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SUPER MoRRI – Scientific understanding and provision of an enhanced and robust monitoring system for RRI

D2.3: Second Responsible Research and Innovation Monitoring Report

Author(s): Thomas Kjeldager Ryan (AU), Christine Baker (AU), Massimo Graae Losinno (AU), Niels Mejlgaard (AU), Richard Woolley (CSIC-UPV)

Contributors: Peta Ashworth, Hendrik Berghäuser, Michael Bernstein, Gustav Bolin, Suzanne de Cheveigne, Ondrej Daniel, Ana Delicado, Anna Domaradzka, Laura Drivdal, Edward Duca, Teodora Georgieva, Ana Godonoga, Luis Junqueria, Peter Kakuk, Panagiotis Kavouras, Agrita Kiopa, Diāna Kiščenko, Luisa Massarani, Marzia Mazzonetto, Tomas Michalek, Padraig Murphy, Reda Nausedaite, Mika Nieminen, Arko Olesk, Paula Otero-Hermida, Petros Pashiardis, Anna Pellizzone, Alain de Sales, Bernd Stahl, Ruzica Tokalic, Jadranka Turnes, Inge van der Weijden, Magdalena Wicher, Lukasz Widla, Milena Wuketich.

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Table 1: Acronyms and abbreviations

Acronyms/Abbreviations	Definition
CCN	Country Correspondent Network
EU	European Union
EC	European Commission
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GERD	Gross domestic expenditure on Research and Development
GTDB	Green Tech Database
ISP	International Satellite Partner network
R&D	Research & Development
R&I	Research & Innovation
RFO	Research Funding Organisations
RPO	Research Performing Organisations
SwafS	Science with and for Society
RRI	Responsible Research and Innovation
OS	Open Science
REI	Research Ethics and Integrity
GE	Gender Equality
PATSTAT	European Patent Office – Worldwide Patent Statistical Database
PE	Public Engagement
TM	Third Mission

Executive Summary

The "Scientific understanding and provision of an enhanced and robust monitoring system for RRI" (SUPER MoRRI) project contributes to monitoring Responsible Research and Innovation (RRI). Over the duration of the project, three monitoring reports will be delivered. The report at hand (Deliverable 2.3) is the second in this small series.

In the First RRI Monitoring Report (MR1), a total of 26 indicators for monitoring RRI were presented. These were drawn from secondary data sources including Eurostat, She Figures, Web of Science and Unpaywall, and Eurobarometer. The majority of these were also included in the group of indicators produced by the MoRRI project, which is the predecessor of SUPER MoRRI. These indicators relate particularly to the key RRI areas of gender equality and open access in the context of research and innovation. These metrics are reported at the national level. A small selection of metrics concerning the broader national research and innovation system has been added.

In this Second RRI Monitoring Report (MR2) many of the secondary data indicators presented in MR1 are updated. New indicators are presented emerging from the SUPER MoRRI empirical research programme. The CCN-RFO study involved the participation of more than 50 RFOs in Europe and beyond. The CCN-RPO study involved data collection for a sample of 122 European universities. Descriptive data and planned indicators are also presented for responsible innovation from another SUPER MoRRI study, of gendered eco-innovations (GenEcoInno).

The third and final RRI Monitoring Report (MR3), scheduled for August 2023, will include further new data and indicators resulting from the ongoing SUPER MoRRI empirical program, along with any updates to the indicators included here that may become available.

1. Introduction

1.1. Scope and Objectives of the Deliverable

The "Scientific understanding and provision of an enhanced and robust monitoring system for RRI" (SUPER MoRRI) project contributes to monitoring Responsible Research and Innovation (RRI). Over the project duration, three monitoring reports will be delivered. The report at hand (Deliverable 2.3) is the second in this small series.

Three strategic documents collectively provide the background for SUPER MoRRI monitoring activities. The principles underpinning the SUPER MoRRI monitoring framework for RRI are outlined in the project's Strategic Development Plan. The project approach to large-scale data collection activities is provided in the Implementation Plan. The Case Study Co-creation Methodology Report presents targeted empirical research efforts supporting the development of understanding and information regarding pathways to RRI benefits.[1]

The SUPER MoRRI monitoring framework utilizes existing resources and data and creates new information from primary data collected as part of the project. It combines qualitative and quantitative approaches and covers different levels of the research and innovation system, including individuals, organisations, regions, and countries. Through inclusion of stakeholders in co-creation processes, it aspires to ensure that any proposed indicators emerging from the project are relevant, credibly contextualized, and responsibly conveyed. The SUPER MoRRI monitoring framework strives for transparency and FAIR data sharing, and employs openly accessible research protocols for each component of the primary data collection.

Figure 1 presents a revised version of the main components of the SUPER MoRRI Implementation Plan. In light of the COVID-19 pandemic, the timing of these components has been adjusted.

[1] SUPER MoRRI strategic documents are available at the project Open Science Framework home https://osf.io/z95gw/

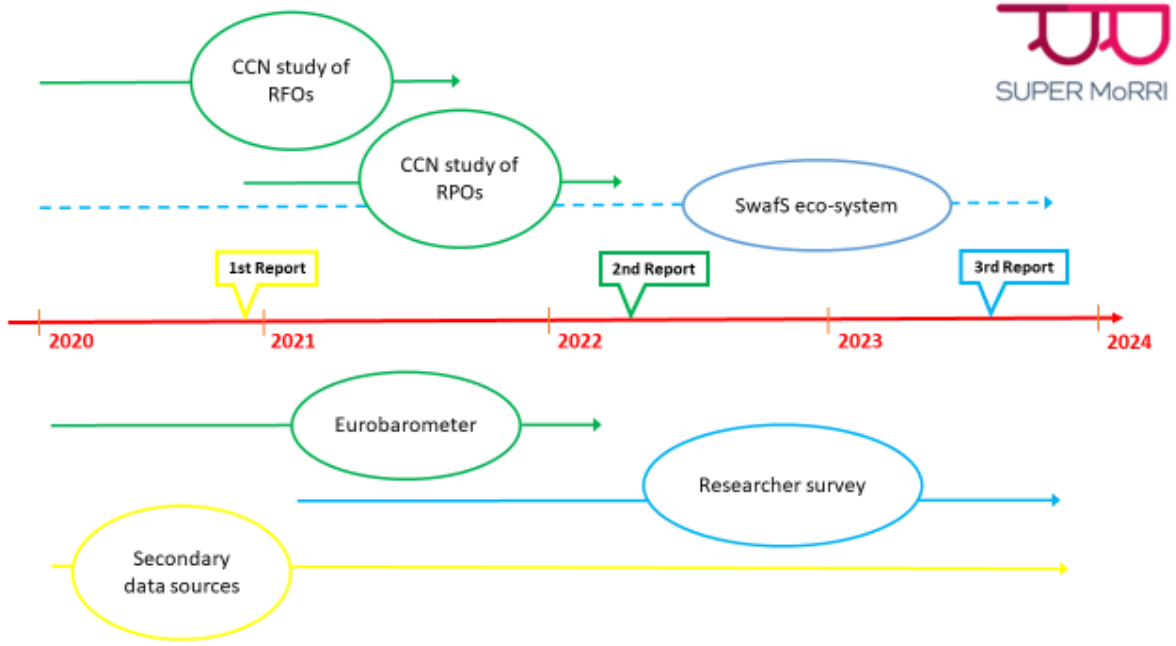


Figure 1: Revised timing of main data collection vehicles

The color-coding of Figure 1 illustrates the sequential inclusion of data from the empirical components of the Implementation Plan in the successive monitoring reports.

The 1st RRI Monitoring Report (MR1) reported secondary data at the country level. MR1 covers the EU27 along with Norway and the UK.

The 2nd RRI Monitoring Report (MR2) expands on MR1 by additionally including information, data, and indicators generated by two completed large-scale studies, one of research funding organisations (RFOs) and the other of research performing organisations (RPOs). These studies were conducted utilising the SUPER MoRRI Country Correspondent Network (CCN). Preliminary results are also included from a study of gendered eco innovations. MR2 updates the metrics and indicators included in MR1. All indicators based on secondary data included in the MR1 are updated with new data points wherever available. The Report also includes results from a new Eurobarometer on public perceptions of research and innovation which was carried out under the auspices of the European Commission in spring 2021. A number of items included in the 2021 Eurobarometer extend time-series existing from previous Eurobarometers. For example, items capturing citizens' perceptions of being interested in and informed about science have been repeated in Eurobarometers since 1992.

Finally, the 3rd RRI Monitoring Report (to be delivered in August 2023) will include results from a large-scale survey of researchers' practices and perceptions in relation to RRI. It will present information and data generated as part of the project's ongoing interactions between SUPER MoRRI and the 'eco-system' of RRI-related projects funded under the European Union's Horizon 2020 'Science with and for Society' (SwafS) programme.

1.2. Relation to Other Tasks and Deliverables

The 2nd RRI Monitoring Report is the second direct output relating to Tasks 2.5 (data collection) and 2.6 (basic analyses, data presentation, and transmission) in Work Package (WP) 2, as delineated by the SUPER MoRRI Grant Agreement. The contents of MR2 were significantly informed by Tasks 1.2 (critical assessment of existing MoRRI indicators) and 1.8 (definition of continuing MoRRI indicator set) in WP1. In turn, the data presented in this report will be transferred to the SUPER MoRRI dashboard developed in WP3, thus linking to Task 3.4 (technological platform development and deployment). Data from the CCN-RFO, CCN-RPO, and GenEcoInno studies presented in this report will also be used in the preparation of project deliverable D5.2. Finally, MR2 also relates to the annotated methodological report in deliverable 2.4.

1.3. Deliverable Structure and Navigation

This 2nd RRI Monitoring Report is structured as follows: The Executive Summary briefly presents the purpose and contents of this report. Chapter 1 introduces the scope and objectives of the deliverable, its relation to other tasks within the project, and its structure. Chapter 1 presents the data collection and curation methodologies.

Chapters 2 to 5 present indicators from secondary data sources including Eurostat, Eurobarometer, She Figures, and Unpaywall. Chapter 6 presents data and indicators from the CCN-RPO study and Chapter 7 covers the CCN-RFO study. Chapter 8 presents the forthcoming metrics based on the Gendered Eco-Innovations Study, utilising data from the Green Tech Database (GTDB). Chapter 9 concludes the report with a brief discussion. Appendices attached include data fiches for indicators, and Protocols for the CCN-RPO and CCN-RFO studies.

Each data visualisation contained in Chapters 2-5 is accompanied by a hyperlink to the relevant full indicator fiche in the Appendix 1. A corresponding hyperlink to the relevant data visualisation in the body of the Report accompanies each data fiche. In this way a simple one-click navigation between these two elements is facilitated in both directions.

1.4. Data sources

This section summarises the major data sources used in this Report. The primary data reported for the first time here have been generated from the SUPER MoRRI empirical research programme. Secondary data reported previously in MR1 have been updated in this Report.

1.4.1. Primary data

Two SUPER MoRRI studies were conducted to generate primary data at the level of organisations. These two studies focused on research performing organisations (RPOs) and research funding organisations (RFOs). Both these studies had a coverage of the EU-27 plus Norway and the UK. Both also included an international benchmarking component.

The broad coverage of these two studies was made possible by their methodological design. A Country Correspondent Network (CCN) was established for the purpose of conducting these studies. The CCN was established through a public open call for correspondents administered by Aarhus University (AU). Correspondents were duly contracted to cover those countries in which SUPER MoRRI does not have

a consortium partner. In SUPER MoRRI countries the work of the CCN was undertaken by consortium partners. International benchmarking for both these studies was made possible by the establishment of a network of International Satellite Partners (ISPs) administered by *Universitat Pompeu Fabra* (UPF). Full details of the CCN and ISP processes and the lists of country correspondents (CCs) and ISPs can be found in the SUPER MoRRI Implementation Plan.[2]

The establishment of the CCN and ISP ensured that data collection was performed by researchers with local R&I system knowledge, relevant language competencies. CCs and ISPs were also selected for their knowledge of RRI. Conducting detailed qualitative research with a broad coverage of organisations and countries required methodological innovation and the CCN/ISP approach delivered an efficient data collection method for the CCN-RFO and CCN-RPO studies.

A research protocol was developed for both studies and published ahead of the fieldwork on the open science framework (OSF).[3] These protocols provided documentation and instructions for the conduct of each of the studies. Each protocol document contained a comprehensive research design, including:

- a background on the CCN/ISP;
- an overview of the study approach and timetable;
- description of the study definitions, objectives and research questions;
- a summary of the process for selecting organisations for inclusion in the studies;
- description of the methodology for desk research;
- a reporting template;
- data handling and management procedures;
- a note on ethics approval and informed consent forms;
- a description of the study quality assurance procedure; and
- standard emails for inviting participation and for study validation inquiries.

Data and information from the CCN-RPO and CCN-RFO studies are presented in Chapters 6 and 7 respectively of this Report.

1.4.2. Secondary data

Since the publication of the 1st Monitoring Report many of the secondary data sources used have been updated. Table 2 summarises these 26 indicators and their most recent update.

Table 2: Overview of Secondary Data based Metrics

Indicator title	Source	Status
Intramural R&D expenditure per inhabitant in all sectors	Eurostat	Updated to include 2018 and 2019 See 2.5
Intramural R&D expenditure as a percentage of GDP in all sectors	Eurostat	Updated to include 2018 and 2019 See 2.6
Patent applications to the EPO by priority year per million inhabitants	Eurostat	Not updated See 2.7

[2] Implementation plan link on our web and OSF
[3] RFO protocol on OSF; RPO protocol on OSF

Indicator title	Source	Status
Share of female researchers by sectors of performance (all sectors)	Eurostat	Updated to include 2018 and 2019 See 2.1
Share of female researchers by sectors of performance (business enterprise sector)	Eurostat	Updated to include 2018 and 2019 See 2.2
Share of female researchers by sectors of performance (higher education sector)	Eurostat	Updated to include 2018 and 2019 See 2.3
Share of female researchers by sectors of performance (government sector)	Eurostat	Updated to include 2018 and 2019 See 2.4
The Glass Ceiling Index	She Figures	Updated to include 2015 and 2018 See 3.1
Dissimilarity Index (higher education sector)	She Figures	Updated to include 2014 and 2018 See 3.2
Dissimilarity Index (government sector)	She Figures	Updated to include 2014 and 2018 See 3.3
Gender pay gap (%) in the economic activity 'Scientific research & development'	She Figures	Not updated See 3.5
Percentage of a country´s publications with a sex or gender dimension in their research content	She Figures	Updated to include 2015-2019 (pooled) See 3.4
Women to men ratio of inventorships, all International Patent Classification (IPC) sections	She Figures	Not updated See 3.6
Women to men ratio of corresponding authorship in all fields of R&D	She Figures	Not updated See 3.7
Percentage of open access publications	WoS and Unpaywall	Updated to include new data for the whole time series + 2020 See 5.1
Percentage of open access publications (Green)	WoS and Unpaywall	Updated to include new data for the whole time series + 2020 See 5.2
Percentage of open access publications (Gold)	WoS and Unpaywall	Updated to include new data for the whole time series + 2020 See 5.3
Percentage of open access publications (Hybrid)	WoS and Unpaywall	Updated to include new data for the whole time series + 2020 See 5.4

Indicator title	Source	Status
Percentage of open access publications (Bronze)	WoS and Unpaywall	Updated to include new data for the whole time series + 2020 See 5.5
Percentage of publications classified as industry co-publications	WoS and Unpaywall	Not updated See 5.6
Percentage of the EU-public interested in scientific discoveries	Eurobarometer	Updated to include 2020 See 4.1
Percentage of the EU-public that feels informed about science	Eurobarometer	Updated to include 2020 See 4.2
Percentage of correct science quiz answers in the EU-public	Eurobarometer	Updated to include 2020 See 4.3
Percentage of the EU-public that believes that scientists are among the best qualified to explain the impact of scientific and technological developments	Eurobarometer	Updated to include 2020 See 4.4
Percentage of the EU-public that attends public meetings or debates about science and technology	Eurobarometer	Updated to include 2020 See 4.5
Percentage of the EU-public that sign petitions or join street demonstrations on science and technology matters	Eurobarometer	Updated to include 2020 See 4.6

Data and visualisation for the continuing indicators based on secondary data are presented in Chapters 2 to 5 of this Report.

A new addition to MR2 that was not present in MR1 is data and visualisations for responsible innovation. These data are drawn from PATSTAT and the Green Tech Database (GTDB). Descriptive data on patenting activity and the participation of women inventors in technology fields focused on environmental sustainability are presented. These data will be the basis of new indicators and visualisations that will be fully developed for MR3. This new material is presented in Chapter 8 of this Report.

1.4.3. Calculation of averages

During the course of SUPER MoRRI there have been changes to country membership of the European Union. This has meant changes to the calculation of EU averages. In what follows, wherever a calculation of averages is used it is accompanied by a note that specifies the basis for its calculation. Table 3 summarises the main parameters for calculating averages in this Report.

Table 3: Summary of averages used in this Report

Type of average	Countries included	Description
Non-weighted average (EU27)	The EU27 member states.	Some data sources do not provide a weighted average, and due to the complexity of the metrics a simple average is calculated.

Type of average	Countries included	Description
Weighted average (EU28)	The EU27 member states and the UK.	Wherever available the weighted average for a given metric is presented in this report. As the UK was a Member State of the EU in the reported years, the UK is included in this type of average. This type of weighted average can be considered the best representation of the EU-average for the relevant period.
Weighted EU Average	Member States of the EU.	The metrics based on Euro Barometer surveys, include surveys going back to 1992 up until 2020. As the number of EU Member States has increased this has changed the number of MS to be included in the EU-average for a given year. For each metric based on Euro Barometer surveys, the EU-average is a weighted average based on the Member States of the EU at the time of data collection.

