA publications within the DOI population of publications covered by altmetric.com. With 40 % of OA publications, the United Kingdom accounts for the highest share, followed closely by Belgium and Luxembourg. At the other end of the scale, Latvia has only 20 % of its publications as OA, followed by Greece with 25 %. Thus, across the EU-28, non-OA publications dominate with 60 % to 80 % of all publications.

Figure 51 Share of OA publications, 2012-2015



Source: CWTS, MoRRI, 2017.  
Data: altmetric.com

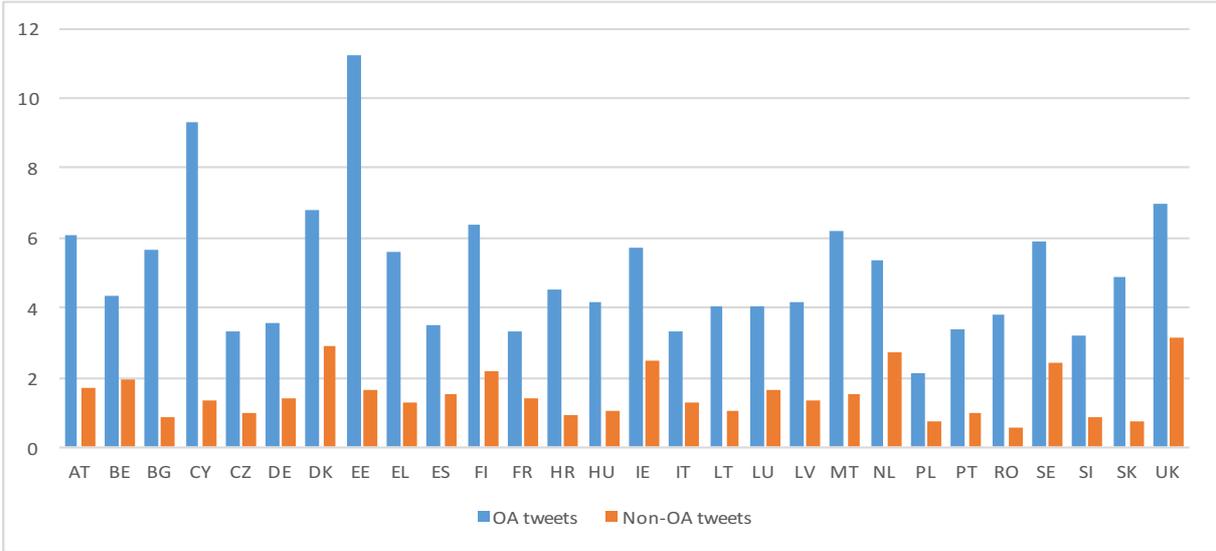
Figure 52 shows clearly that OA publications are tweeted far more than non-OA ones. On average, each OA publication is tweeted 5 times while non-OA ones are tweeted 1.5 times. Estonian OA publications obtain the highest ratio with 11.2 tweets while Polish ones receive the lowest ratio with 2.1. The low shares of non-OA tweets in several eastern Member States such as Romania, Poland, Bulgaria, Slovakia, Slovenia or Croatia (all below 1.0)

<sup>8</sup> See: <https://arxiv.org/abs/1502.05701>

<sup>9</sup> See: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0183551>

(and also in comparison to their ratios of OA publication-based tweets) suggests that access to non-OA publications is by and large limited.

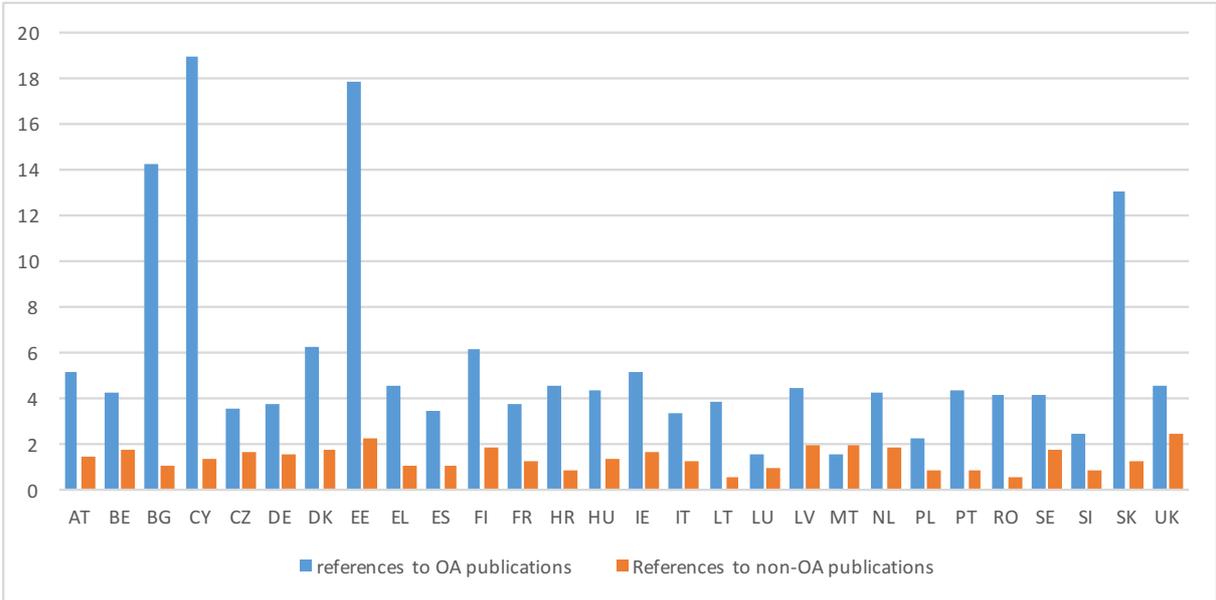
Figure 52 OA3.1 - Ratio of OA and non-OA publications used in Twitter, 2012-2015



Source: CWTS, MoRRI, 2017.  
Data: altmetric.com

An interesting indicator with a broader impact concerns the references in Wikipedia. These articles refer to a variety of sources, including scientific articles. The following figures indicate the shares of articles – OA as well as non-OA – as cited in Wikipedia entries.

Figure 53 OA3.2 - Share of OA and non-OA publications used in Wikipedia, 2012-2015



Source: CWTS, MoRRI, 2017.  
Data: altmetric.com

If one assumes that these entries are not only written by researchers<sup>10</sup> but that information needs to be referenced, those authors without access to paid journal articles will quote from open access ones. In fact, as Figure 53 indicates, the open access articles tend to be cited much more often than the non-OA ones. Overall, 5.7 % of OA articles and 1.4 % of non-OA articles are cited in Wikipedia.

The use though is very varied. An interesting difference can be found among the countries with the smallest outputs: for Luxembourg and Malta the share is around 1.5 % and thus the lowest, Cyprus has the highest share with almost 19 %. A high share can also be found in Estonia (18 %), Bulgaria (14 %) and Slovakia (13 %), while Slovenia (2.4 %) and Poland (2.2 %) have amongst the lowest shares, together with the smallest countries mentioned above.

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<sup>10</sup> There are about 30 million registered users and another 30 million individual internet provider (IP) users – thus, the probability is rather high that non-specialists are authoring and editing many entries (see: [Wikipedia: Authors of Wikipedia](#)).

### 5.3 OA4 - Public perception of open access

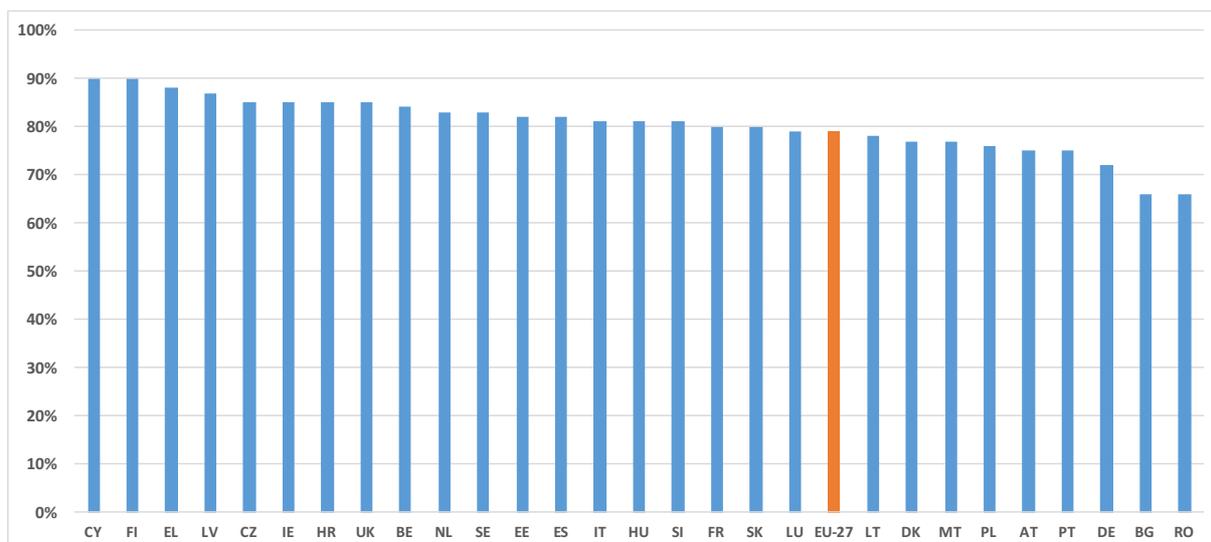
#### The indicator

The indicator on the public perception of open access is constructed from a question in Eurobarometer 2013. It provides the share of people who think that publicly funded research should be made available.

This indicator was collected only once, therefore its evolution cannot be provided.

#### Outcomes

Figure 54 OA4 - Public perception of open access,2013



Source: Eurobarometer 401.

Within Europe, the spread between almost fully agreeing to the statement (90 % in Cyprus and Finland) and the least favourable ones (66 % in both Bulgaria and Romania) is nevertheless quite high at more than 30 %. The EU average is 79 %. While 19 EU Member States are above the EU average, 9 are below. There seems to be no clear pattern discernible in the sense that a mix of old and new, northern, southern, eastern and western Member States, high and low gross expenditure on research and development (GERD) countries can be found on both sides of the average.