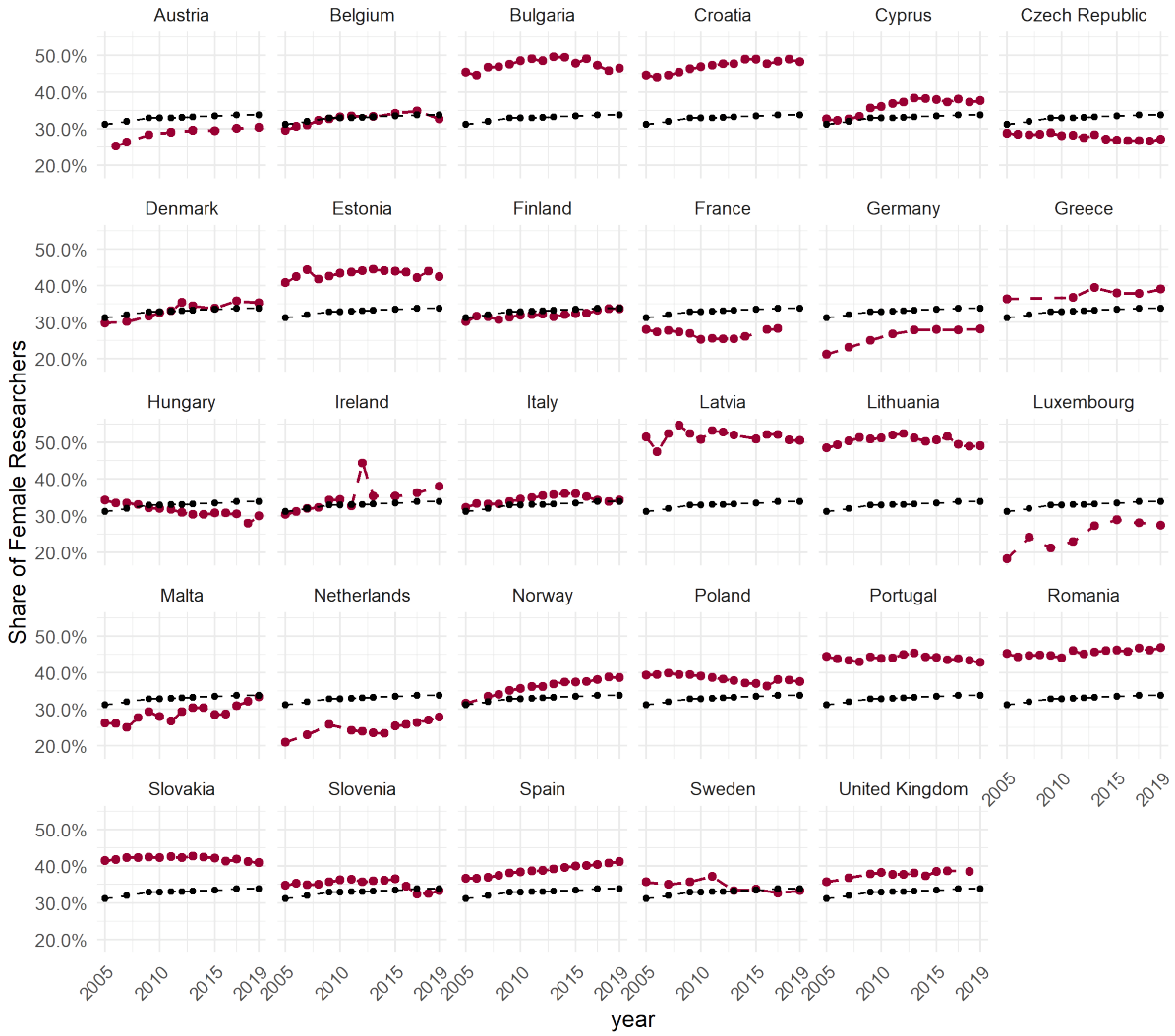
2. Eurostat Indicators

This section presents indicators based on data from Eurostat. Eurostat is a Directorate-General of the European Commission (EC), its primary objective is to provide statistical information to the institutions of the European Union (EU).

In the first monitoring report, data from Eurostat was used to contextualise the level of research and innovation activity across countries. For this purpose metrics were presented on the level of national spending on R&D, both per inhabitant and as share of gross domestic product, and the number of patent applications filed to the European Patent Office per million inhabitants of a country.

Since the publication of the first monitoring report, Eurostat has released data for 2018 and 2019. This section presents updated versions of these metrics. Of the seven Eurostat-based indicators included in MR1, all but one have been updated.

2.1. Share of female researchers by sectors of performance, all sectors



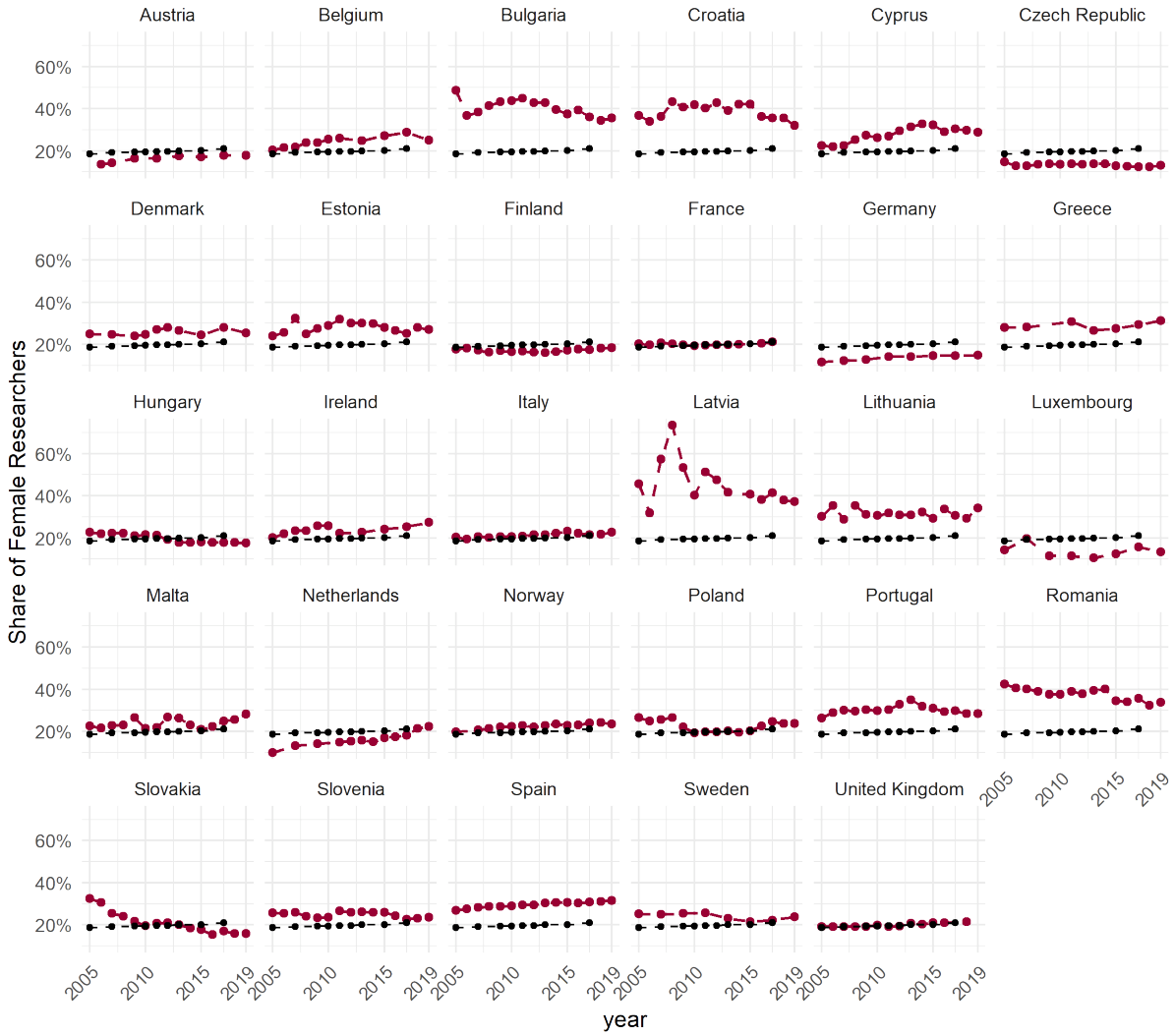
Coverage: EU27 + NO & UK (2005-2019).
Data missing: 2005 (AT); 2006 (DK, DE, EL, LU, NL, SE, UK, NO); 2007 (EL);
2008 (AT, DK, DE, EL, LU, NE, SE, UK); 2009 (EL); 2010 (AT, DE, EL, LU, NE, SE);
2012 (AT, BE, LU, SE); 2014 (AT, BE, DK, DE, EL, EI, LT, LU, SE); 2015 (FR);
2016 (AT, BE, DK, DE, EL, IE, LU, SE); 2018 (AT, BE, DK, FR, DE; EL, IE, LU, SU); 2019 (FR, UK).
Black dashed line: Weighted average (EU28).

Figure 2: Share of female researchers in all sectors

Figure 2 depicts change in the share of female researchers in all sectors for the period 2005-2019. For a detailed data fiche for the indicator see Table 15.

In 2019 the EU28 average in share of female researchers in all sectors was 33,8%, the same average share as in 2017. The Netherlands experienced the largest increase in share of female researchers from 2017 to 2019 from 26,4% to 27,9%. Latvia experienced the largest decrease in share of female researchers in the same period, from 52,2% to 50,6%.

2.2. Share of female researchers by sectors of performance, Business enterprise sector



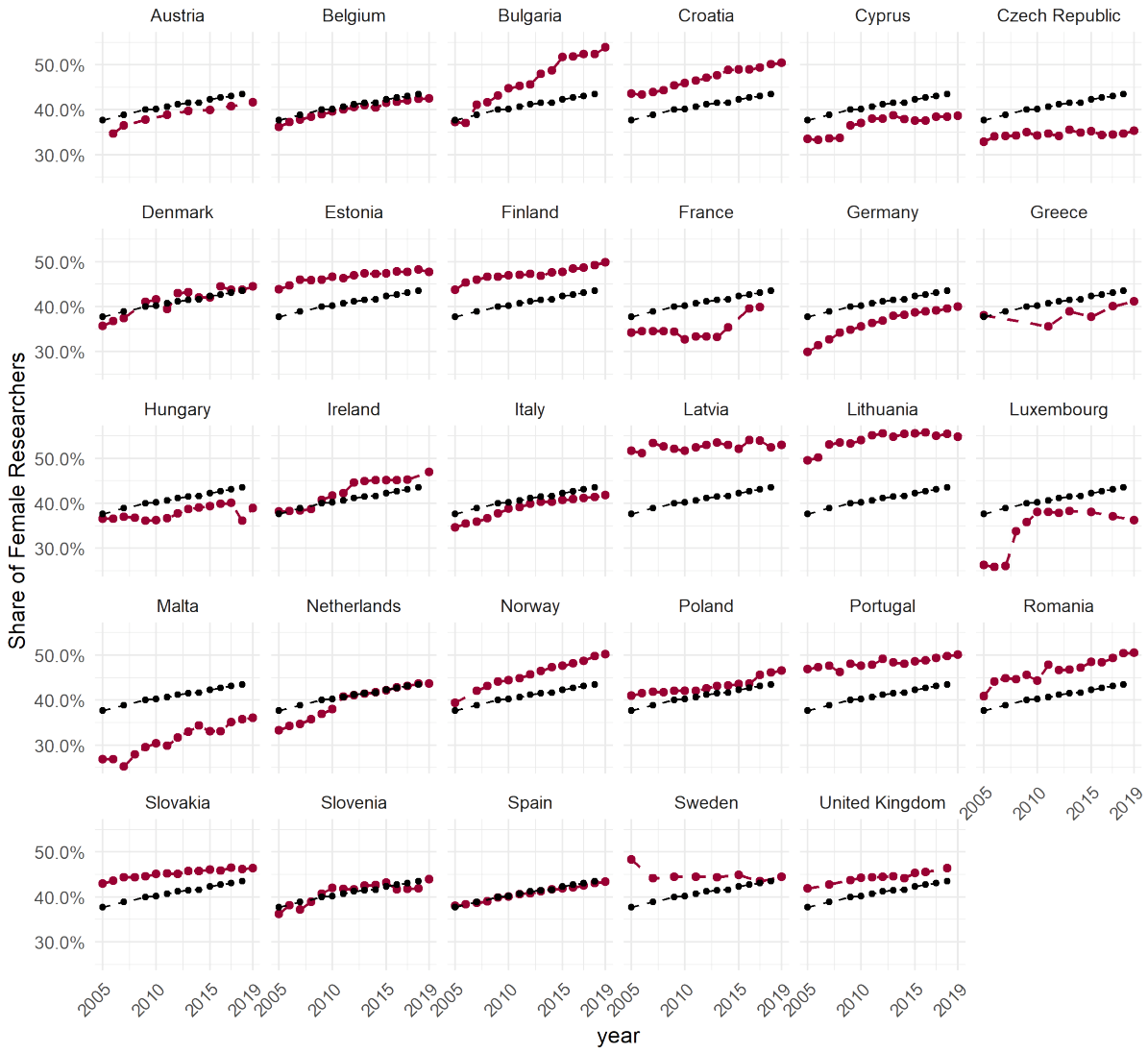
Coverage: EU27 + NO & UK (2005-2019).
Data missing: 2005 (AT); 2006 (DK, DE, EL, LU, NE, SE); 2008 (DK, DE, LU, NE, AT, SE); 2009 (EL); 2010 (DE, EL, LU, NI, AT, SE), 2012 (BE, DE, IE, EL, LU, SE); 2014(BE, DK, DE, IE, EL, LT, LU, AT, SE); 2015 (FR); 2016 (BE, DK, DE, LU, AT, SE); 2018 (AT, BE, DK, EU27, EU28, FR, DE , EL, IE, LU, SE); 2019 (UK, DE, EU28).
Black dashed line: Weighted average (EU28).

Figure 3: Share of female researchers in the business sector

Figure: 3 depicts the development in the share of female researchers in the business enterprise sector for the time period 2005-2019. For a detailed data fiche for the indicator see Table 16. From 2017 to 2019 the EU27 average share of female researchers in the business enterprise sector remained stable.

Lithuania and Malta experienced the highest increases in the share of female researchers in the business enterprise sector, with an increase from 30,6% in 2017 to 34,1% in 2019 in Lithuania and an increase from 24,9% to 28,2% in Malta for the period. Latvia and Belgium experienced the largest decreases in the share of female researchers in the business enterprise sector from 2017 to 2019, from 41,5% to 31,7% in Latvia and from 28,7% to 25% in Belgium.

2.3. Share of female researchers by sectors of performance, Higher education sector



Coverage: EU27 + NO & UK (2005-2019).
Data missing: DK (08); EL (06, 07, 08, 09, 10, 14, 16, 18); FR (15, 18, 19);
LU (14, 16); AT (05, 08, 10, 12, 14, 16, 18); SE (06, 08, 10 ,12, 14, 16); UK (06, 08, 19); EU28 (06, 08, 19).
Black dashed line: Weighted average (EU28).

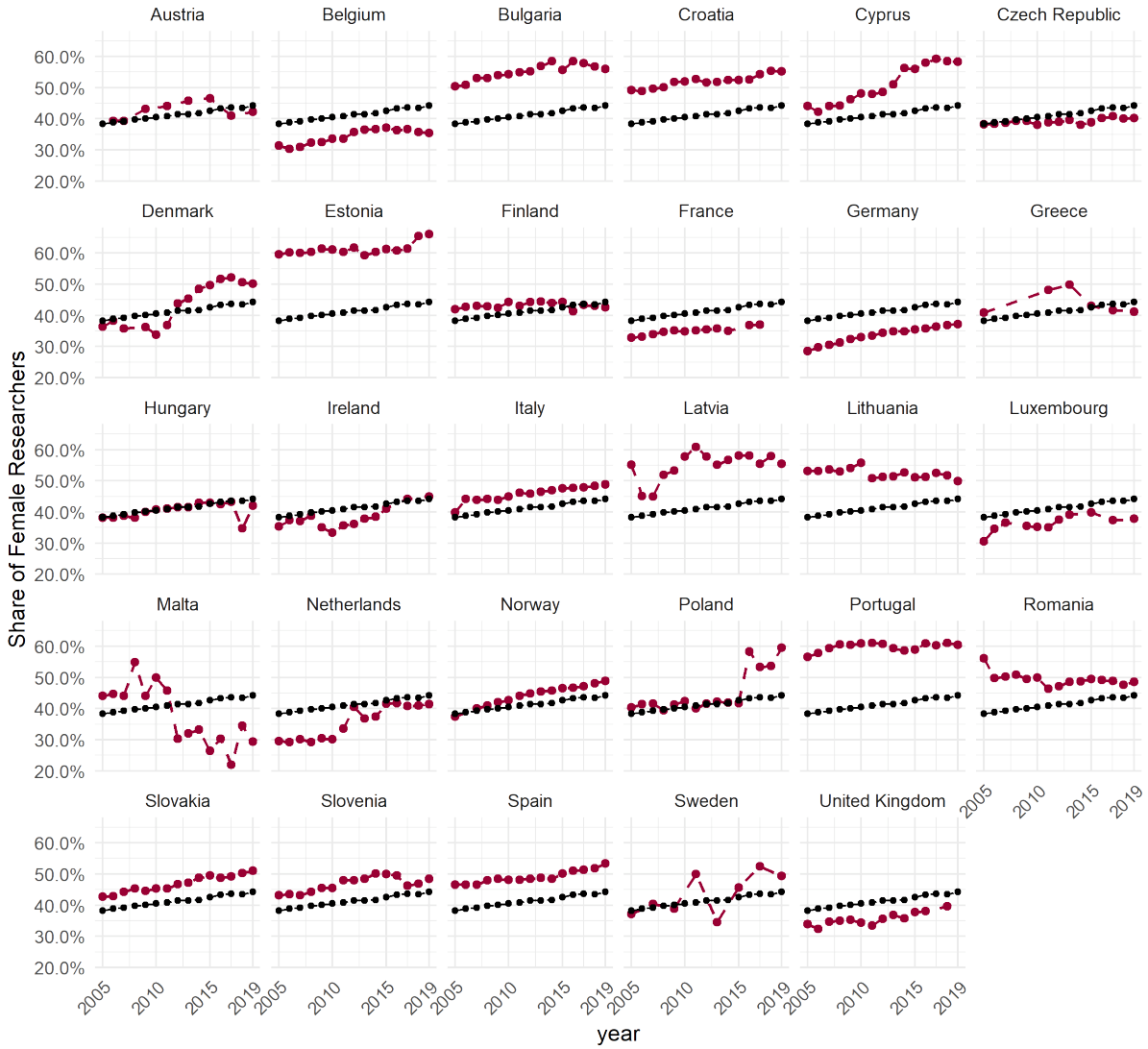
Figure 4: Share of female researchers in the higher education sector

Figure 4 depicts the development in the share of female researchers in the higher education sector for all countries (EU28 + NO) in the time period 2005-2019. For a detailed data fiche for the indicator see Table 17.