## 5.4 OA5 - Funder mandates

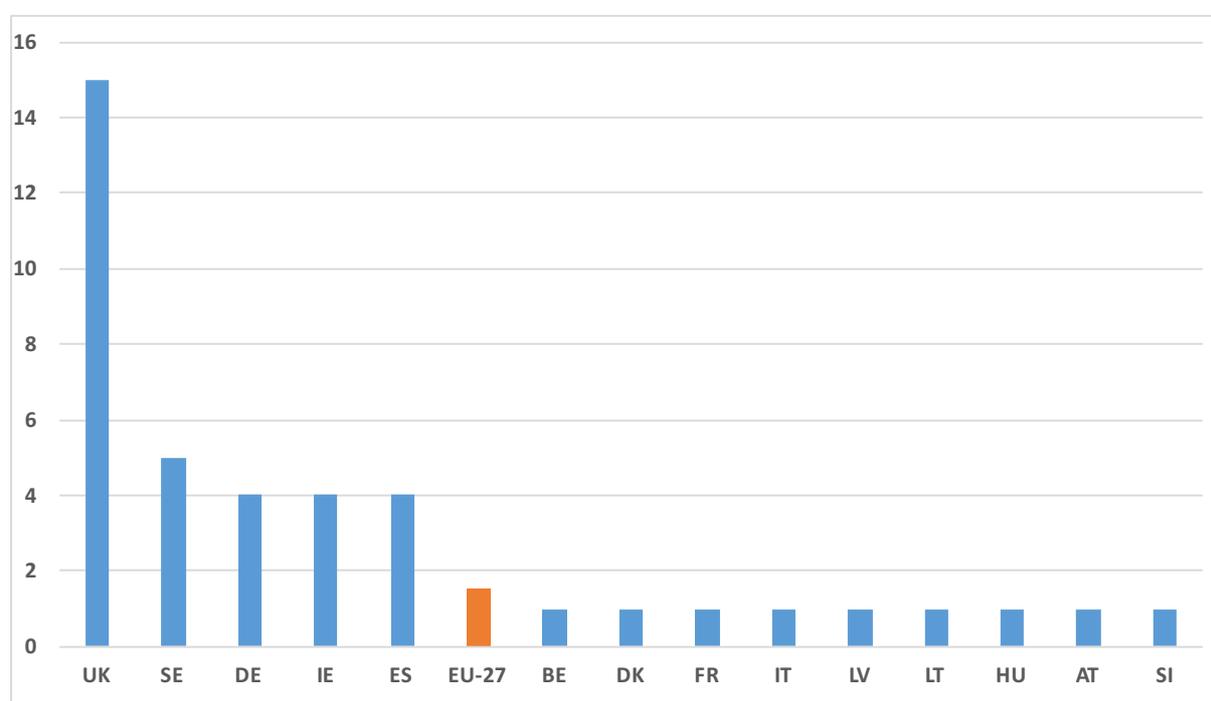
### The indicator

This indicator is derived from an ad-hoc survey by DG-RTD of the OpenAIRE network. It is used as background material to a staff Commission paper (SDW (2012)0222) on open access. It signals whether or not national funders are disposed to open access publishing. The absolute numbers, however, need to be taken into perspective with national funding structures. While in some EU Member States there may be one or two main research-funding agencies, in others the number can be much more substantial (such as in the United Kingdom with its many Research Councils).

The indicator has not been updated since 2011 but it is likely that there have been changes since given the significant drive of open science during recent years.

### Outcomes

Figure 55 OA5 - Existing funding mandates for OA publishing, 2011



Source: EC 2012 (SWD(2012)0222).

If funding organisations require open access publishing of their sponsored research was checked by DG-RTD in an ad-hoc survey of the OpenAIRE repository. While the survey uses absolute figures, interpretation of the absolute figures need to take into account national funding structures and therefore the number of funders<sup>11</sup>. According to the OpenAIRE data (for the EU-27<sup>12</sup>), there were no national funders in 13 MS requiring open access publications versus 14 who indicated that there were national funders requiring OA publishing. The United Kingdom is the country with the highest number of individual funding agencies that apply open access mandates (15), followed by Sweden (5),

<sup>11</sup> In a number of Member States, there are dedicated thematic Councils (e.g. United Kingdom, Denmark) which also act as funders, while in others there are one or two main funding agencies (e.g. Germany).

<sup>12</sup> Without Croatia

Germany, Ireland and Spain (4 each). These are also the countries above the EU average of 2.

## 5.5 OA6 - Research-performing organisations' support structures for researchers as regards incentives and barriers for data sharing

### The indicator

This is a composite indicator built from three questions of the HEI and PRO surveys (MoRRI, 2017). The questions were:

(1) Which of the following policies apply in your institution:

- Your institution has explicit open data management regulations,
- Your institution chooses to follow funder- or field-specific incentives for open data and publication sharing?

(2) Which of the following open data sharing practices apply in your institution:

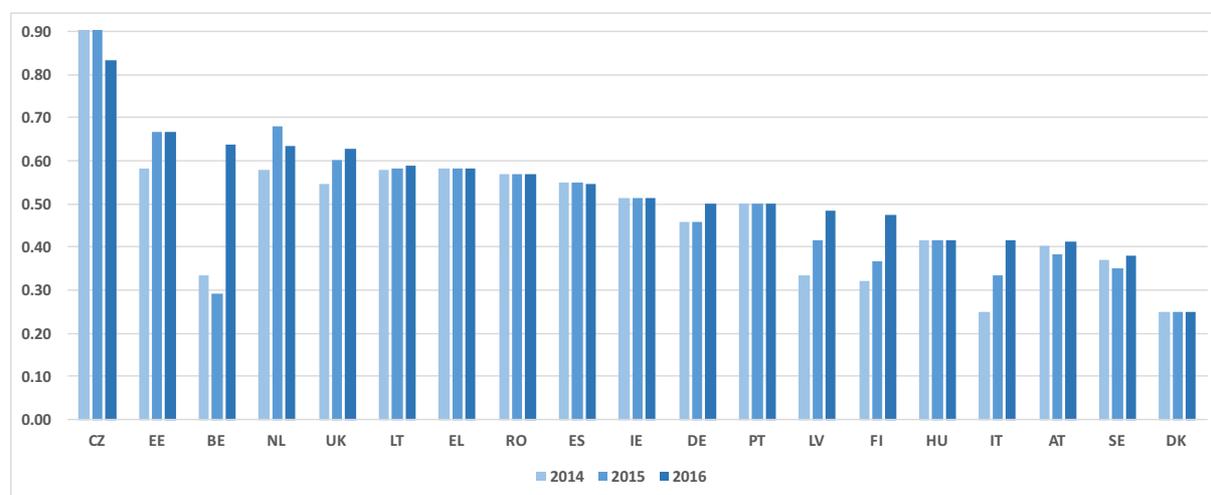
- Repositories are provided by your institution/ by departments?

(3) Which of the following support (in kind and in funding) options with regard to open access publishing and data sharing apply:

- IT support for FAIR data practices,
- budget for the implementation of Open Data sharing,
- online communication on publication and data sharing practices, and
- training in research data sharing.

### Outcomes

Figure 56 Higher education institutions' support structures for researchers as regards incentives and barriers for data sharing



Source: HEI Survey, MoRRI, 2017.

Note: No data for BG, HR, CY, MT, SK, SI, PL, LU. Insufficient response for FR

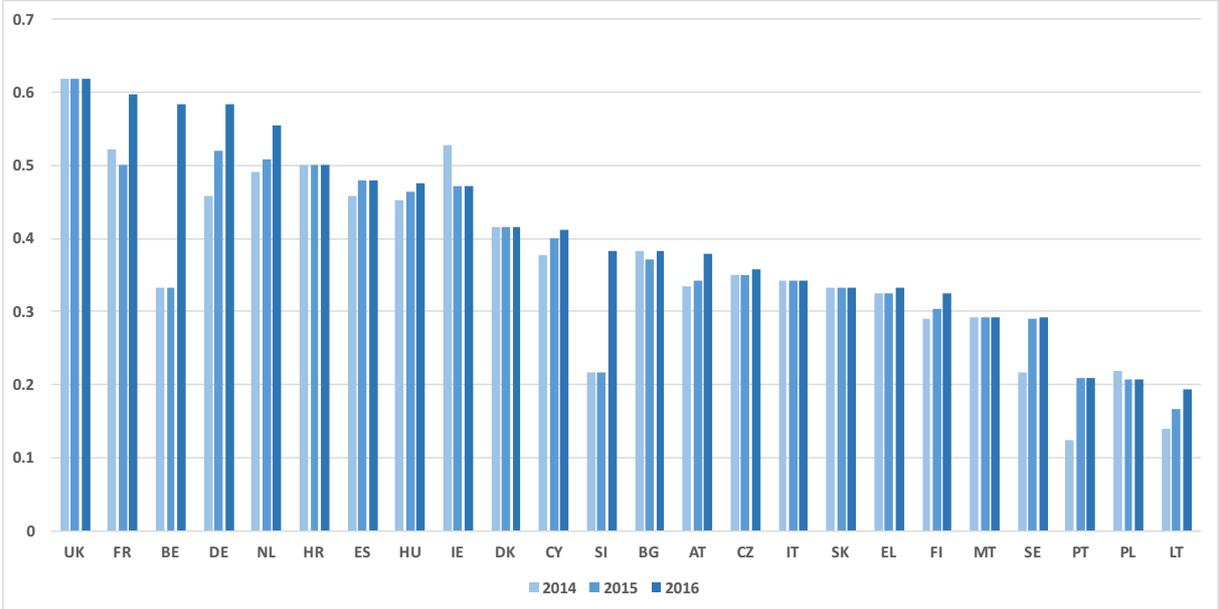
Support structures for data sharing are developed in some EU Member States. Given the lack of responses from several countries, one can however assume that these structures are not developed. The majority of the non-responding countries are also those with a rather low public perception of open access (see Figure 54).