From 2017 to 2019, the EU27 average in share of female researchers in the higher education sector increased marginally from 42,3% to 43%.

Slovenia and Ireland recorded the highest increases in the share of female researchers in the higher education sector, with an increase from 41,8% in 2017 to 43,9% in 2019 in Slovenia and an increase from 45,3% to 43,9% in Ireland in the same time period. Hungary, Latvia and Luxembourg experienced the largest decreases in the share of female researchers in the higher education sector from 2017 to 2019, with a fall from 40,1% to 38,9% in Hungary, from 53,9% to 53,9% in Lativa, and from 37,1% to 36,2% in Luxembourg.

2.4. Share of female researchers by sectors of performance, Government sector



Coverage: EU27 + NO & UK (2005-2019).
Data missing: AT (05, 08, 10, 12, 14, 16, 18); DK (08); EL (06-10, 12, 14, 16, 18); FR (15, 18, 19); IE (16, 18); LU (08, 14, 16, 18); NO (06); SE (06, 08, 10, 12, 14, 16, 18); UK (17, 19).
Black dashed line: Weighted average (EU28).

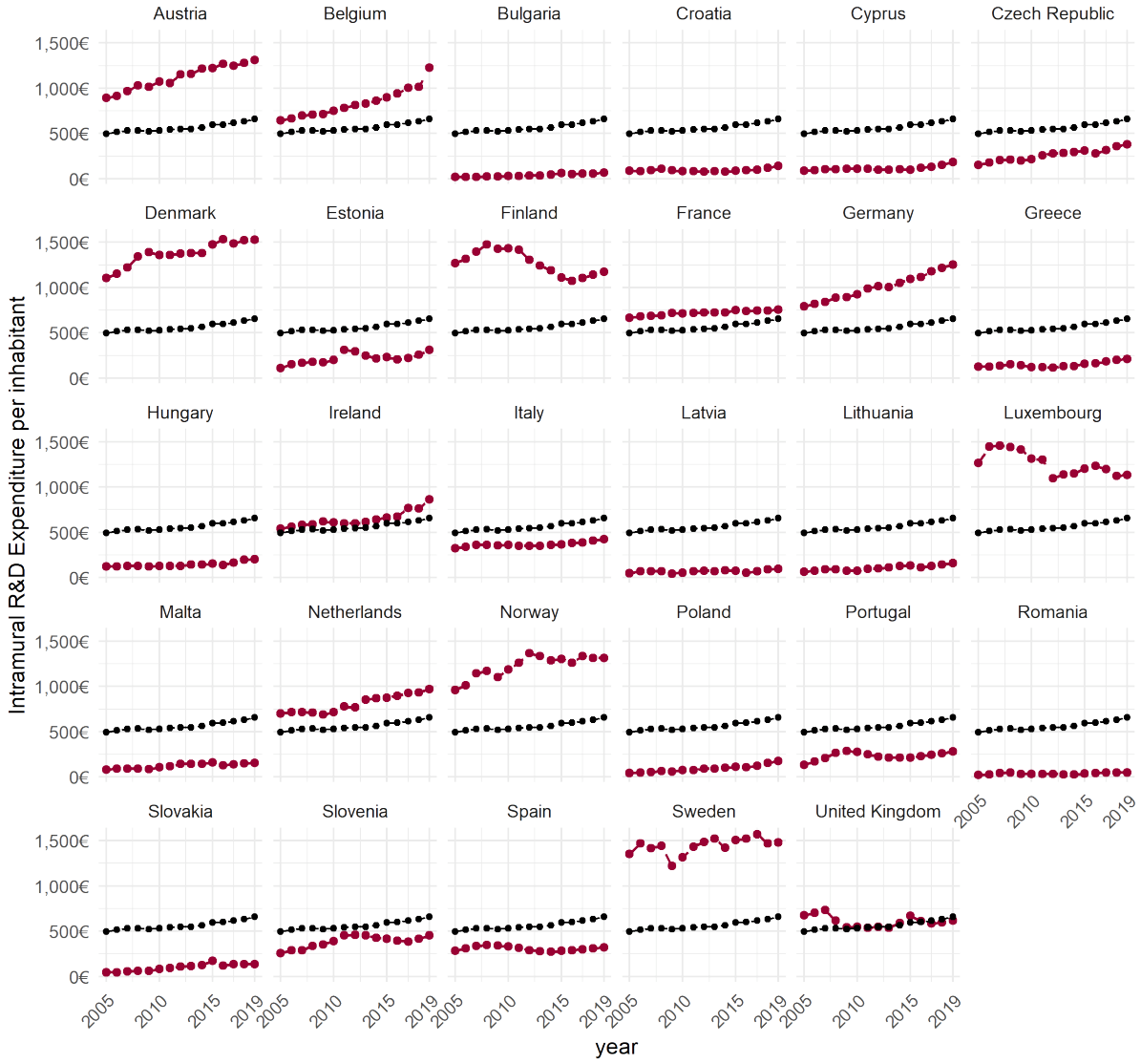
Figure 5: Share of female researchers in the government sector

Figure 5 depicts the development in the share of female researchers in the government sector for all countries (EU28 + NO) in the time period 2005-2019. For a detailed data fiche for the indicator see Table 18.

From 2017 to 2019 the EU28 average in share of female researchers in the government sector increased from 43,6% to 44,2%.

Malta and Poland experienced the highest increases in the share of female researchers in the government sector, from 21,9% in 2017 to 29,4% in 2019 in Malta and from 53,4% to 59,5% in Poland in the same time period. Sweden and Lithuania experienced the largest decreases in the share of female researchers in the government sector from 2017 to 2019, from 52,4% to 49,4% in Sweden and from 52,5% to 49,9% in Lithuania.

2.5. Intramural R&D expenditure per inhabitant in all sectors



Amounts are adjusted for inflation, fixed on 2015 levels
Coverage: EU27 + NO & UK (2005-2019).
Black dashed line: Weighted average (EU28).

Figure 6: Intramural R&D expenditure per inhabitant in all sectors

Figure 6 depicts the intramural R&D expenditure per inhabitant in all sectors for all 28 EU countries and Norway (EU27 + NO & UK) for the period 2005-2019. The expenditure is adjusted for inflation and is shown in fixed 2015 prices. For a detailed data fiche for the indicator see Table 19.

From 2017 to 2019 the average intramural R&D expenditure per inhabitant in all sectors in the EU rose 42,5€ from 616€ to 658,5€ per inhabitant.

Notably the intramural R&D expenditure increased by 219€ per inhabitant in Belgium from 2017 to 2019, from 1.005€ to 1.224€. This increase alone was higher than the full intramural R&D expenditure per inhabitant of 11 EU member states in 2019, highlighting the differences in scale of R&I systems across Member States (MS).

From 2017 to 2019 the intramural R&D expenditure per inhabitant in all sectors increased in all EU member states except Sweden, Luxembourg, Norway, and Slovakia – with Sweden and Luxembourg experiencing the largest falls. Expenditure per inhabitant decreased by 91€ from 1.568€ to 1.477€ in Sweden, and by 60€ from 1.194€ to 1.134€ in Luxembourg. However, Sweden had the highest intramural R&D expenditure per inhabitant in all sectors in the EU in 2017 and the second highest expenditure in 2019 behind Denmark.

2.6. Intramural R&D expenditure (GERD) as a percentage of GDP in all sectors

Figure 7: Intramural R&D expenditure as a percentage of GDP in all sectors

Figure 7 depicts the intramural R&D expenditure as a percentage of GDP in all sectors for all 28 EU countries and Norway (EU27 + NO & UK) for the period 2005-2019. For a detailed data fiche for the indicator see Table 20.

From 2017 to 2019 the average intramural R&D expenditure as a percentage of GDP in all sectors in the EU rose marginally from 2,08% to 2,15%. Belgium had the highest increase in this indicator, rising from 2,67% to 3,17%. Luxembourg had the largest decrease, falling from 1,27% to 1,16%.

2.7. Patent applications to the EPO by priority year

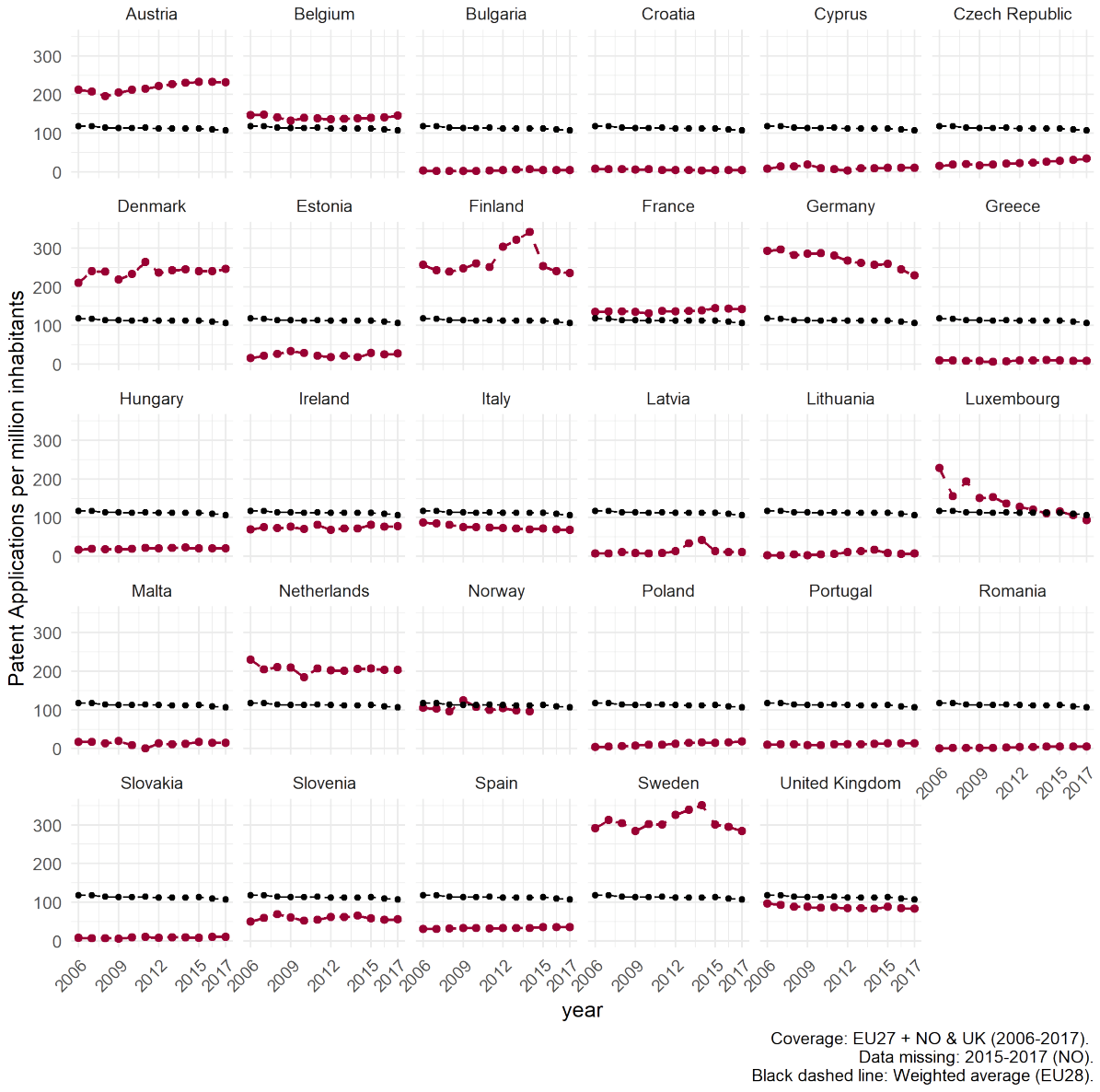


Figure 8: Patent applications to the EPO by priority year per million inhabitants

Figure 8 depicts development in the average number of patent applications to the European Patent Office (EPO) for the EU27 + NO & UK for the period 2006-2016. Not updated since MR1. For a detailed data fiche for the indicator see Table 21.

The average number of patent applications has remained largely stable in the period from 2006 to 2017, fluctuating between 117,65 applications on average per million inhabitants in 2006 and 106,84 applications on average in 2017. The number of applications per million inhabitants in most of the countries also fluctuated very little across the period. Only Denmark increased by more than 20 the number of applications per million inhabitants between 2006 and 2017, from 210,05 to 246,61. Finland (21,43), Germany (64,13), Luxembourg (134,25) and the Netherlands (25,73) experienced a decrease of more than 20 in the number of applications per million inhabitants in the same period.

3. *She Figures* Indicators

The periodic *She Figures* reports are produced by DG Research and Innovation in support of the EC Gender Equality Strategy. The reports provide an overview of the gender equality situation within the research and innovation sector in the EU.

In the first SUPER MoRRI monitoring report, data from *She Figures* was used to monitor gender aspects of Responsible Research and Innovation. Since the publication of MR1, *She Figures 2021* has been published including new data for 2018 for four of these country-level indicators:

1) The Glass Ceiling Index which compares the proportion of women in academia with the proportion of women in top academic positions;
2) the Dissimilarity index for the higher education sector which indexes the gender balance within the higher education sector,
3) the Dissimilarity index for the government sector which indexes the gender balance within the government sector; and
4) a metric for the percentage of publications with a sex or gender dimension in their research content.

3.1. The Glass Ceiling Index

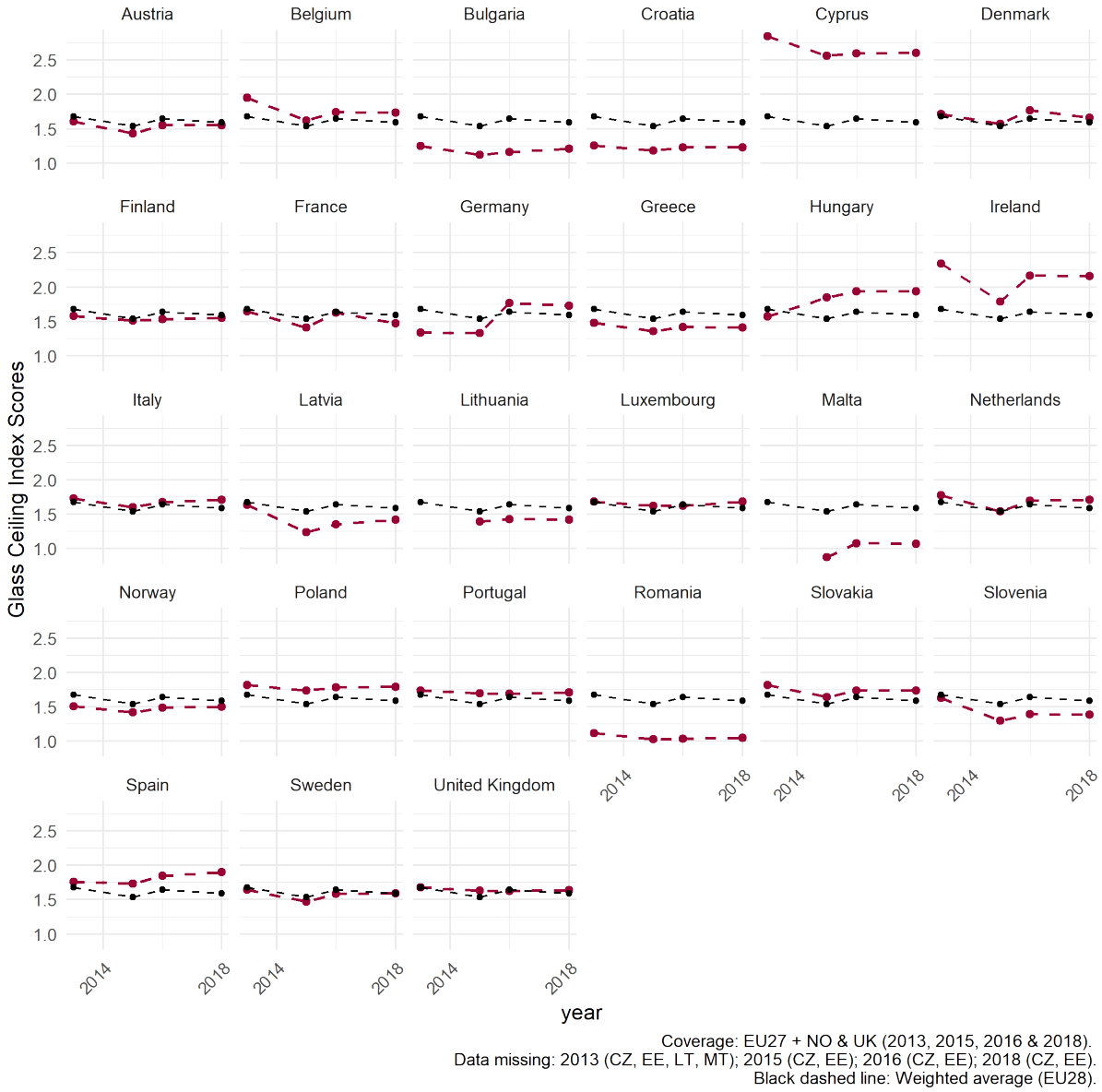


Figure 9: Glass Ceiling Index scores for 2013, 2015, 2016 & 2018

Figure 9 depicts the development in the Glass Ceiling Index for EU28 and NO from 2013 to 2018.