There was no responding higher education institution offering all of the options. In 2016, a relatively high share of the options can be found in the Czech Republic, Estonia, Belgium,

the Netherlands and the United Kingdom (all above 0.60), while the country with the lowest share of structures was Denmark with 0.25. Overall, the average was 0.53 in 2016.

The situation is less advanced in public research organisations. The average for the EU was 0.41 in 2016. The level ranges from 20 % to 60 % – the lowest level to be found in Lithuania (0.19) and the highest in the United Kingdom (0.62).

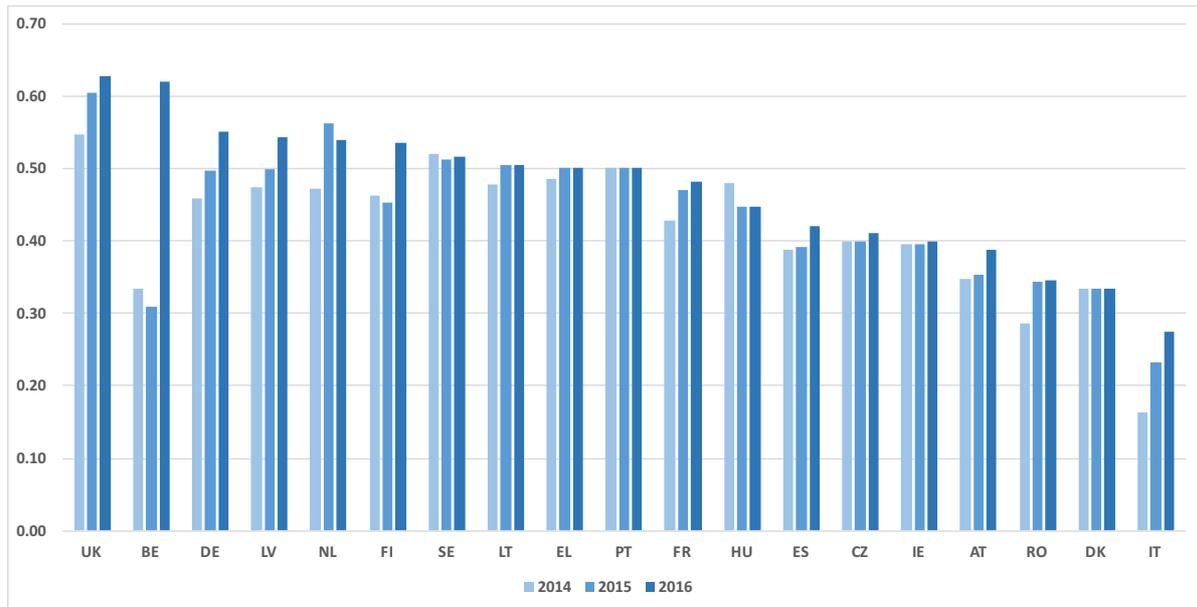
Figure 57 Public research organisations’ support structures for researchers as regards incentives and barriers for data sharing



Source: PRO Survey, MoRRI, 2017.  
 Note: No data for LU; insufficient response for RO, LV.

With both results taken together, the overall picture can be seen in Figure 58: the average of the 19 countries included was 0.47 in 2016. The highest range was recorded for the United Kingdom with 0.63 and the lowest for Italy with 0.27. The differences between the types of research organisations and their achievements in terms of incentives and barriers thus explain the aggregated picture.

Figure 58 OA6 - Support structures for researchers as regards incentives and barriers for data sharing



Source: HEI, PRO Surveys, MoRRI, 2017.  
 Note: No data for LU.

### Evolution

It is interesting to note that there are increases in a number of countries, which are not only due to higher response rates but also most likely due to real changes in support. Estonia, Belgium, the Netherlands, the United Kingdom, Germany, Latvia, Finland, Italy, Austria and Sweden indicated changes in their system from one year to another. Interestingly there is not a constant change in all of the countries but several indicated ups and downs.

Nevertheless, the absence of several Member States and the rather low shares of structures suggest that the concept of data sharing needs to be developed further.

## 6 Ethics

In the context of MoRRI, we used thus the following working definition: 'Ethics as a scientific discipline is concerned with normative rules for everybody. In the context of research and innovation, ethics is a common platform for deliberation and discussion of values in society that are based on perceptions of right and wrong, influenced by cultural norms and aiming at informing policymaking.'

The following indicators are included:

Number	Name of indicator	Note
E1a	Ethics at the level of higher education institutions and public research organisations	Data available for 2014, 2015, 2016. Composite index based on HEI and PRO surveys of MoRRI consortium, 2017.
E1b	Ethics at the level of higher education institutions and public research organisations (composite indicator)	Data available for 2014, 2015, 2016. Composite index based on HEI and PRO surveys of MoRRI consortium, 2017.
E2	National ethics committees index	Unchanged indicator based on EPOCH (2012).
E3a	Research-funding organisations index	Data available for 2014, 2015, 2016. Composite index based on RFO survey of MoRRI consortium, 2017.
E3b	Research-funding organisations index (composite indicator)	Data available for 2014, 2015, 2016. Composite index based on RFO survey of MoRRI consortium, 2017.

# Ethics

## Main observations



### Ethics committees

- Research ethics' committees are widely spread - in many Member States they are common such as Spain, the UK, Malta, Portugal, Slovenia, Ireland and Finland.
- At least 50 % of the higher education institutions in EU Member States have a committee with the exception of Bulgaria, where they are not everywhere..



### Funders

- Ethics assessments by funding organisations are done in a number of countries such as Belgium, Bulgaria, Croatia, Malta, Poland, or Slovenia.
- There are, however, a number of countries where this is not common practice such as in Cyprus, France, Hungary, Portugal, Spain and the UK.

### Research integrity



- Research integrity offices are less common in the EU.
- They are more common in Germany, Belgium and the UK and less so in Estonia, Greece, Malta, Portugal, or Slovenia.
- Research performing organisations are less likely to have a research integrity office compared to higher education institutions.

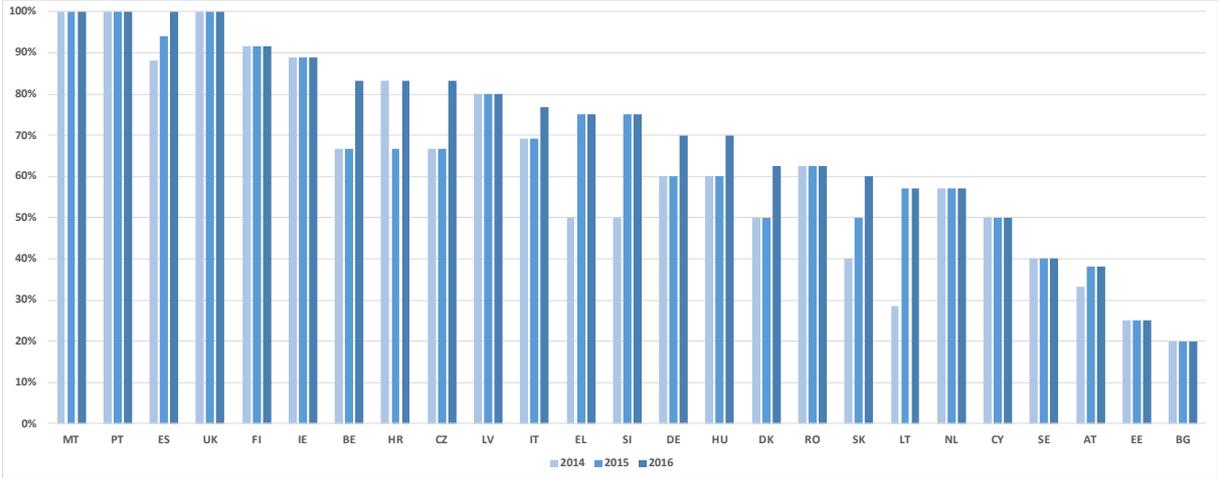
6.1 E1a - Ethics at the level of higher education institutions and public research organisations

The indicator

This indicator was derived from two questions in the surveys on higher education institutions and public research organisations (MoRRI, 2017), namely: 'Did your organisation have a research ethics committee?' and 'Did your institution have a research integrity office?' (operating during 2014, 2015 and 2016).

Outcomes

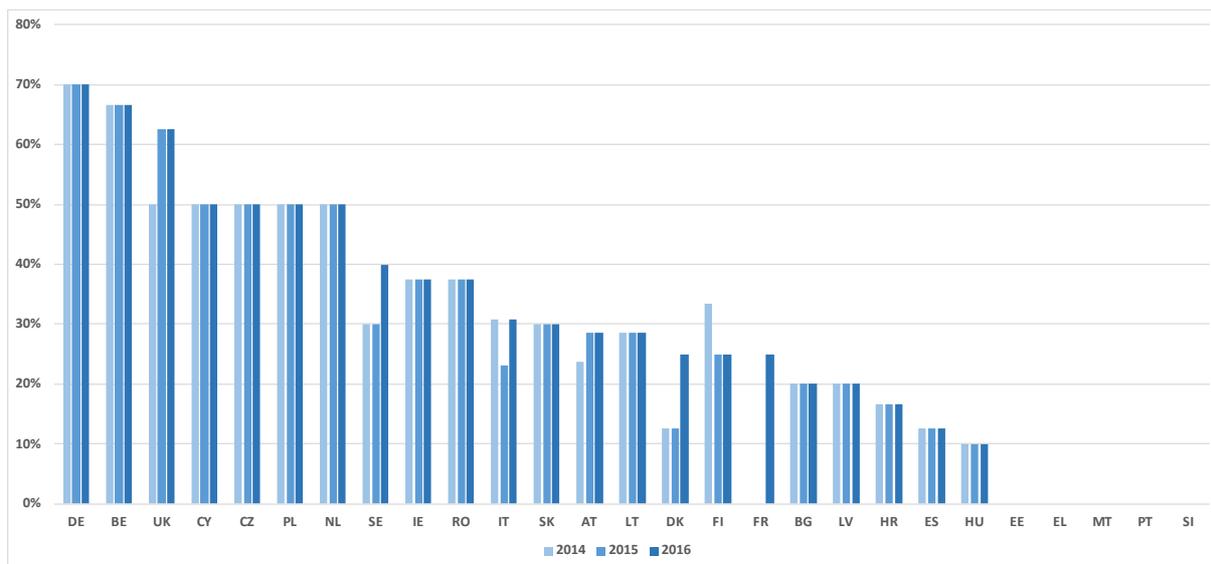
Figure 59 Share of higher education institutions having a research ethics committee



Source: HEI Survey, MoRRI, 2017.  
 Note: No data for LU. FR and PL's response rate too low.