The Glass Ceiling Index shows the proportion of women at the top level compared with the proportion of women in academia in general. A score of 1,0 thus represents elimination of the glass ceiling on hiring women into top academic positions. Current results confirm that the proportion of women in top academic positions in Europe remains significantly lower than the proportion of women in academia. Nevertheless, some countries have seen recent improvements in this indicator. For example, France have moved from an index score of 1,63 to 1,47. Romania and Malta remained in 2018 the two member states with the best Glass Ceiling Index ratios For a detailed data fiche for the indicator see Table 22.

From 2013 and 2016 only four countries experienced an improvement in their Glass Ceiling Index score, out of the 26 countries with data points for the two years. However, from 2016 to 2018 at total of 18 countries recorded an improvement in their Glass Ceiling Index score, out of 27 countries with comparison data points for the two years.

3.2. Dissimilarity index, higher education sector

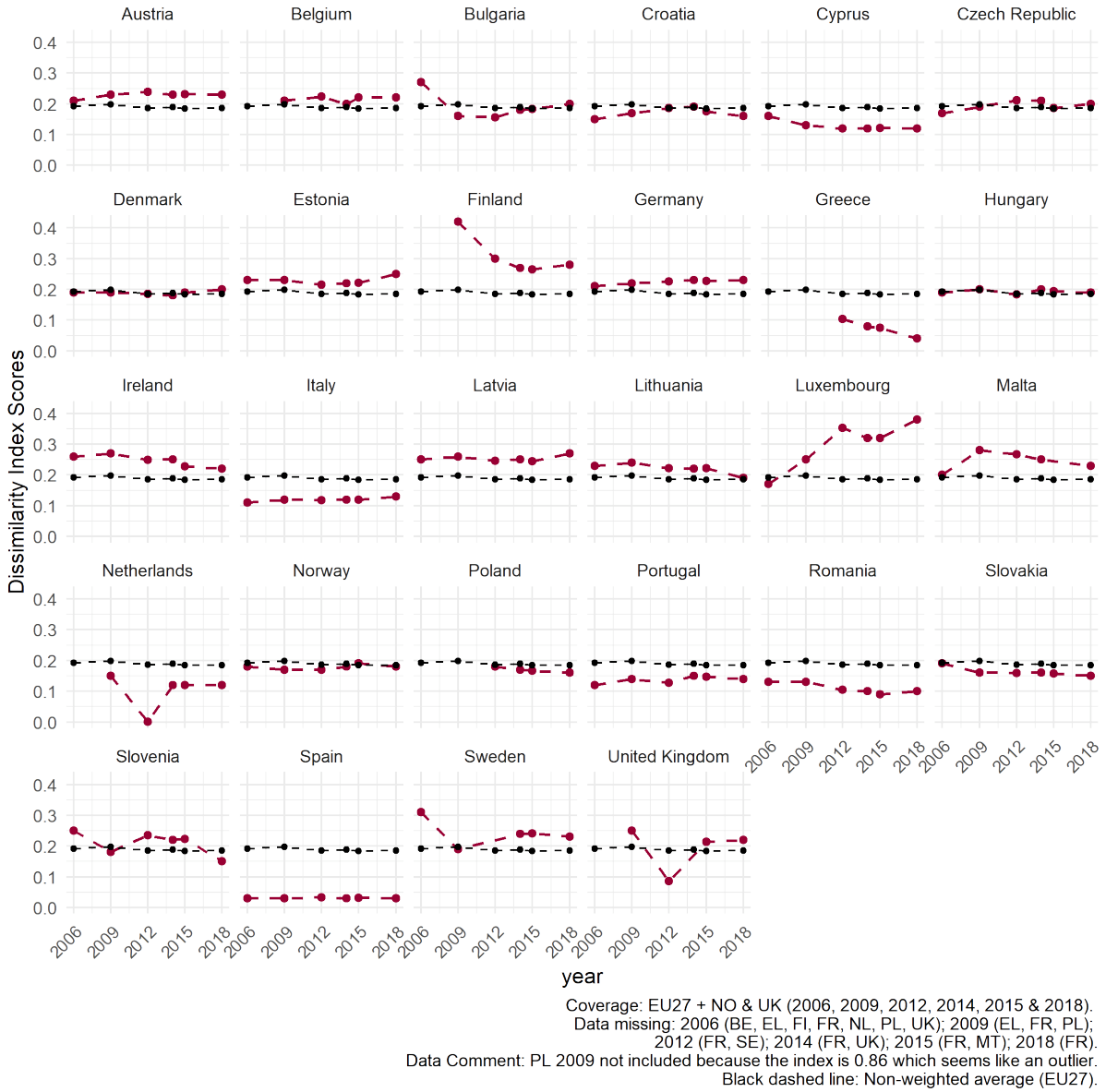
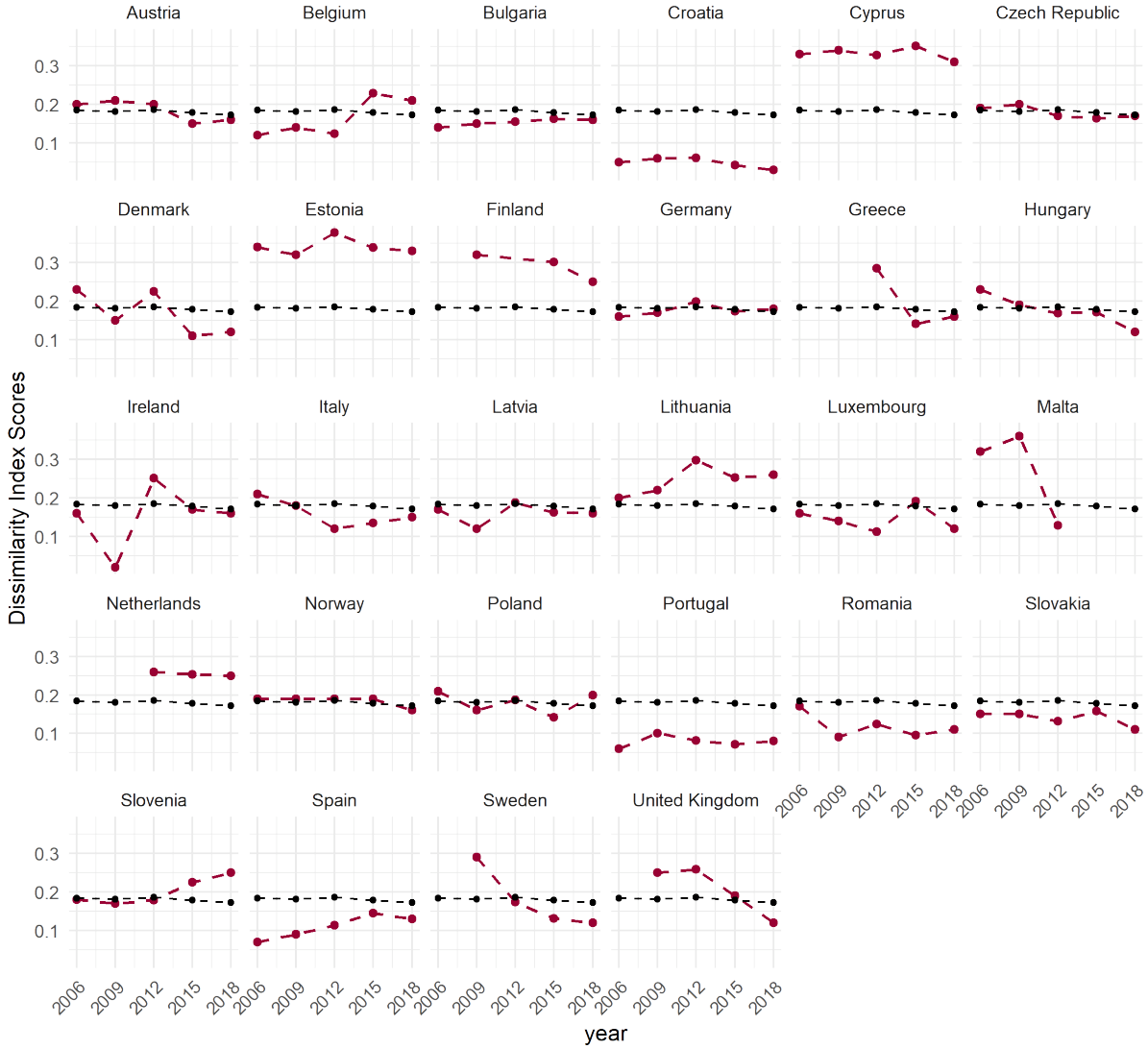


Figure 10: Dissimilarity Index scores for the higher education sector

Figure 10 depicts shows Dissimilarity Index scores in the higher education sector for the EU27 + NO & UK for 2006, 2009, 2012, 2014, 2015 and 2018. For a detailed data fiche for the indicator see Table 23.

The Dissimilarity Index provides a theoretical measurement of the percentage of women and men in a group who would have to move to another occupation to ensure that the proportions of women were the same across all the possible occupations. It can therefore be interpreted as the hypothetical distance from a balanced sex distribution across occupations. From 2015 to 2018 only moderate changes occurred in the imbalance of female representation across R&D areas. Luxembourg recorded the highest increase in Dissimilarity Index score, which signals a worsening of the imbalance in the distribution of women across R&D areas. Greece and Slovenia experienced the largest decreases in Dissimilarity Index scores, with female representation within all areas of R&D in Slovenia improving to be relatively more balanced than that of the EU overall in 2018. Spain continues to stand out with a stable low score on this Index.

3.3. Dissimilarity index, Government sector



Coverage: EU27 + NO & UK (2006, 2009, 2012, 2014, 2015 & 2018).
Data missing: 2006 (BE, EL, FI, FR, NL, PL, UK); 2009 (EL, FR, PL);
2012 (FR, SE); 2014 (FR, MT, UK); 2015 (FR, MT); 2018 (FR, MT).
Black dashed line: Non-weighted average (EU27).

Figure 11: Dissimilarity Index scores for the government sector

Figure 11 shows Dissimilarity Index scores in the government sector for the EU27 + NO & UK for 2006, 2009, 2012, 2014, 2015 and 2018. For a detailed data fiche for the indicator see Table 24.

Dissimilarity Index scores across Europe remained stable from 2015 to 2018. The average Dissimilarity Index score across the EU decreased, continuing the trajectory from earlier years of the data series.

Croatia continues to stand out with a stable and remarkably low score on the index, indicating a balanced representation of women across R&D areas within the Croatian government sector.

3.4. Percentage of a country´s publications with a sex or gender dimension in their research content

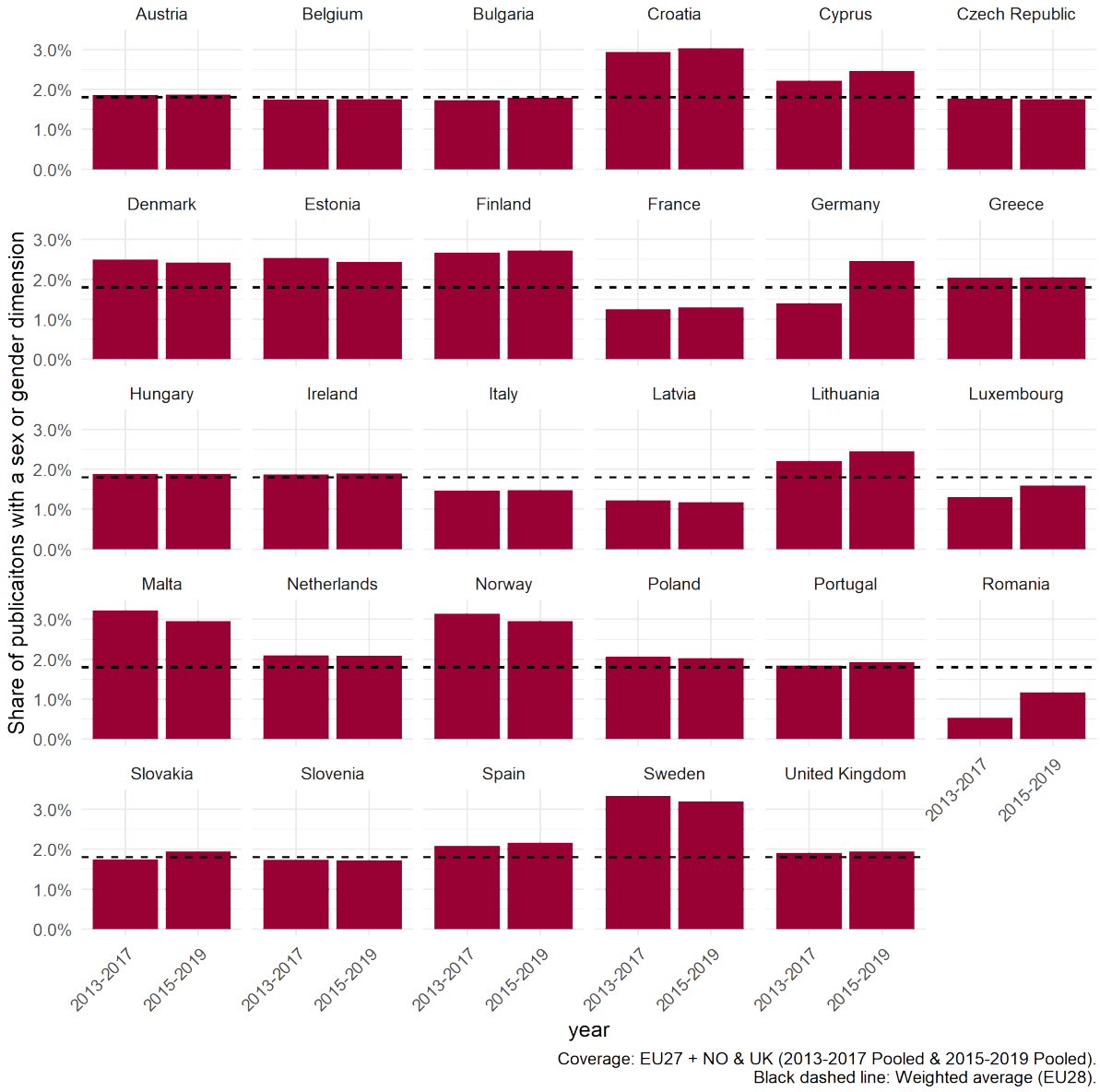


Figure 12: Percentage of publications with a sex or gender dimension in their research content

Figure 12 illustrates the pooled share of publications from 2013-2017 and the pooled share from 2015 to 2019 with a sex or gender dimension in their research content for the EU28 and NO. The dotted horizontal line indicates the average percentage for the EU28 countries. For a detailed data fiche for the indicator see Table 25.

This indicator now includes pooled data for 2015 to 2019 that was not available in MR1. With two data points it is now possible to monitor the development in the share of publications with sex or gender dimension in the EU. The indicator suggests that very little changed between the first and second periods. The EU average percentage of publications with a sex or gender dimension in their research content remained steady comparing the periods (from 1,79% to 1,81%).

3.5. Gender pay gap within scientific research & development

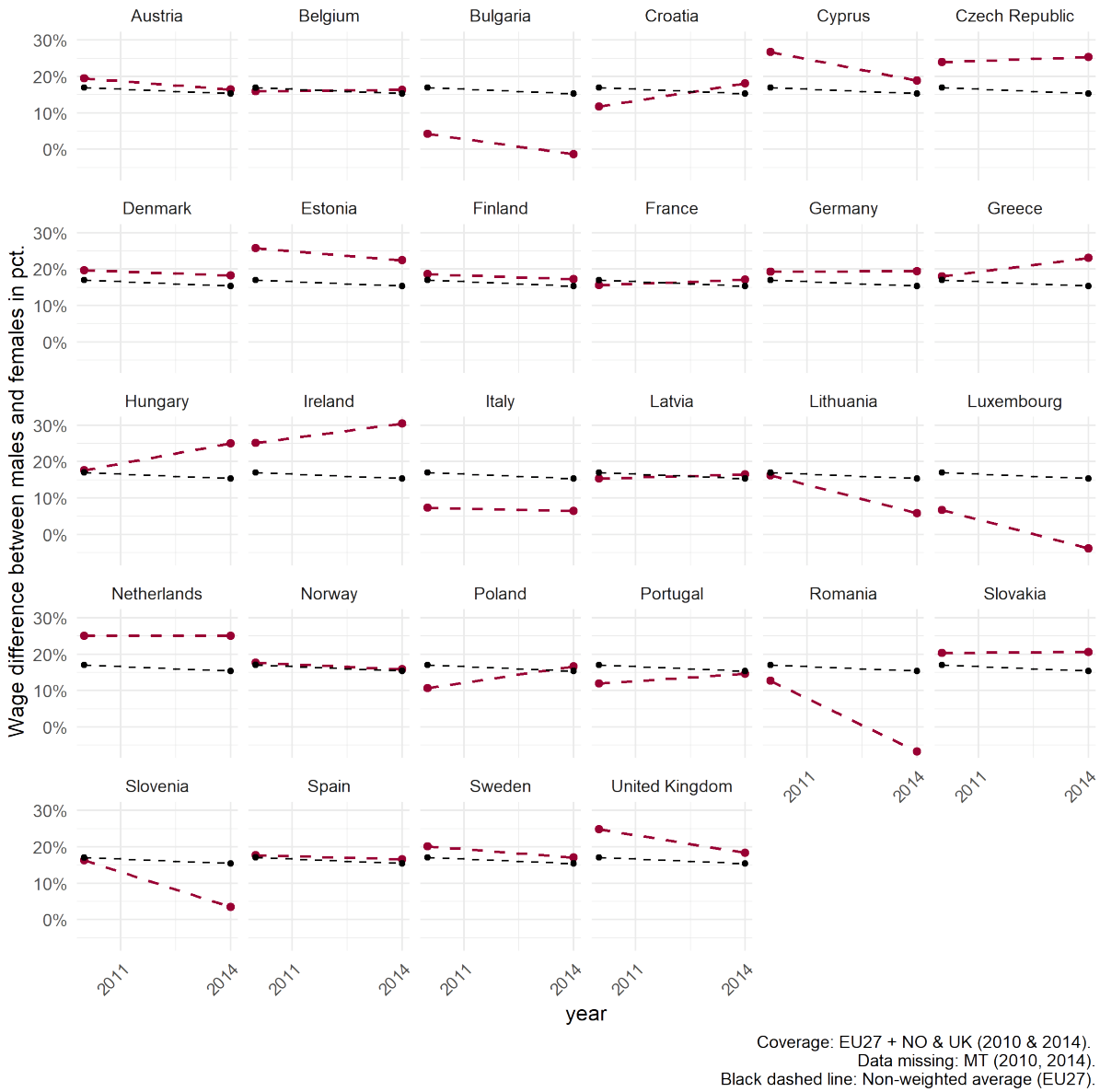


Figure 13: Gender pay gap within scientific research & development

Figure 13 depicts the development of the Gender Pay Gap within the economic activity of scientific research & development for the EU27 + NO & UK from 2010 to 2014. Indicator not updated since MR1. For a detailed data fiche for the indicator see Table 26.