Research ethics committees at higher education institutions are quite common in a number of Member States, such as the United Kingdom, Malta and Portugal. In Spain, the reporting higher education institutions indicated a change between 2014 and 2016 in order to achieve a very high degree in 2016. In another 17 Member States, ethics committees are more often established than non-established (all countries above 0.50). Only Sweden, Austria, Estonia and Bulgaria are below the mean, suggesting that many higher education institutions do not have an ethics committee.

Figure 60 Share of higher education institutions having a research integrity office



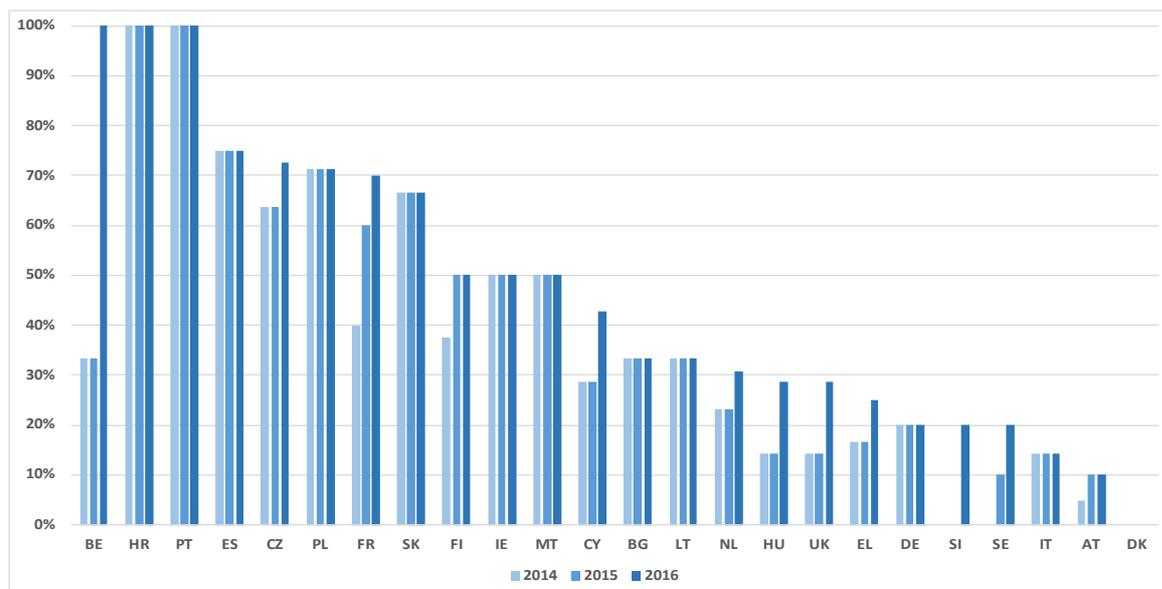
Source: HEI Survey, MoRRI, 2017.

Note: No data for LU. FR and PL's response rate too low.

Research integrity offices are less common in the EU according to the results presented in Figure 60. While the majority of EU Member States report this type of organisation, 5 MS (Estonia, Greece, Malta, Portugal, Slovenia) do not have them. This type of office seems to be more common in Germany, Belgium and the United Kingdom compared to other countries.

Research integrity offices are a rather new type of structure to deal with good scientific practice but they can also address ethical questions of research. The responses from some countries suggest that there is mainly one form – for example Malta, Portugal, Spain – where the ethics committee dominates and the research integrity office does not play a role. In other countries, this clear-cut distinction is not as clear. There is one exception – Estonia – which has no research integrity offices and has a below mean index score for ethics committees.

Figure 61 Share of public research organisations having a research ethics committee



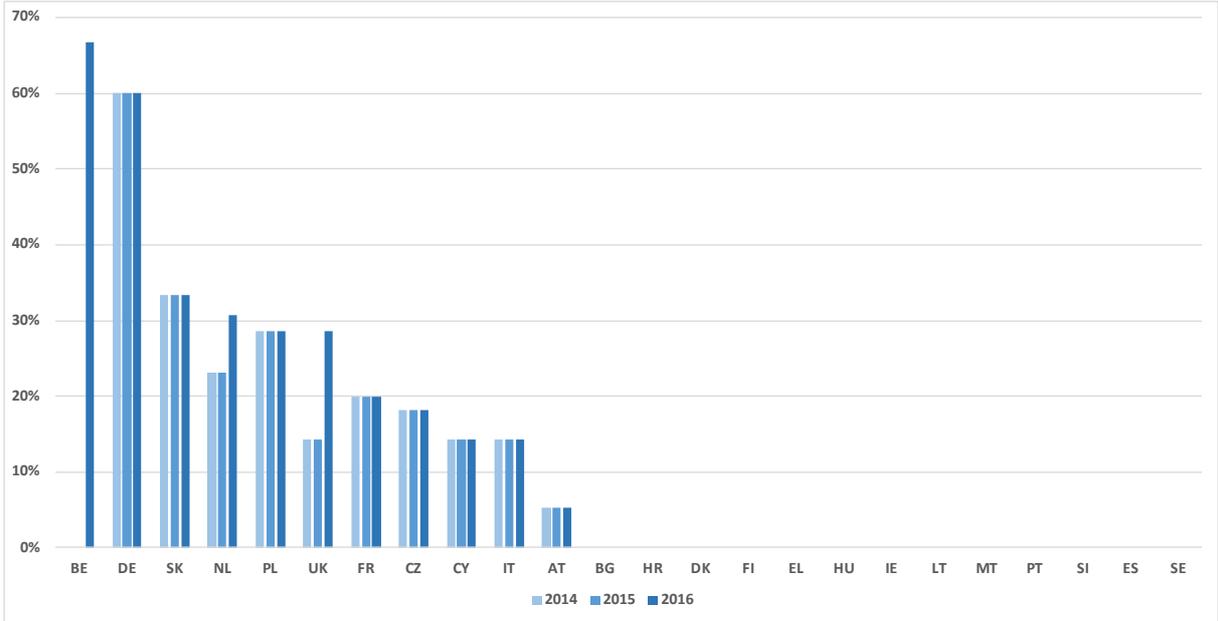
Source: PRO Survey, MoRRI, 2017.

Note: No data for LU. LV and RO's response rate too low.

In 2016, the situation for public research organisations varied from that of higher education institutions by the number of countries being much lower where at least 50 % of the organisations have a research ethics committee. Out of the 25 MS included in the survey, 21 indicate that at least 50 % of higher education institutions have a research ethics committee in existence, but only 11 out of the 25 MS report the same for the research organisations.

In terms of research integrity offices, the concept seems to be known to public research organisations in only 11 MS (see Figure 62).

Figure 62 Share of public research organisations having a research integrity office



Source: PRO Survey, MoRRI, 2017.  
 Note: No data for LU. LV and RO’s response rate too low.

**Evolution**

Between 2014 and 2016, significant developments in terms of higher education institutions’ research ethics committees can be seen for Lithuania, Greece, and from a higher level, also the Czech Republic, Belgium and Italy. However, they seem to be less often established at public research organisations. Between 2015 and 2016, developments were indicated for 12 Member States suggesting that research ethics committees are slowly increasing in public research organisations.

In terms of research integrity offices, the situation remained rather stable for the higher education institutions: only a few report changes between the years (United Kingdom, Sweden, Denmark, Finland and Italy), while for the remaining MS there were no changes between 2014 and 2016.

This structure remained unchanged for the majority of countries – only Belgium, the Netherlands and the United Kingdom reported any change. It is noteworthy that Belgium is the only Member State to report this structure for the first time in 2016.

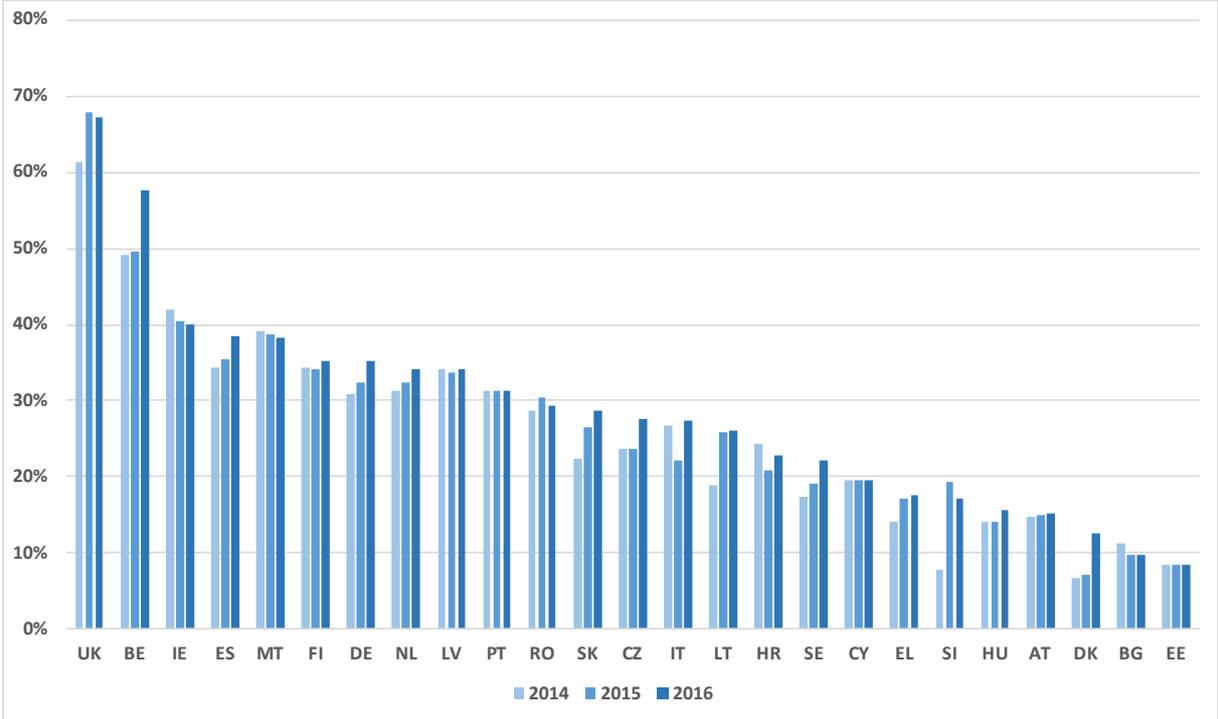
6.2 E1b - Ethics at the level of higher education institutions and public research organisations (composite indicator)

The indicator

This indicator is a complex composite that uses two starting questions in the surveys of higher education institutions and public research organisations (MoRRI, 2017), namely 'Do you have a research ethics committee?' and 'Do you have a research integrity office?', and subsequent questions on the design, functions and impacts of these institutional arrangements, such as 'Have the opinions [of the research ethics committee] been binding or non-binding recommendations?', or 'Has the research integrity office been able to take independent initiative to investigate a case?'

Outcomes

Figure 63 Composite index of research ethics committees/research integrity offices at higher education institutions

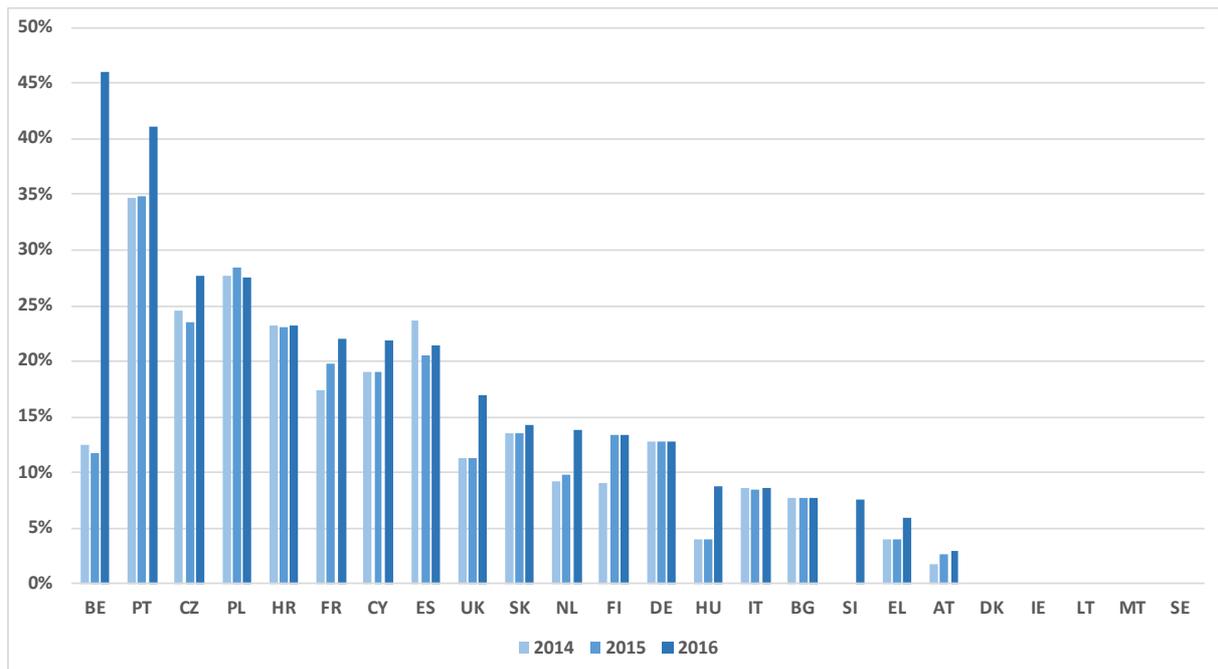


Source: HEI Survey, MoRRI 2017  
 Note: No data for LU. FR and PL's response rate too low.

The indicator indicates the spread between the Member States and whether research ethics committees and/or research integrity offices exist at higher education institutions. The share of higher education institutions is above 60 % in the United Kingdom and drops down to below 10 % in Estonia.

These structures are much less developed in research organisations. Besides Belgium, the share varies between zero and 28 % for those countries where public research organisations have research ethics committees and/or research integrity offices.

Figure 64 Composite index of research ethics committees/research integrity offices at public research organisations



Source: PRO Survey, MoRRI 2017

Note: No data for LU. LV and RO's response rate too low.

## Evolution

Between 2014 and 2016, the evolution between higher education institutions and public research organisations seemed rather active. One can see, overall, more research ethics committees and/or research integrity offices to be in existence for both types. One of the reasons may be that the umbrella organisation All European Academies (ALLEA) published revised guidelines. One can assume that Belgium is not the only country where the national academies have published a similar code for the national level – which has then been adopted by a large number of the Belgian higher education institutions. Decreases from one year to the next can either suggest that these structures are less stable than one could assume, or that reorganisation and rebranding occurred. Given that the survey responses were asked for the 3 years, we would not think that the differences occurred due to changes in survey respondents.

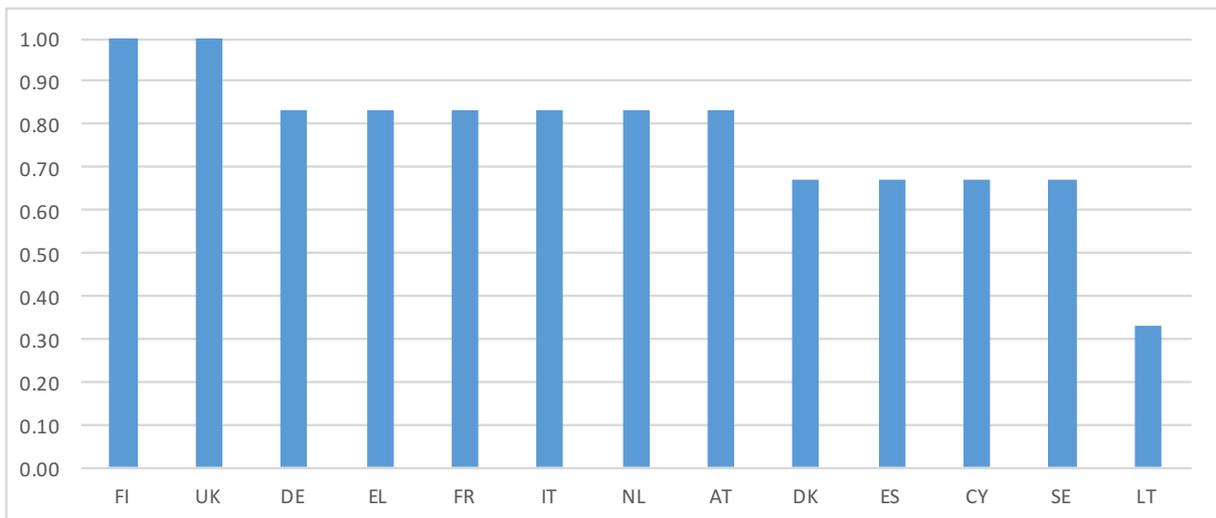
### 6.3 E2 - National ethics committees index

#### The indicator

This index captures features of national ethics committee's infrastructures in a country. It measures the existence, output, impact and quality of national ethics committees (NECs). The data source is qualitative and integrates research from the MASIS and EPOCH research projects. The data was collected only once.

#### Outcomes

Figure 65 E2 - National ethics committees' index, 2012



Source: EPOCH, 2012; calculation: Technopolis.

The variance between the 13 observed countries is obvious. The countries with the highest index are Finland and the United Kingdom (1.0 each), followed by another 6 MS at an index of 0.83. The only country with a rather low index is Lithuania with 0.33.

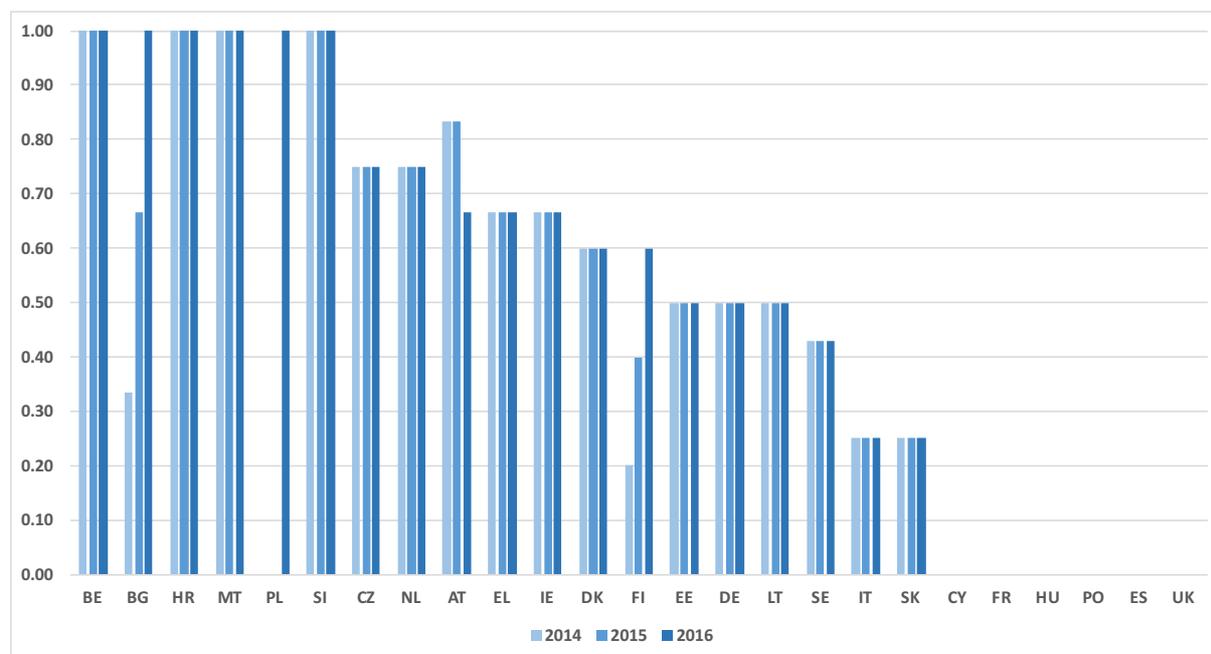
## 6.4 E3a - Research-funding organisations' index

### The indicator

The indicator is based on the dedicated survey of the funding organisations (MoRRI, 2017) and its question 'Has your organisation integrated any type of ethics assessment/review in its funding decisions?'