Across the full set of countries, only a modest development towards closing the gap between salaries for women and men in R&D can be detected from 2010 to 2014. In Romania, Luxembourg, and Bulgaria, the gap has been closed, while Hungary and Ireland have seen a widening of the gap.

3.6. The women to men ratio in number of inventorships

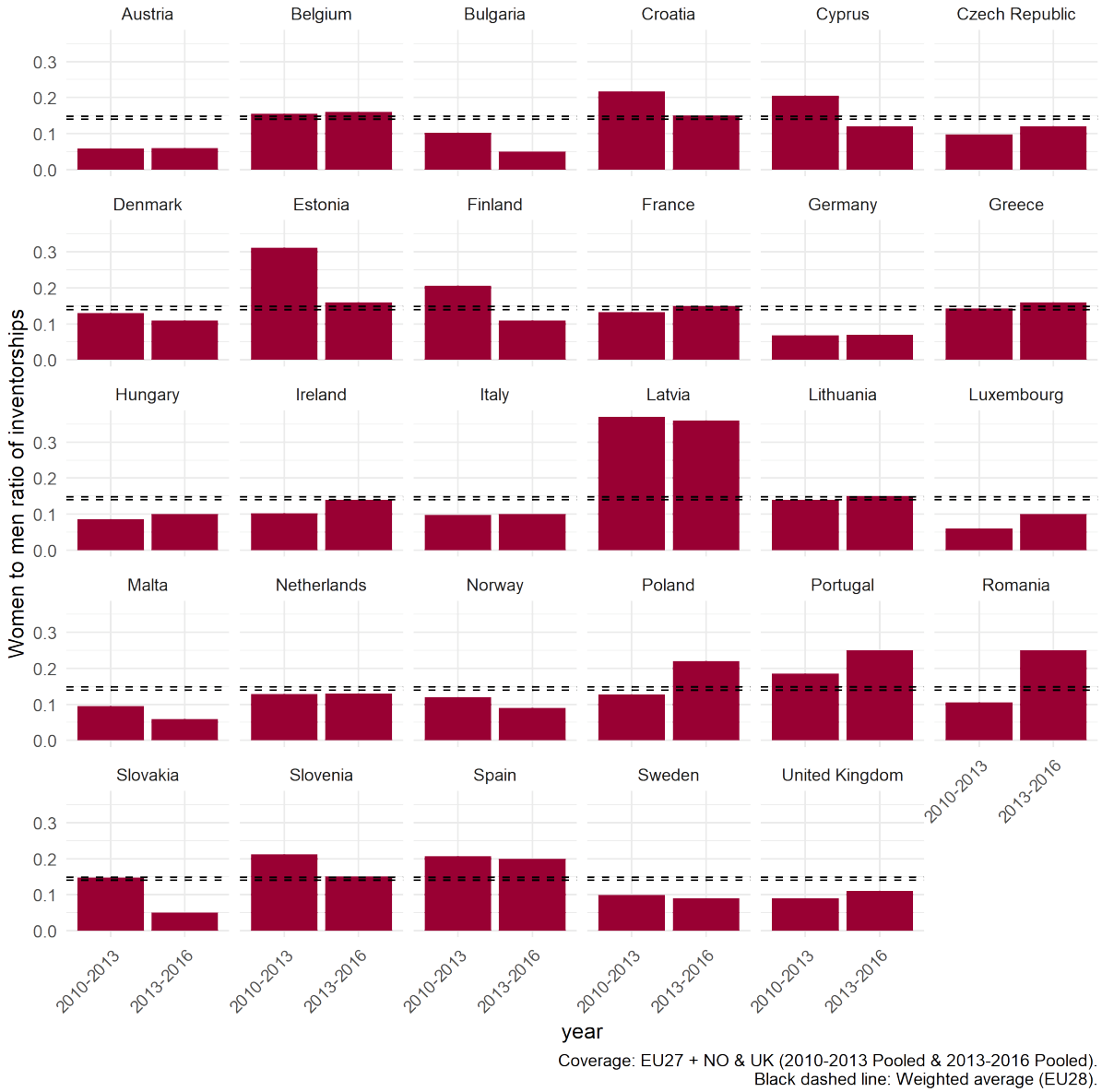


Figure 14: Women to men ratio in number of inventorships

Figure 14 depicts the development in the women to men ratio of inventorships, according to International Patent Classification, for EU27 + NO & UK for the two periods 2010-2013 and 2013-2016. Indicator not updated since MR1. For a detailed data fiche for the indicator see Table 27.

On this indicator there are significant differences between countries and no uniform trend comparing the first and second periods covered. Latvia stands out as the best performed country, while Romania, Sweden, and the UK show the greatest improvement on this indicator.

3.7. The women to men ratio in number of corresponding authorships

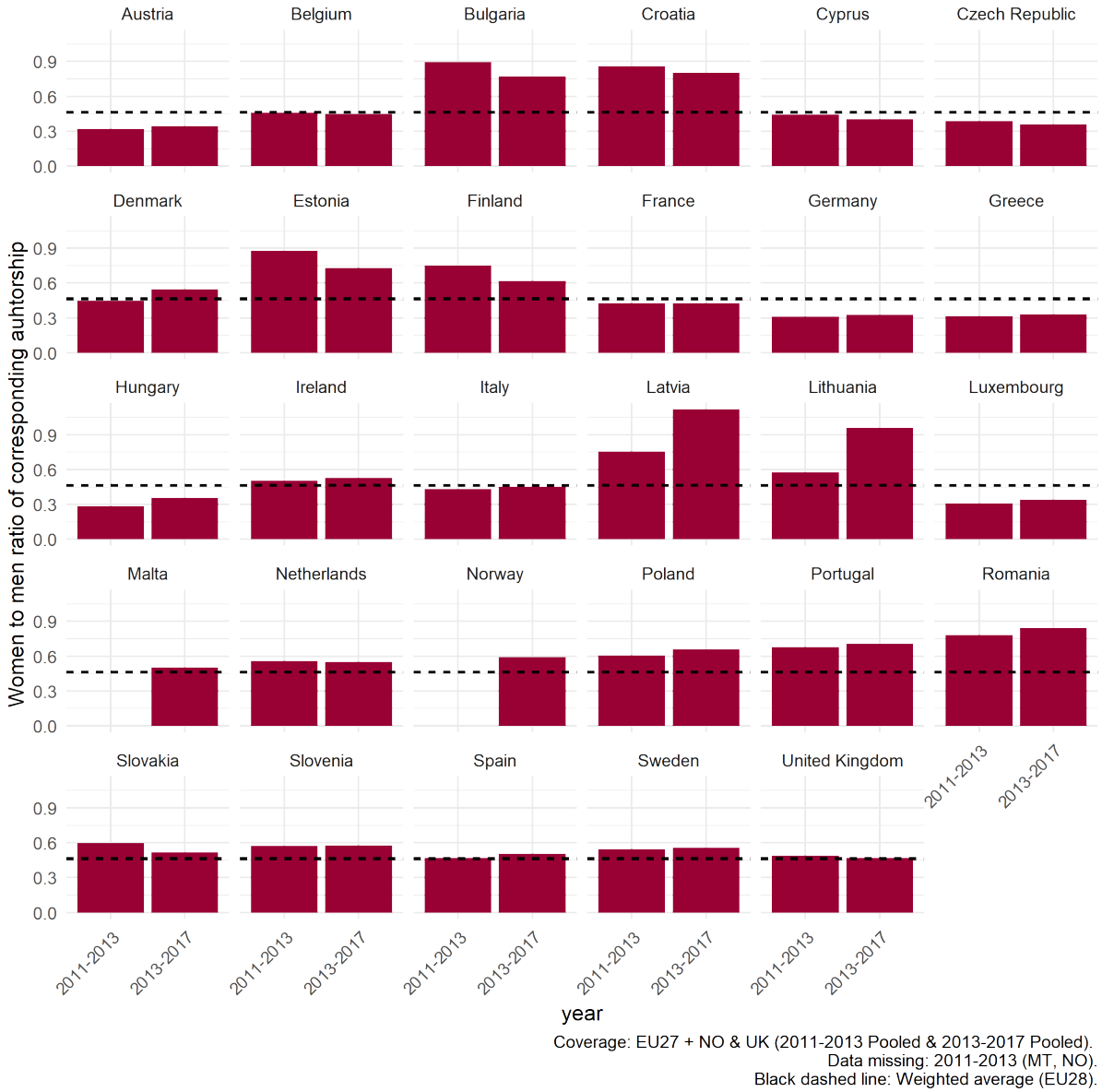


Figure 15: Women to men ratio in number of corresponding authorships within R&D

Figure 15 depicts the development in the women to men ratio of corresponding authorships in all fields of R&D for the EU27 + NO & UK for the two periods 2010-2013 and 2013-2017. Indicator not updated since MR1. For a detailed data fiche for the indicator see Table 28.

In the 2013-2017 period, Latvia and Portugal had the highest women to men ratio of corresponding authorship in all fields of R&D. Latvia is the only country with more women than men as corresponding authors, specifically for the 2013-2017 period.

4. Eurobarometer Indicators

Eurobarometer surveys are public opinion surveys which are conducted regularly on behalf of the European Commission and other EU Institutions. Various Eurobarometers have been conducted since 1973.

The first monitoring report presented different indicators from Eurobarometer survey. In MR1, data from the following Eurobarometer surveys were included: EB 38.1 from 1992, EB 224 from 2005, EB 340 from 2010 and EB 419 from 2014. This section provides an update to the indicators based on Eurobarometer data from the first monitoring report, by adding data from the latest Eurobarometer survey EB 516 from 2021. There is thus a gap, of at least six years, from the most recent surveys included in the first monitoring report to the most recent EB 516 survey included in this second report.

The new wave of Eurobarometer was published in Dec 2021, which has allowed for the six Eurobarometer based indicators to be updated to include observations for 2020.

For each indicator based on Eurobarometer data, a weighted EU average is presented. It is worth considering that EU member states change over the years, thus averages changes might be affected by such change. This is also relevant in relation to the United Kingdom's recent exit out of the EU, resulting in EU averages for 2020 being for the EU27 group of Member States and not EU28.

Over the years, some item formulations in the Eurobarometer surveys have changed slightly. This should be considered when comparing data points between surveys.

4.1. Interest in scientific discoveries

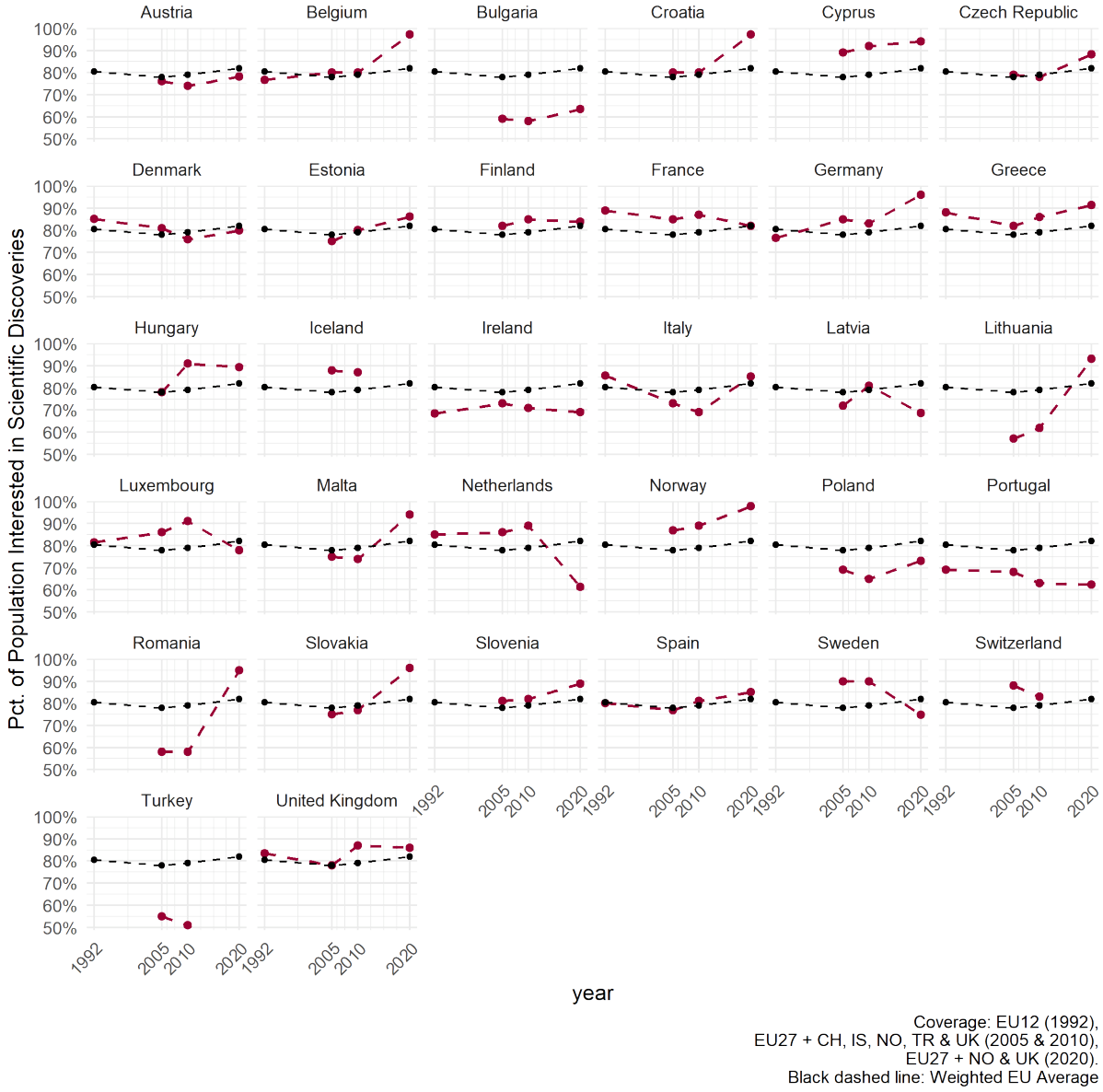


Figure 16: Percentage of the EU-public interested in scientific discoveries

Figure 16 depicts the development in the percentage of inhabitants that are interested in *scientific discoveries* for all countries (EU27 + CH, IS, NO, TR & UK) for the years 1992, 2005, 2010 and 2020. For a detailed data fiche for the indicator see Table 29.