### Outcomes

Figure 66 E3a - Research-funding organisations' index



Source: RFO Survey, MoRRI, 2017.

The results of this indicator suggest that ethics assessments by funding organisations are done in a number of Member States, such as Belgium, Bulgaria, Croatia, Malta, Poland and Slovenia. There are, however, a number of MS where this is not common practice, such as in Cyprus, France, Hungary, Portugal, Spain and the United Kingdom. One should bear in mind that Member States maintain various systems: for example, in many Member States, issues such as dangerous pathogens or radioactive medical products in medical research are regulated and researchers may need prior approval from their own organisations before they apply for project funding from research funders. Therefore the absence of a procedure at funding organisation level does not mean that there is a lack of this procedure, but it could also be that it is provided at an earlier stage and/or by another competent organisation.

### Evolution

In terms of developments, it is interesting to note that the funding organisations in only 4 countries, namely Bulgaria, Poland, Austria and Finland, indicate some changes. In all others, the situation in 2016 was the same as in 2014. Austria was the only MS with a decrease, suggesting that a funding organisation has changed its assessments.

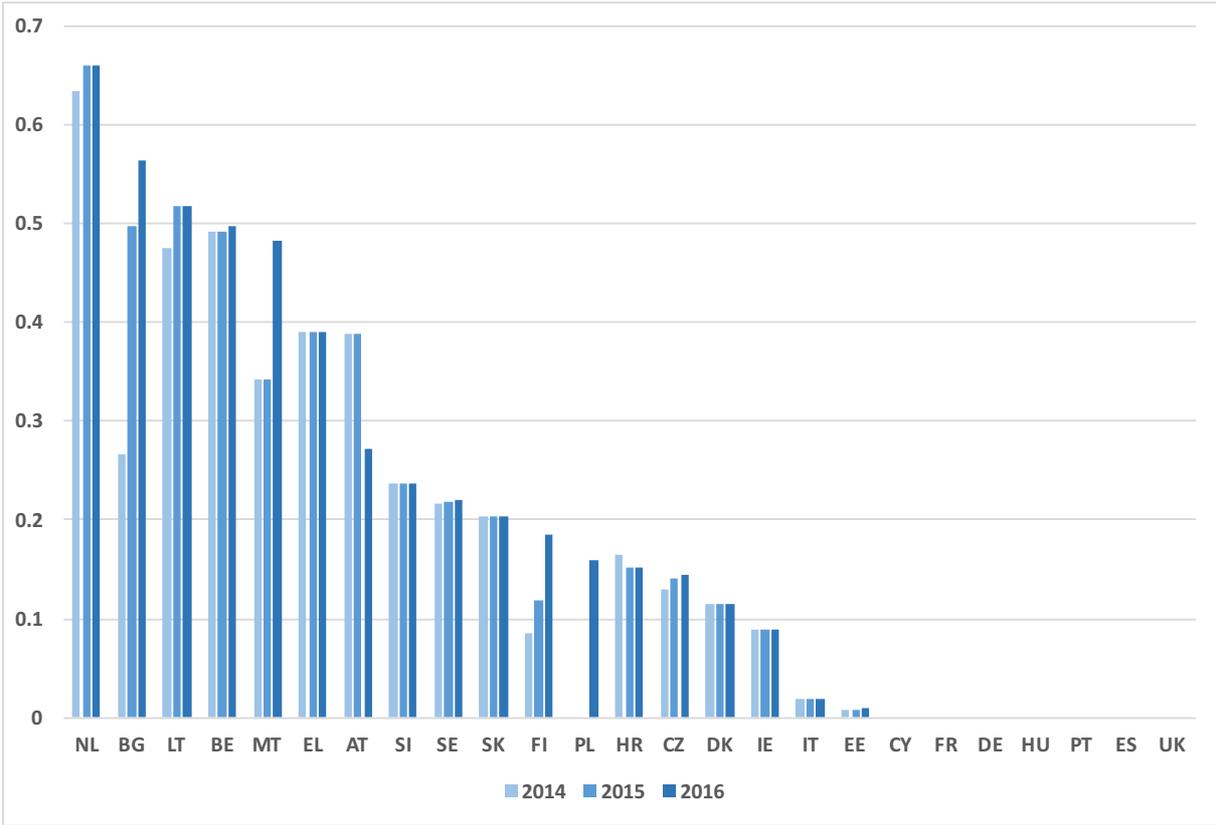
6.5 E3b - Research-funding organisations' index (composite indicator)

**The indicator**

This indicator is a complex composite that uses the starting questions in the survey of funding organisations (MoRRI, 2017), namely 'Has your organisation integrated any type of ethics assessment/review in its funding decisions?' and subsequent questions on the design and numbers of the projects concerned. It mirrors the indicator on 'Research-funding organisations' index'.

**Outcomes**

Figure 67 E3b - Composite index of research-funding organisations



Source: RFO Survey, MoRRI, 2017.

It is most likely that this composite indicator does not provide the most accurate picture about the situation in the Member States.

Research-funding organisations in only 18 Member States provided information. The outcome bears some resemblance to the previous indicator but while in the former a number of MS indicate 100 % agreement with a single question, this agreement drops significantly – most likely due to a rather complex question and a high dropout rate (compare, for example, Croatia in both these indicators).

**Evolution**

Among the 18 Member States that signalled relevant procedures, only 4 had no changes during the period 2014-2016, while changes seemed to have happened in all the others. The largest change can be found in Bulgaria, followed by Malta. Austria is the only country where some aspects seemed to have been abandoned between 2015 and 2016.

## 7 Governance

The European Commission defines governance in the context of responsible research and innovation as 'Policy-makers ... have a responsibility to prevent harmful or unethical developments in research and innovation.'<sup>13</sup>

While this definition provides a high-level policy, we defined it as 'all processes of governing, whether undertaken by a government, market or network, whether over a family, tribe, formal or informal organisation or territory and whether through laws, norms, power or language'. For science and innovation, this means the provision and distribution of resources as well as the rules of how those resources are used (outputs).

The following indicators are included:

Number	Name of indicator	Note
GOV1	Use of science in policymaking	Unchanged indicator based on MASIS (2012).
GOV2	RRI-related governance mechanisms within research-funding and performing organisations	Data available for 2014, 2015, 2016. Composite index based on HEI, PRO and RFO surveys of MoRRI consortium, 2017.
GOV3	RRI-related governance mechanisms within research-funding and performing organisations (composite indicator)	Data available for 2014, 2015, 2016. Composite index based on HEI, PRO and RFO surveys of MoRRI consortium, 2017.

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<sup>13</sup> [http://ec.europa.eu/research/science-society/document\\_library/pdf\\_06/responsible-research-and-innovation-leaflet\\_en.pdf](http://ec.europa.eu/research/science-society/document_library/pdf_06/responsible-research-and-innovation-leaflet_en.pdf)

# Governance

## Main observations



Gender equality



Ethics



Science literacy and science education



Public engagement



Open access

- There were many changes between 2014 and 2016.
- In Croatia, Portugal, the Netherlands, Spain and the UK, RRI dimensions diffused considerably.
- Beside Poland - which did not record any change, and Romania, which saw a decrease between 2015 and 2016, all other countries seem to have introduced one or more of the RRI dimensions in their organisations.
- By 2016, all Member States had reached a considerable degree, which signals a geographical widening of RRI dimensions in all Member States.

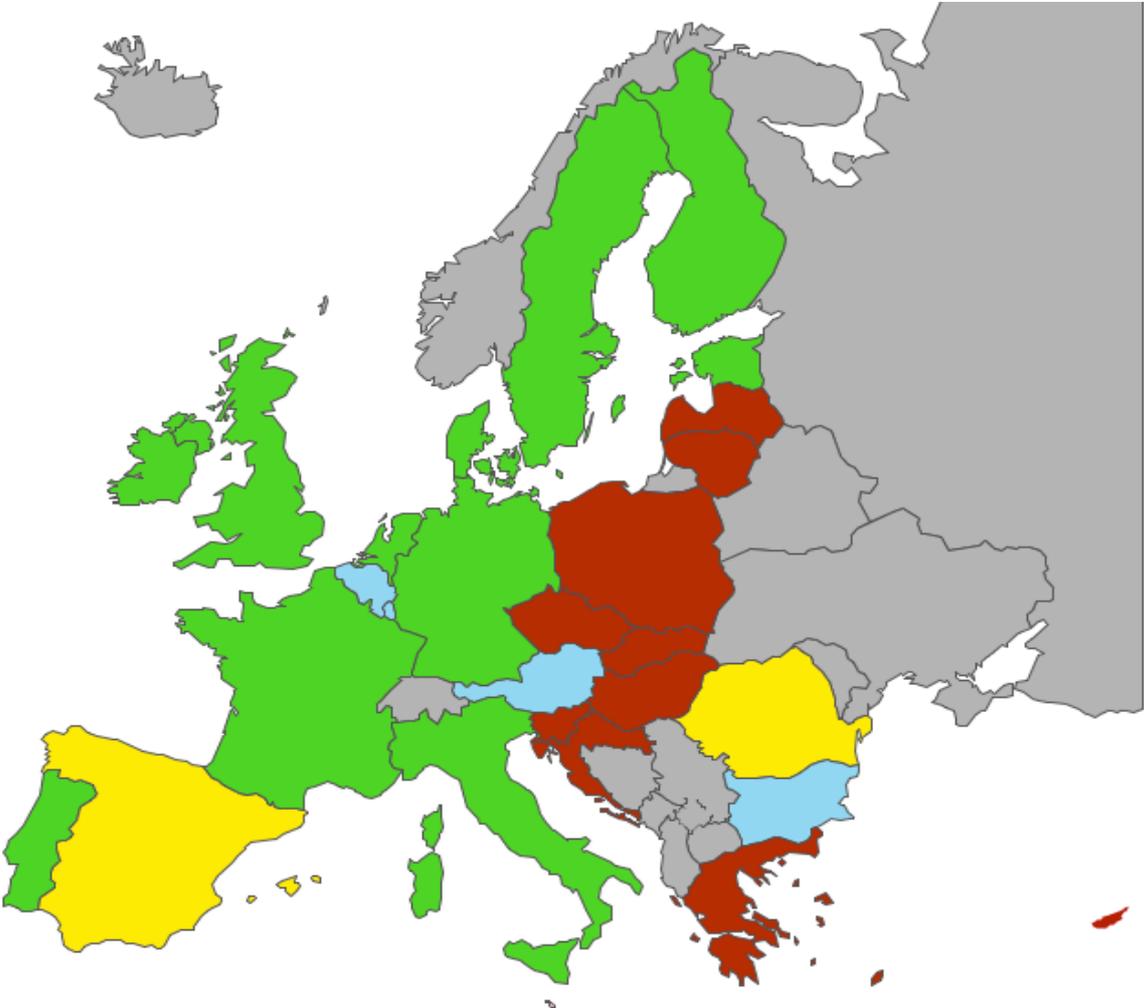
7.1 GOV1 - Use of science in policymaking

The indicator

The use of science in policymaking is an indicator of the extent to which science-based knowledge and advice is adequately used in policy-making processes. The indicator was built based on qualitative opinions by national experts in the course of the MASIS project (2012). There are two dimensions relating to the use of science-based knowledge in decision-making. One dimension concerns the extent to which a formalised structure for feeding science-based knowledge into decision-making is in place, e.g. in terms of institutional sites dealing with these processes. The other dimension concerns the extent to which science-based knowledge and advice have a real impact on decisions. Based on these elements, 4 categories of countries were identified: highly formalised procedures and high saliency; less formalised, but with considerable influence; formalised procedures but low impact of science-based knowledge in policy-making; and low degree of science-based knowledge in policy-making.

Outcomes

Figure 68 Use of science in policymaking, 2012



Source: MASIS report, 2012.  
Key: Green: highly formalised/high impact; blue: less formalised/considerable impact; yellow: formalised/low impact; red: no formalisation/low impact.

Using this indicator, the EU Member States can be broadly classified into 4 groups: 10 MS are highly formalised with a high impact on policymaking – all of them are to be found within the group of the old EU-15 Member States. The second largest group with 9 MS are neither characterised through formalisation nor through an impact of science on policymaking. Spain and Romania are 2 countries that are formalised but with a rather low impact, while it is noted that Belgium, Luxembourg, Austria and Bulgaria have a high impact despite being less formalised.

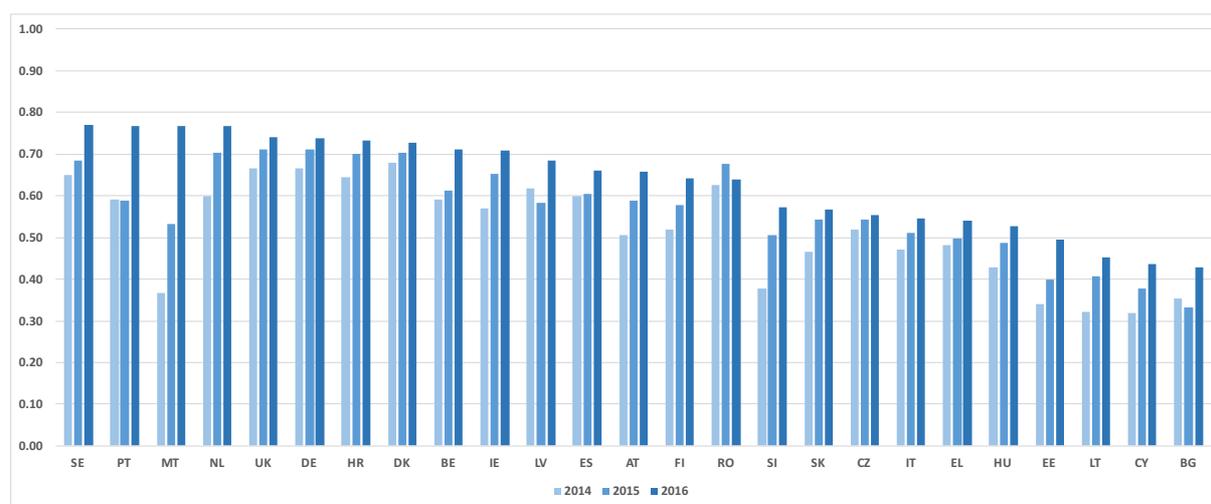
## 7.2 GOV2 - RRI-related governance mechanisms within research-funding and higher education institutions

### The indicator

The following indicator aims to provide an insight into how far the RRI concept has reached the research system by addressing the following question to funding organisations and research-performing organisations: 'Has your organisation established processes for managing ethics/ citizen engagement/ open access and open science/ gender equality/ responsible research and innovation?' Respondents were asked to identify each of the dimensions for which established processes are implemented in the organisation that they represent. A maximum score is given to organisations that cover all 5 dimensions.

### Outcomes

Figure 69 RRI-related governance mechanisms within research-funding and research-performing organisations



Source: HEI, PRO and RFO surveys, MoRRI, 2017.

Note: No data for LU. FR and PL's response rate too low.

In 2016, 10 Member States reached above the 0.70 mark, indicating that at least 70 % of the research-performing and funding organisations had RRI-related governance mechanisms in place. The highest shares with above 0.70 can be found in 10 MS ranging from Sweden to Ireland. Only 4 MS score below 0.50: Estonia, Lithuania, Cyprus and Bulgaria.

### Evolution

This indicator reflects an increase across all EU Member States between 2014 and 2016. The dimensions seem to diffuse considerably in all MS. While in 2014, the EU-average share was 0.52, it increased to 0.57 in 2015 and 0.63 in 2016. Most of the increase can be found in Malta (+0.40), but also Slovenia (+0.19), Portugal (+0.18), Estonia (+0.16) and Austria (+0.15) had marked increases.

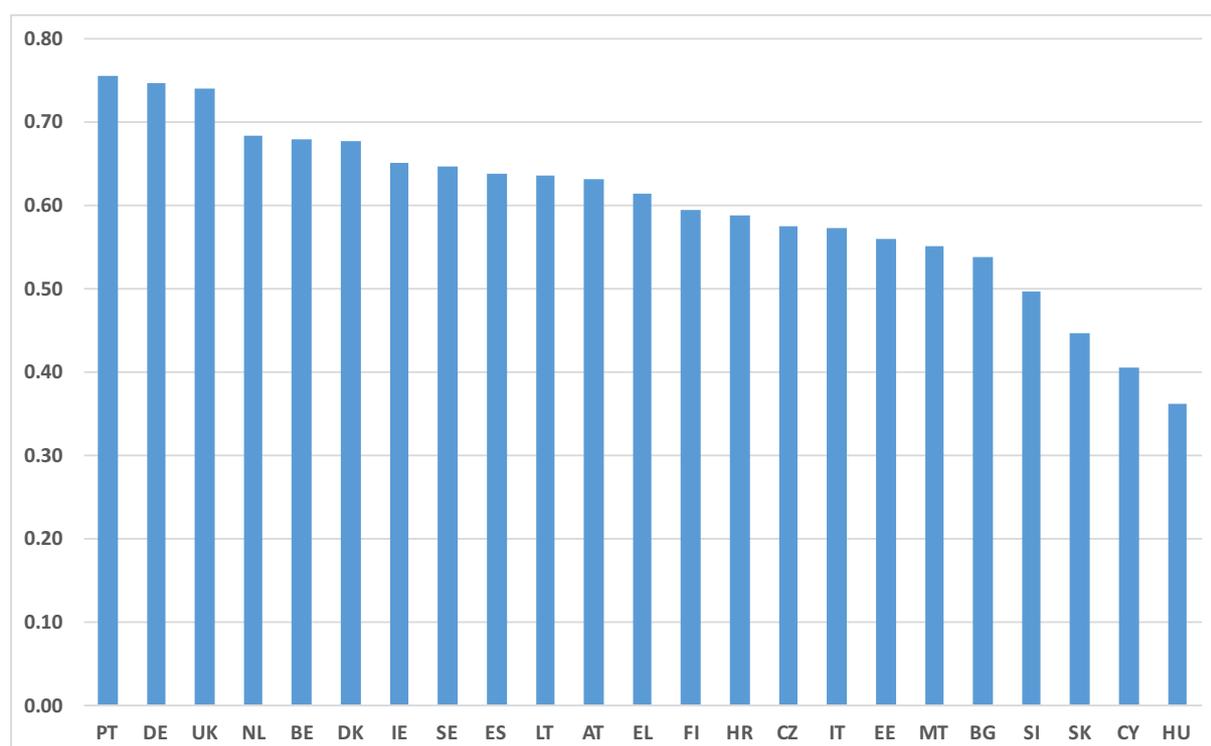
### 7.3 GOV3 - RRI-related governance mechanisms within research-funding and research-performing organisations – composite index

#### The indicator

This composite indicator is based on the question: 'Did your organisation actively encourage ethics/ citizen engagement/ open access and open science/ gender equality/ responsible research and innovation among researchers, employees or partner organisations during 2016, and are there changes compared to previous years?' Respondents were asked to indicate the degree of the present encouragement and that of the past 2 years to enable a better understanding of the dynamics.