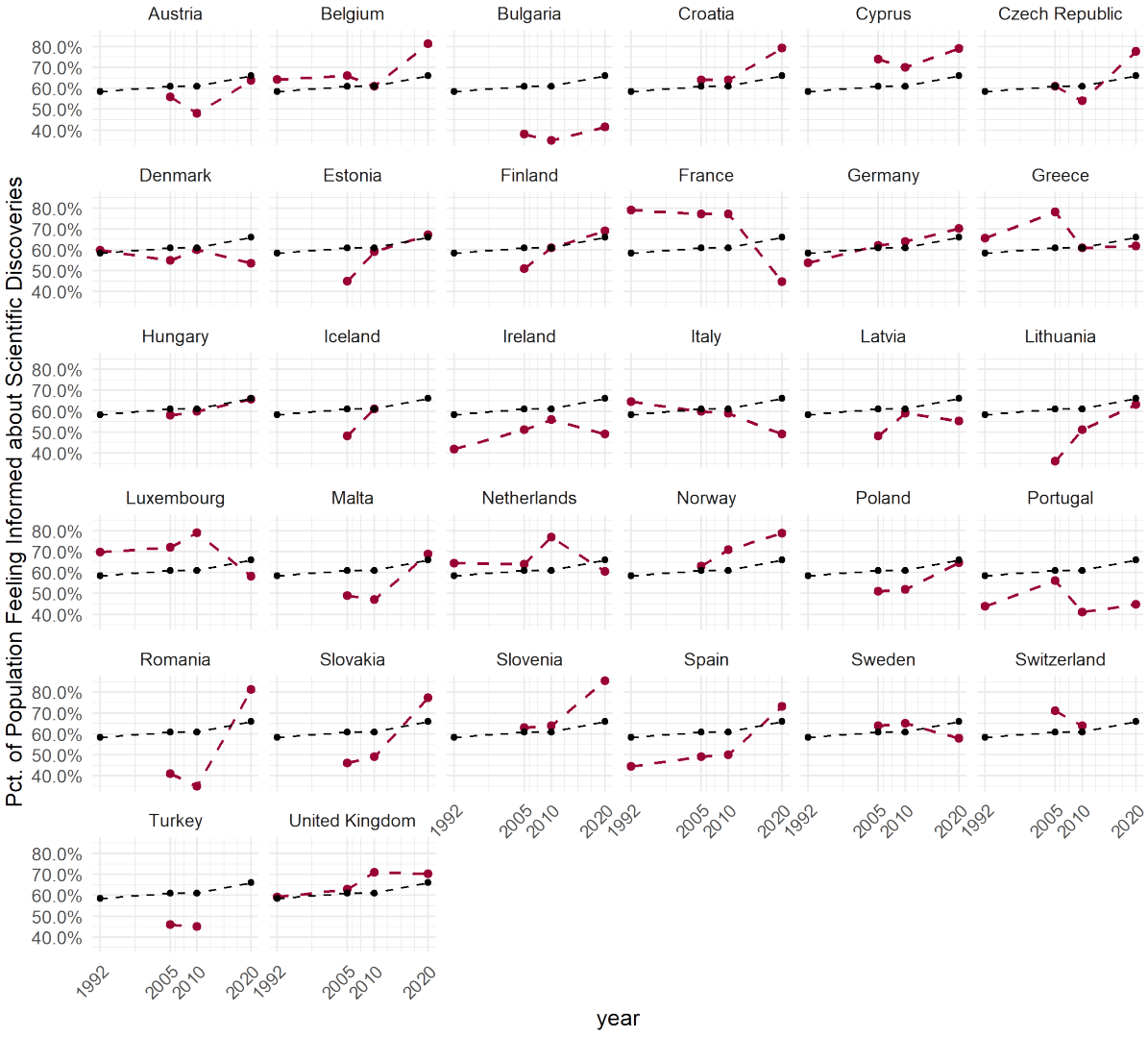
Overall, interest in scientific discoveries in the EU populace has increased recently, which might of course reflect the direct importance of science for citizens throughout the COVID-19 pandemic. Comparing 2010 and 2020, the EU average level of interest in science increased from 79% to 84%. However, this overall trend was not mirrored in all countries.

A notable development is the decrease in interest in scientific discoveries in Sweden and the Netherlands, comparing 2010 to 2020. In 2010, the percentage for the two countries were higher than

the EU average of 79%. This is not the case for 2020, as both populations reported a reduction in interest. From 2010 to 2020 the Netherlands experienced a remarkable decrease of 28% in citizen interest in science, from 89% in 2010 to 61% in 2020. Sweden reported a 15% decrease in the proportion of citizens interested in science, from 90% in 2010 to 75% in 2020.

In direct contrast to the Netherlands and Sweden, Romania and Lithuania experienced a very strong surge in interest amongst their populations from 2010 to 2020, surpassing the EU average. The percentage of interested citizens increased from 58% to 95% in Romania and from 62% to 93% in Lithuania.

4.2. Science efficacy



Coverage: EU12 (1992),
EU27 + CH, IS, NO, TR & UK (2005 & 2010),
EU27 + UK (2013),
EU27 + NO & UK (2020).
Black dashed line: Weighted EU Average

Figure 17: Percentage of the EU-public that feels informed about science

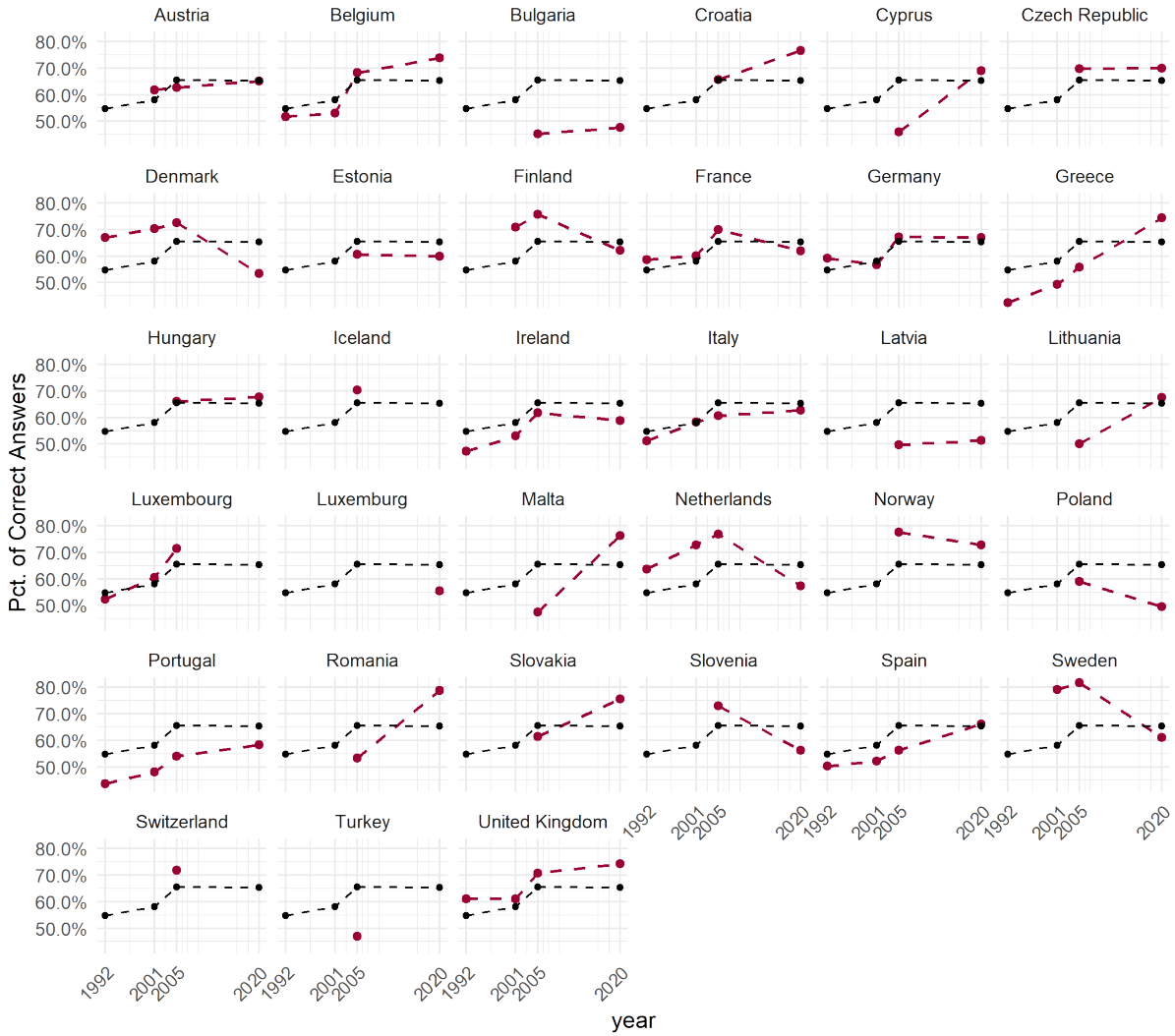
Figure 17 depicts the development in the percentage of citizens that feel very or moderately well informed about developments in science for the EU27 plus CH, IS, NO, TR and UK for the years 1992, 2005, 2010 and 2020. For a detailed data fiche for the indicator see Table 30.

Similar to the EU average level of interest in scientific discoveries, the average percentage of citizens that feel well-informed about science also increased slightly when comparing 2010 to 2020, rising from 58,6% to 65,2%.

However, of the 29 countries with data points for in 2010 and 2020 (EU27 + NO and UK), nine countries experienced a decrease in the percentage of their citizens feeling well-informed about science. Most of these decreases were rather insignificant, however both France and Luxembourg experienced relatively higher decreases. In both these countries the proportion for citizens feeling well-informed about science declined from above the EU average to below this average. The percentage of citizens feeling well-informed about science in France fell from 77% in 2010 to 45% in 2020, and from 79% to 58% in Luxembourg for the same comparison.

In contrast to France and Luxembourg, Romania and Slovakia experienced a rise in feeling of being well-informed amongst their populations from 2010 to 2020, with both surpassing the EU average. The percentage of citizens feeling well-informed about science increased from 35% to 81% in Romania and from 49% to 77% in Slovakia.

4.3. Science knowledge



Coverage: EU12 (1992),
EU15 (2001),
EU27 + CH, IS, NO, TR & UK (2005 & 2010),
EU27 + NO & UK (2020).
Data missing: LU (2020).
Black dashed line: Weighted EU Average

Figure 18: Percentage of correct science quiz answers

Figure 18 depicts the development in the average percentage of correct science quiz answers among citizens in the EU27 plus CH, IS, NO, TR and UK for the years 1992, 2001, 2005 and 2020. For a detailed data fiche for the indicator see Table 31.

The figure provides a partial impression of citizens' level of 'textbook' knowledge of science. The overall average percentage of correct science quiz answers increased from 63,1% in 2005 to 64,4% in 2020, continuing the longer-term trajectory of a slowing increase over time.

Notable results include the decrease in percentages of correct answers in Sweden and the Netherlands from 2005 to 2020. Out of all countries included in 2005 (E27, CH, IS, NO, TR, UK), Sweden had the highest average percentage of correct answers with 81% in 2005, which then declined to 61% in 2020.

In 2005, the Netherlands similarly had one of the highest average percentages of correct answers of 76%, which had declined to 57% in the 2020 survey.

Malta and Romania experienced a rise in average percentage of correct quiz answers among their populations from 2010 to 2020, rising from below the EU average to above it. The average percentage of correct quiz answers among citizens increased from 47,5% to 76,3% in Malta and from 53,2% to 78,6% in Romania.

4.4. Trust in scientists

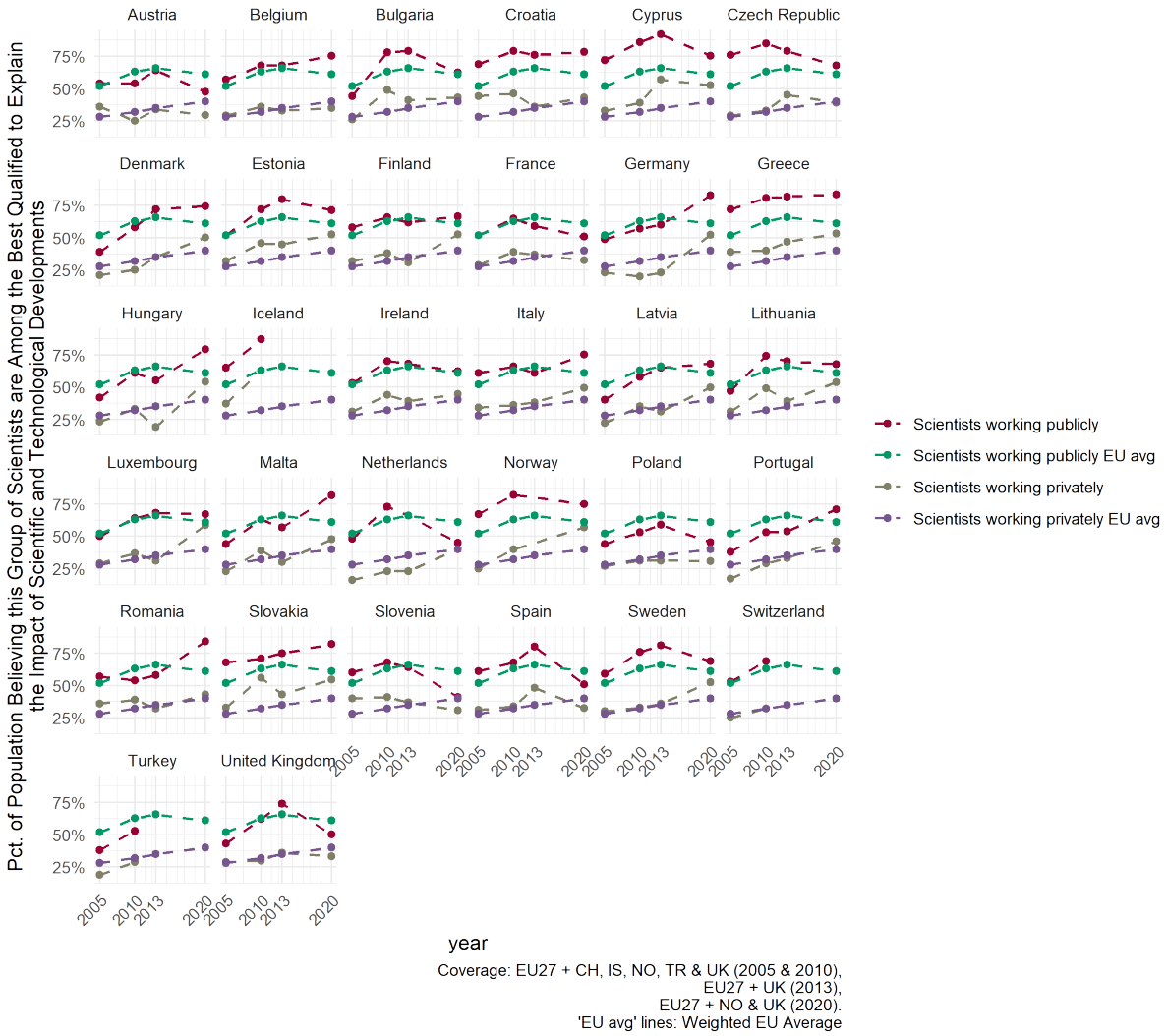
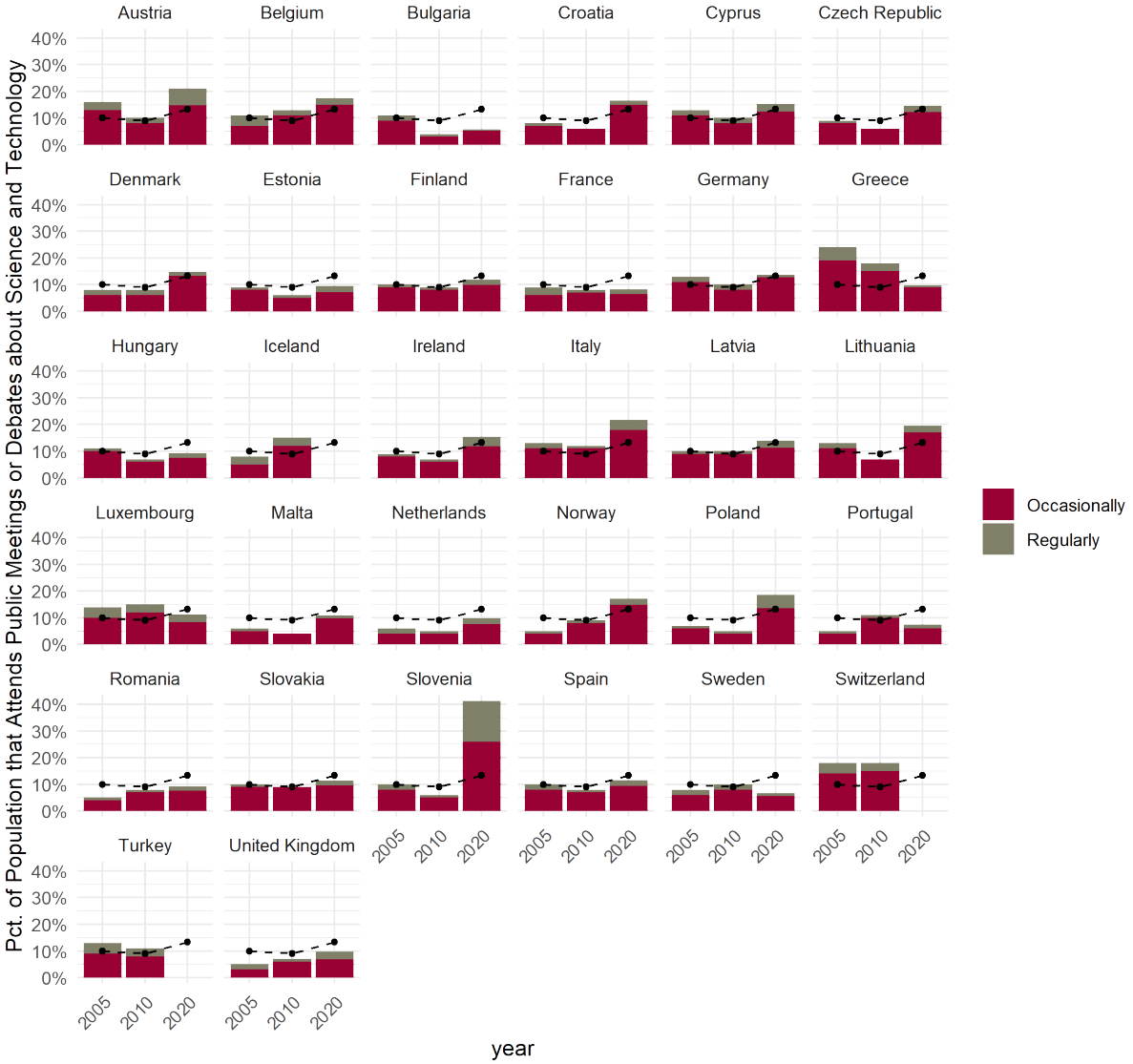


Figure 19: Percentage of the EU-public that believes that scientists are among the best qualified to explain the Impact of Scientific and Technological Developments

Figure 19 depicts the percentage of citizens that believes that scientists are among the best qualified to explain the impact of scientific and technological developments for the EU27 plus CH, IS, NO, TR and UK for 2005, 2010, 2013 and 2020. For a detailed data fiche for the indicator see Table 32.

The figure shows the percentage of citizens of the EU that believes that scientists are among the best qualified to explain the impact of S&T increased with regard to both privately and publicly employed scientist. The COVID-19 pandemic promoted scientists and their explanations and predictions about the evolution of the pandemic into the public eye, which may have affected responses to this question in the 2020 Eurobarometer survey. The prior rising trajectory of the EU average for this indicator did not continue in relation to publicly employed scientists, as the EU average decreased from 66% to 61% when comparing 2013 and 2020. Interestingly this result was not replicated in relation to privately employed scientists, with the indicator rising from 35% to 40% comparing 2013 and 2020. However, privately employed scientist remain less trusted than publicly employed scientist in all countries and for all years of the Eurobarometer.

4.5. Engagement and co-creation (Meetings and debates)



Coverage: EU27 + CH, IS, NO, TR & UK (2005 & 2010), EU27 + NO & UK (2020).
Black dashed line: Sum of the Weighted EU Average of both Answers

Figure 20: Percentage of the EU-public that attends public meetings or debates about science and technology

Figure 20 depicts the percentage of citizens that attends public meetings or debates about science and technology for the EU27 plus CH, IS, NO, TR and UK in 2005, 2010 and 2020. For a detailed data fiche for the indicator see Table 33.

Historically, the average share of people in the EU who engage with science by attending public meetings or debates about science and technology has been quite low, 10% in 2005 and 9% in 2010. However, 2020 results show an improvement in this indicator with the average EU share increasing to 13,3%, or more than one-third in comparison to 2010.

Perhaps this indicator of increased public engagement in attending meeting and debates might be caused by the immediacy of COVID-19 in 2020. However, not all countries experienced this rise. Other local factors may well be as, or more, important than COVID-19 in influencing the 2020 results.

4.6. Engagement and co-creation (Petitions and demonstrations)

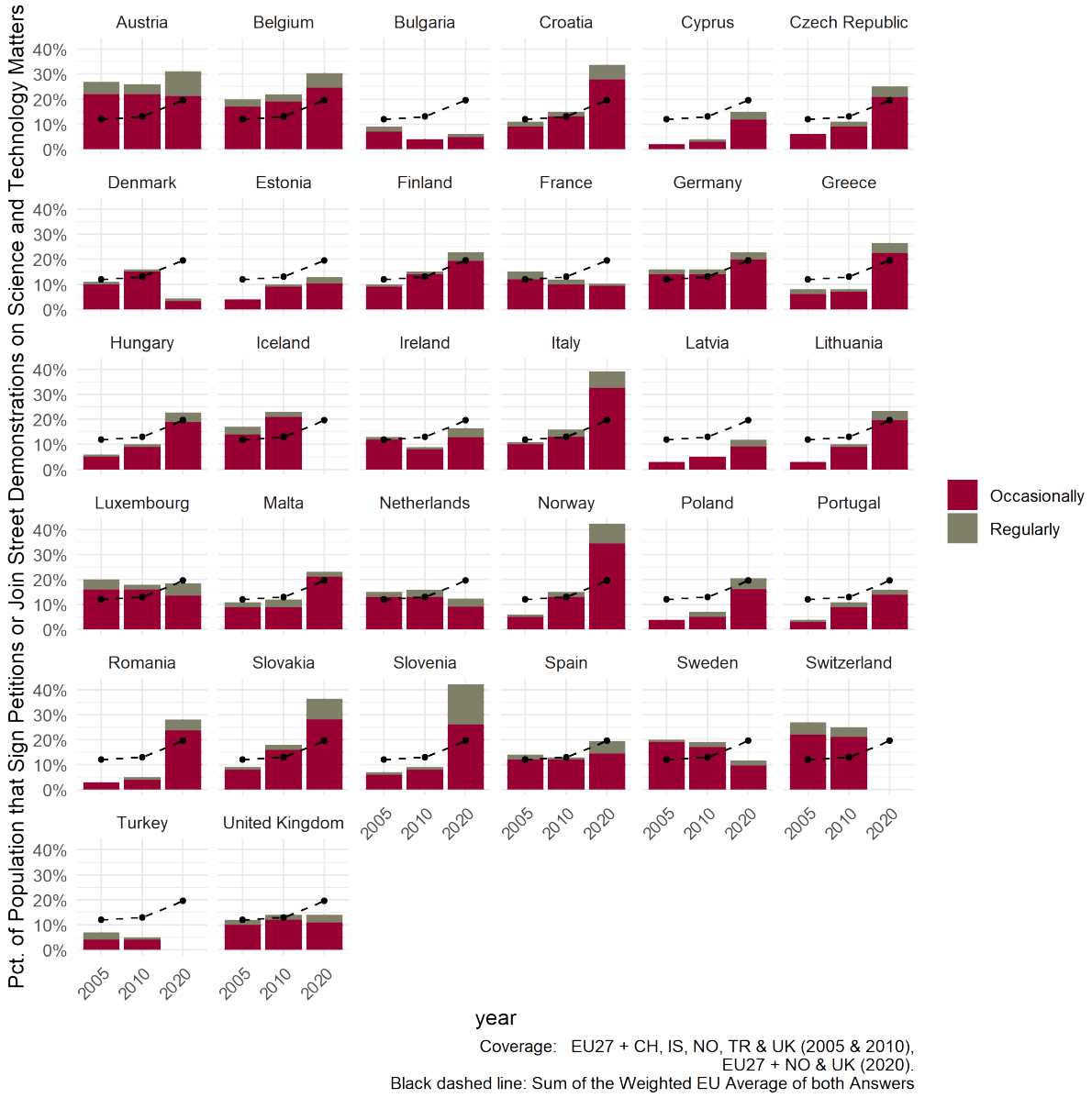


Figure 21: Percentage of the EU-public that sign petitions or join street demonstrations on science and technology matters

Figure 21 depicts the development in the percentage of citizens that sign petitions or join street demonstrations on matters of science and technology matters in 2005, 2010 and 2020. For a detailed data fiche for the indicator see Table 34.

Like the previous indicator described, the EU average for this indicator of public engagement with science via petitions and street demonstrations also recorded a substantial rise. The average EU share of citizen participating in petitions or street demonstrations increased from 13% to 19,6% comparing 2010 to 2020, an increase of more than 50% on this indicator.

Considerations about whether the emergence of COVID-19 has affected this indicator, as noted for the previous indicator, likely apply to this indicator also.

5. Open Access Indicators

In the first monitoring report, data provided by CWTS at Leiden University was included to present five indicators of open access publication. These indicators are based on Web of Science and Unpaywall data. Since the publication of MR1, the CWTS database of Open Access publications has been expanded, both to include data points for 2020 but also to include increased numbers of publications for previous years. This section thus includes new data for 2020, but also updates data used for all the previous years included in the time series. In a change from MR1, the UK is no longer included in the time series.

5.1. Percentage of open access publications

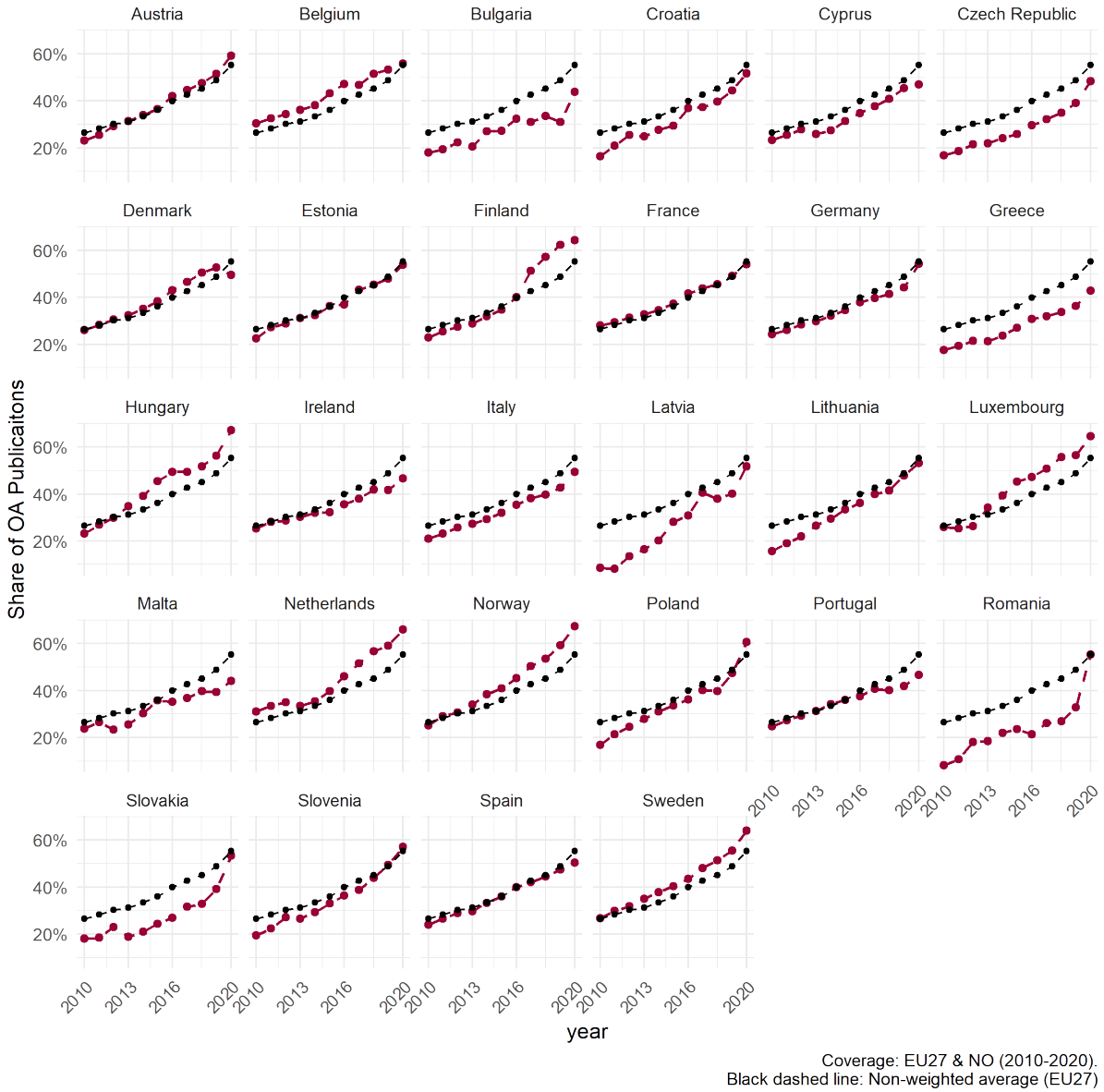


Figure 22: Percentage of open access publications

Figure 22 shows the development in the percentage of open access publications for the EU27 and Norway from 2010 to 2020. For a detailed data fiche for the indicator see Table 35.

As was the case in MR1, a rising trend in open access publishing continues to be evident. This trend is fairly uniform across countries, although a faster rate of increase is evident in a number of eastern European countries.

5.2. Percentage of open access publications (Green)

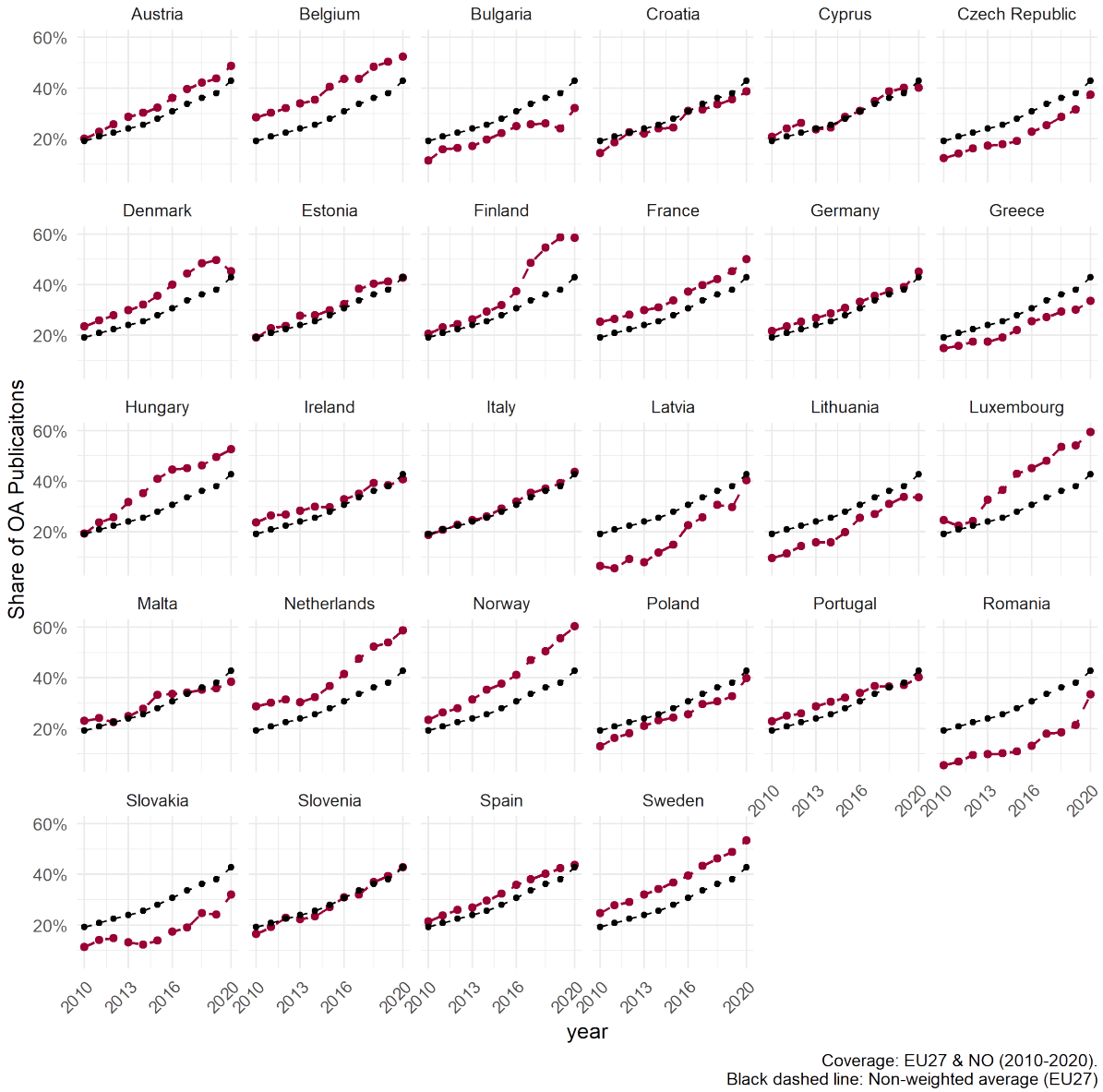


Figure 23: Percentage of open access publications (Green)

Figure 23 depicts the development in the percentage of *green* open access publications for the EU27 and Norway for the period 2010-2020. Green open access is a form of open access publishing in which

a version of the author's manuscript is placed in an openly accessible archive or repository. For a detailed data fiche for the indicator see Table 36.

5.3. Percentage of open access publications (Gold)

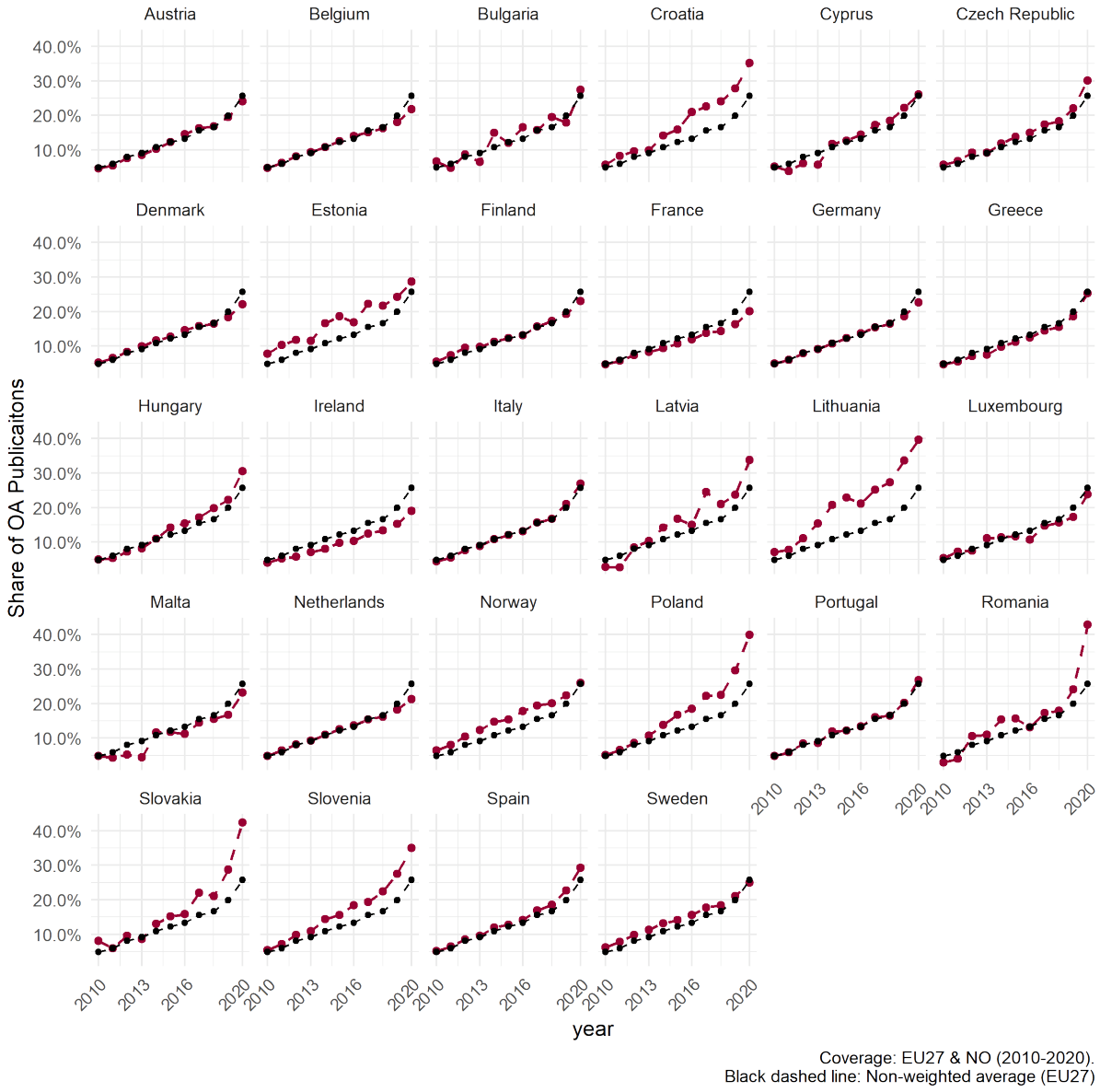


Figure 24: Percentage of open access publications (Gold)

Figure 24 depicts the development in the percentage of *gold* open access publications for the EU27 Norway for the period 2010-2020. Gold open access ensures that the final version of the publication is made fully and permanently accessible immediately. For a detailed data fiche for the indicator see Table 37.