#### Outcomes

Figure 70 Composite index on RRI-related governance mechanisms, 2016

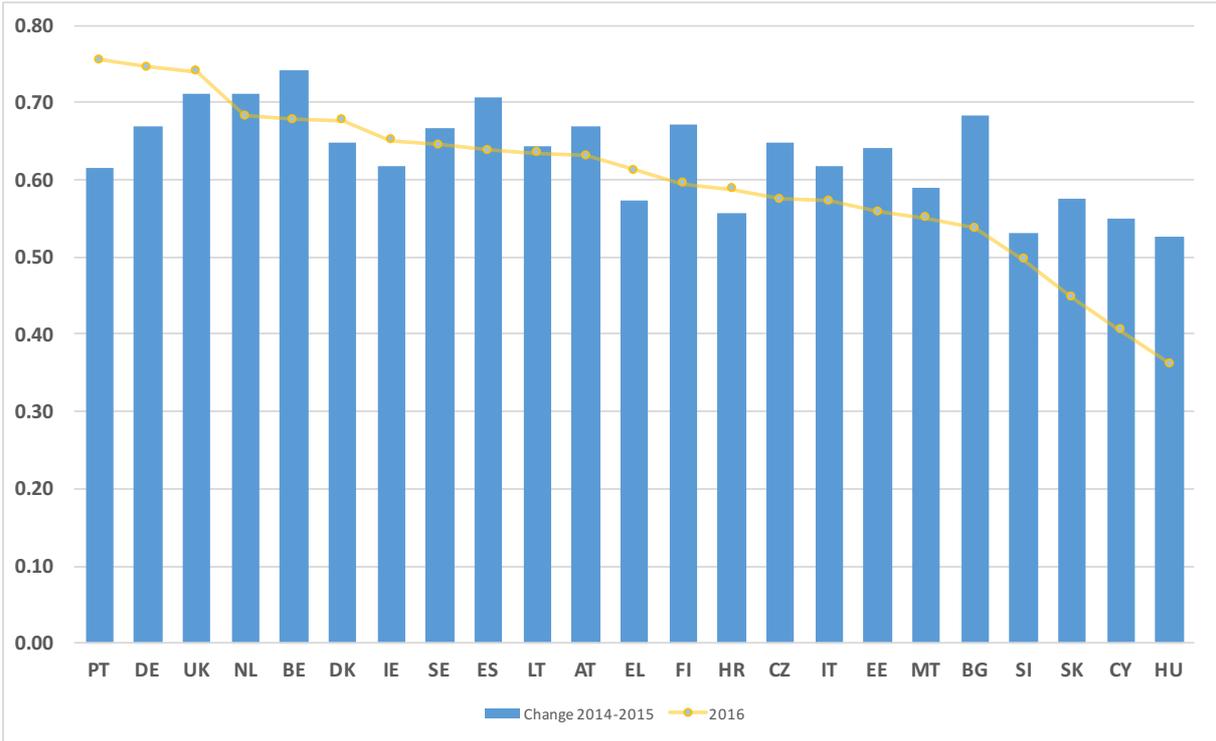


Source: HEI, PRO and RFO surveys, MoRRI, 2017.

There are several aspects to be noted. First, for 2016, one can see that only four MS (Slovenia, Hungary, Slovakia and Cyprus) are lagging in terms of encouragement. All other MS are above the mean of 0.5. Portugal, Germany and the United Kingdom reach values above 0.70.

# Evolution

Figure 71 Composite index on RRI-related governance mechanism changes, 2014-2015



Source: HEI, PRO and RFO surveys, MoRRI, 2017.

In terms of the changes between 2014 and 2015, Figure 71 includes the relevant information. In order to compare it to the situation in 2016, the 2016 data have been included in the form of small dots. The order of MS also follows the 2016 order. This enables one to analyse if changes in 2014 and 2015 happened and potentially affected the situation in 2016. Portugal, for example, indicated changes at a level of 0.61 between 2014 and 2015. In 2016, however, it reached 0.76, thus suggesting that the previous changes had a positive effect on the situation in 2016.

At the other end, Hungary indicated changes in 2014 and 2015 (0.53) that affected RRI-related governance mechanisms, but showed negative indications in 2016. The index for Hungary reached only 0.36.

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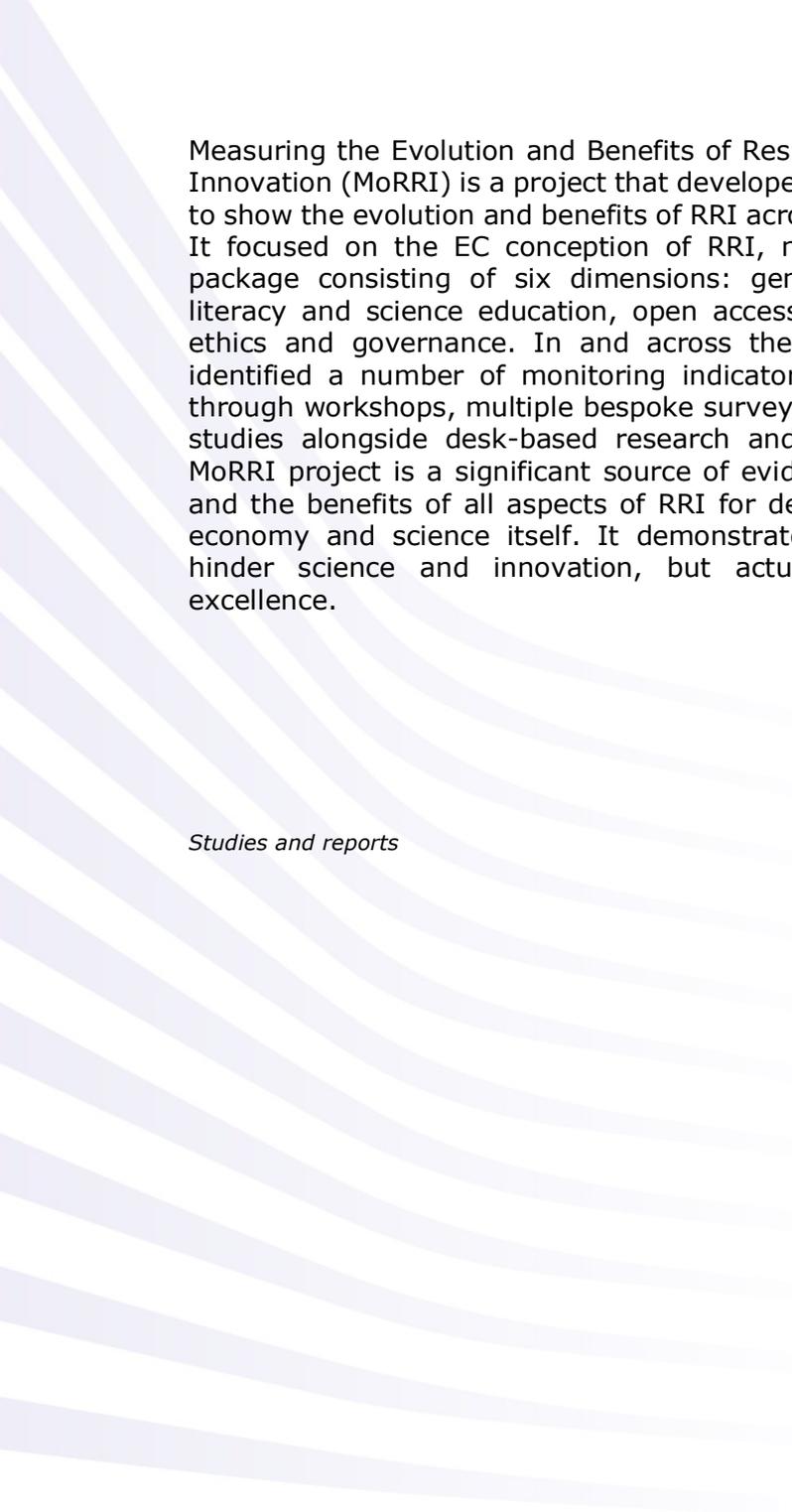
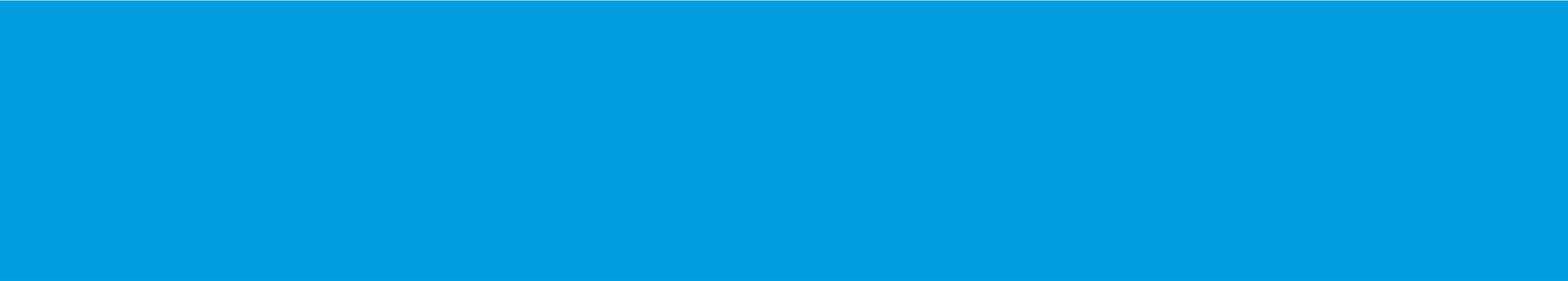
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Measuring the Evolution and Benefits of Responsible Research and Innovation (MoRRI) is a project that developed a monitoring system to show the evolution and benefits of RRI across EU member states. It focused on the EC conception of RRI, namely an operational package consisting of six dimensions: gender equality, science literacy and science education, open access, public engagement, ethics and governance. In and across these dimensions MoRRI identified a number of monitoring indicators. This was achieved through workshops, multiple bespoke surveys, and a series of case studies alongside desk-based research and other methods. The MoRRI project is a significant source of evidence on the evolution and the benefits of all aspects of RRI for democracy, society, the economy and science itself. It demonstrates that RRI does not hinder science and innovation, but actually fosters scientific excellence.

*Studies and reports*