5.4. Percentage of open access publications (Hybrid)

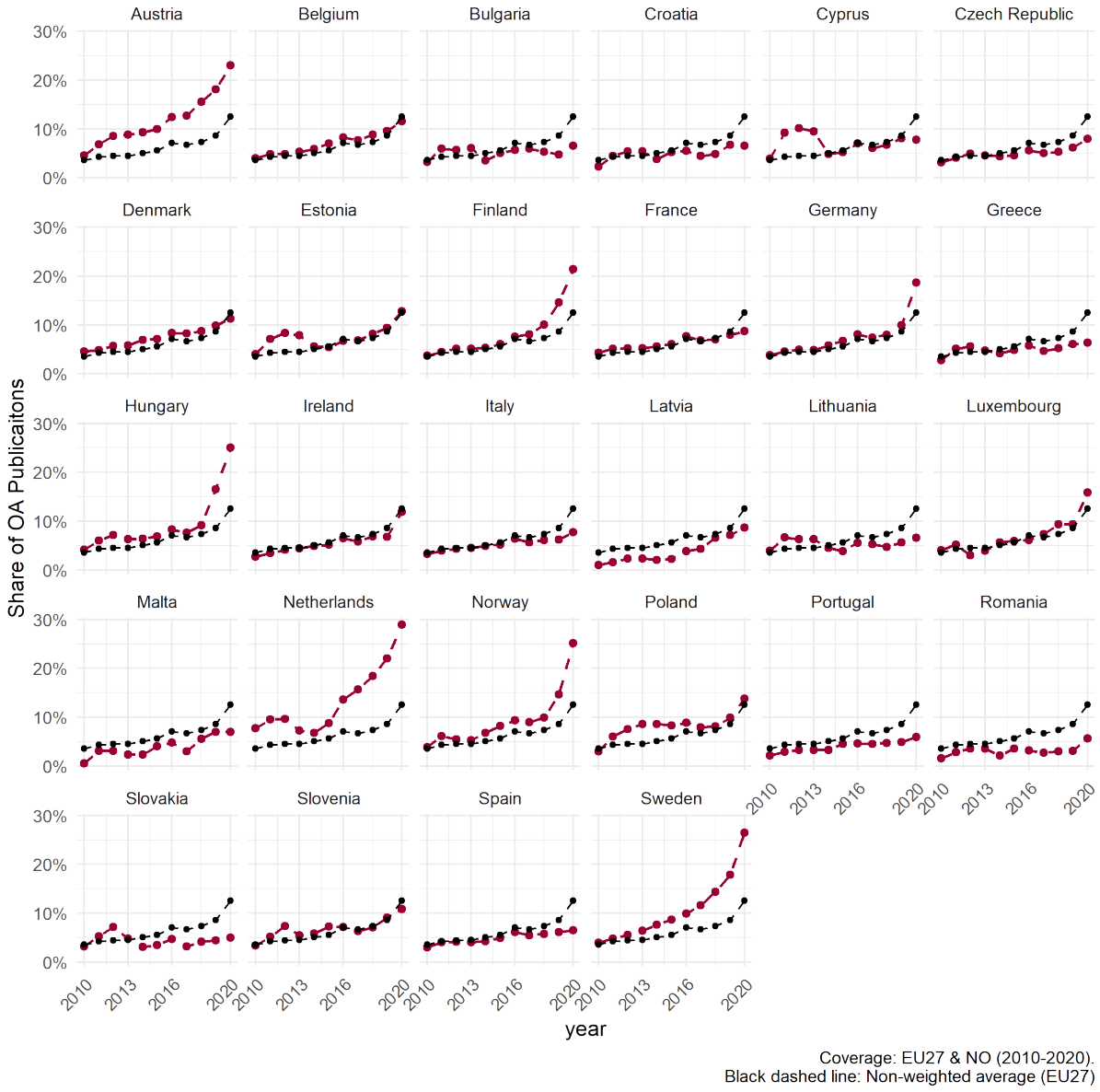


Figure 25: Percentage of open access publications (Hybrid)

Figure 25 depicts the development in the percentage of *hybrid* open access publications for the EU27 Norway for the period 2010-2020. Hybrid open access is a form of open access publishing in which the author(s) of a publication pay for open access publishing in a non-open access journal, thereby creating open accessibility to a single publication in an otherwise toll access journal. For a detailed data fiche for the indicator see Table 38.

5.5. Percentage of open access publications (Bronze)

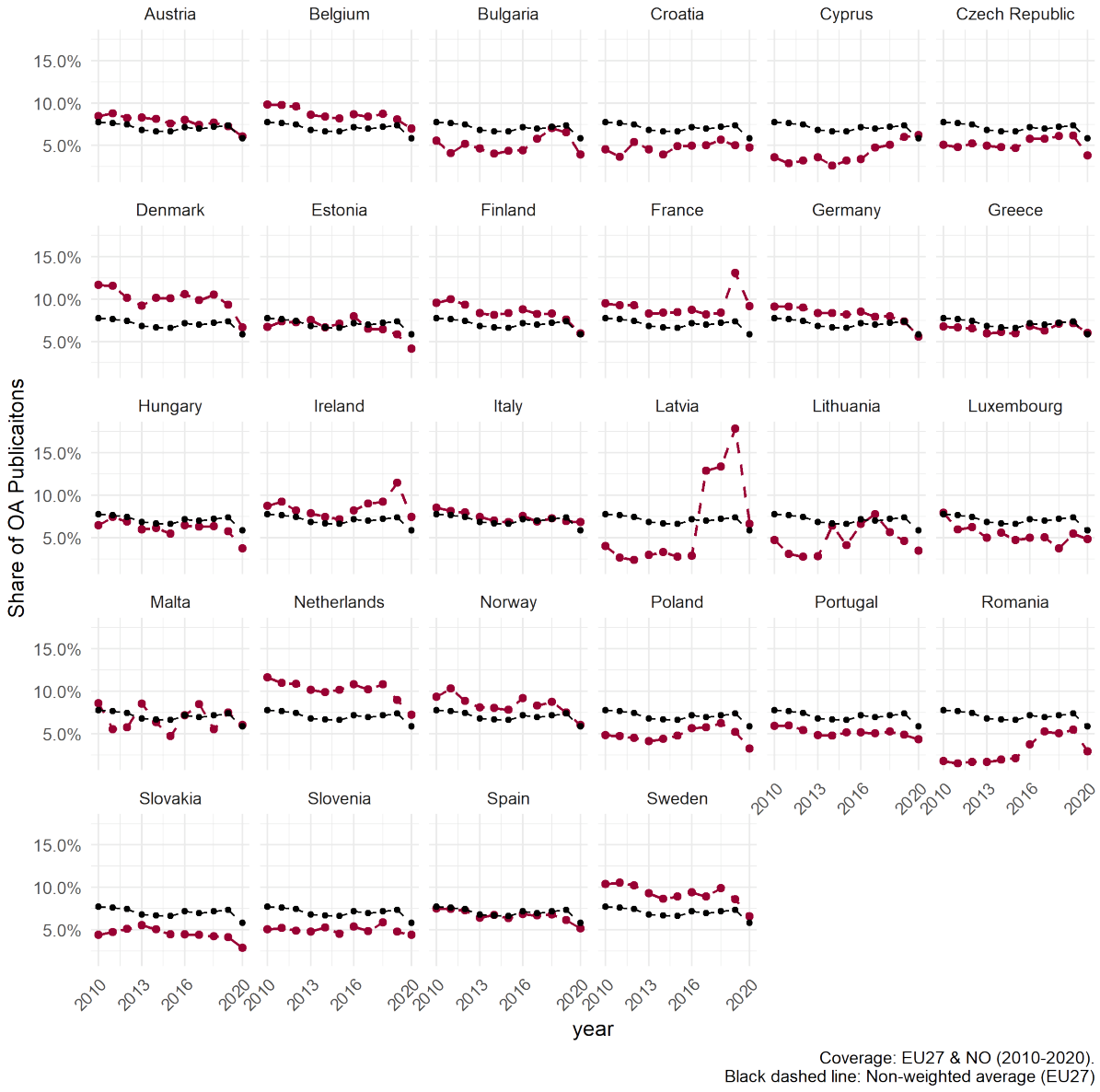


Figure 26: Percentage of open access publications (Bronze)

Figure 26 depicts the development in the percentage of *bronze* open access publications for the EU27 and Norway for the period 2010-2020. Bronze open access is a form of open access publishing where publishers make publications openly accessible without a clear license. For a detailed data fiche for the indicator see Table 39.

5.6. Percentage of co-publications with industry

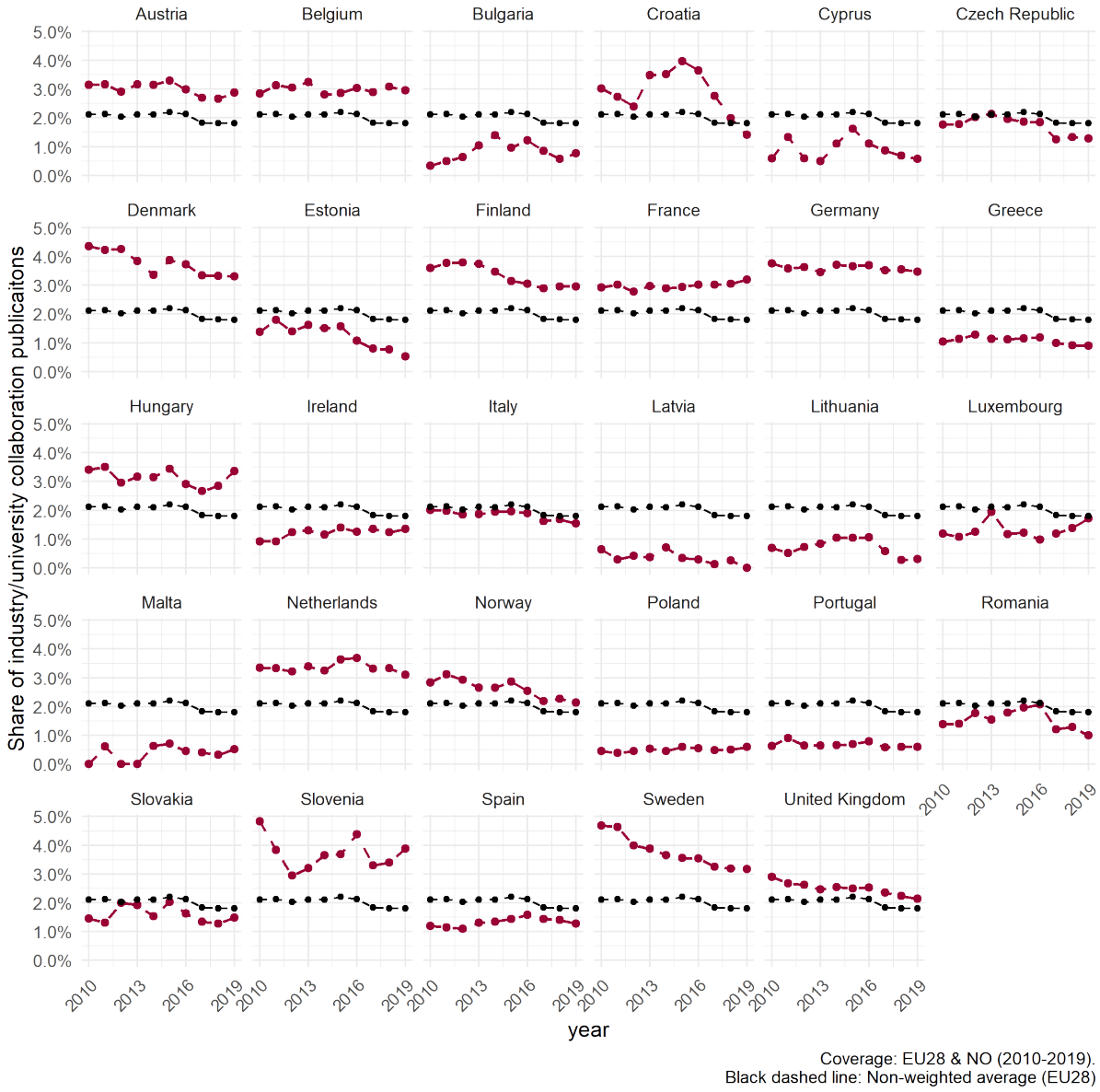


Figure 27: Percentage of publications classified as industry co-publications

Figure 27 illustrates the development in the percentage of publications classified as industry co-publications for the EU27 + NO & UK from 2010 to 2019. Indicator not updated since MR1. For a detailed data fiche for the indicator see Table 40.

The European average for the share of publications produced as a university-industry co-authorship has remained stable over the full data series for this indicator. As of 2019, Slovenia and Germany had the highest percentage of industry co-publications, with shares of 3,9% and 3,5% respectively.

6. RRI in Research Performing Organisations

This chapter presents data and indicators drawn from the CCN-RPO study undertaken between June 2021 and November 2021. The chapter begins with a short description of the aims and scope of the empirical data collection, followed by an overview and description of the sample of European HEIs. In the six sections following, we present metrics and qualitative contextualization of how HEIs work with areas related to the concept of RRI: 1) responsible research and innovation; 2) open science (OS); 3) research ethics and integrity (REI); 4) gender equality (GE); 5) public engagement (PE); and 6) the third mission (TM).

The metrics provided include:

1. the proportion of HEIs who work with and include one or more of the six areas listed above in their organisation strategy;
2. the proportion of HEIs who have implemented specific policies, structures, and actions supporting one or more of these six areas;
3. the distribution of HEIs in terms of the strategic priority they place on each area;
4. whether HEIs have a mainly aspirational or mainly practical approach to each area; and
5. a composite metric that combines these four metrics.

In the final section of the chapter, we provide an overview and discussion of the RRI repertoires of European HEIs. A short section on international benchmarking is also included. We finish by briefly describing other relevant areas upon which HEIs place strategic emphasis, but which were not directly included in the methodological design of the CCN-RPO study.

6.1. Aim, scope and method of the CCN-RPO study

The objective of the CCN-RPO study was to examine a limited range of mechanisms through which HEIs work to enhance responsibility in research. The study focused on the strategic priorities of European HEIs and their organisational policies, supporting structures, and actions related to RRI, open science, research ethics and integrity, gender equality, public engagement, and the third mission.

The study design was based on selecting a representative sample of European HEIs. The study aim was to develop an overview and understanding of RRI policies and practices in different types of European universities. The data collection process was focused on compiling a comprehensive overview of each HEI's strategic focus, organisational policies, and support structures for RRI. A consistent approach was taken, with country correspondents (CCs) focusing on the externally communicated strategies and policies as presented on HEIs' institutional websites. Country correspondents then produced a descriptive report of HEI strategic aims and actions within the six predefined areas.

Data was collected for a total 122 European HEIs. Data was also collected from seven HEIs from USA, Australia, and Brazil to enable international benchmarking. The selection of RPOs in Europe was based on two criteria: 1) collecting data on HEIs in the EU27 plus Norway and the UK; and 2) securing representativeness of HEIs at the European level. The selection methodology used the European Tertiary Education Register (ETER) database. Depending on the size of the country, either two, four or six HEIs were selected. Variation among these selections were based on three diversity measures (Ryan et al. 2021), size, disciplinary focus, and teaching/research balance. For each country, HEIs were clustered in groups based on these variables and one RPO in each cluster was selected. The method ensured variety of HEIs within each country and representativeness at the European level. In the CCN-

RPO study protocol the sample was compared to the ETER database in terms of distribution on the variables of interest. The similarity in distributions indicate an acceptable degree of representativeness of HEIs at the European level. Details on the study sampling process and the full list of HEIs selected is attached at Appendix B. Further details of the study design are available in the study Protocol.[4]

Each country correspondent was provided with a reporting template and guidelines on how to gather information and convey it in a standardised format. After completing their search activities CCs contacted HEIs to validate the documentation collated and to ensure that important omissions did not occur in our six areas of interest, and to potentially gain access to additional information. Overall, 43 of the 122 RPOs responded to the CC's request. In all cases this response did not have any important effects on the data collection and reporting. Country correspondents were also asked to evaluate two questions regarding individual HEI's approach to each area of RRI after collecting and reporting the data.

Quality assurance was performed using a two-step method. First, country correspondents where organised in teams. In these teams, CCs provided feedback on each other's report. In the second step, the final reports where thoroughly checked in an internal review. CCs were then asked to revise the reports required. Further detail on the quality assurance process is attached at Appendix C.

The metrics and indicators in this 2nd monitoring report summarise the inclusion of key areas relating to RRI in organisational "strategy documents" or "policy, support structures and actions", as made available publicly on organisational websites. These indicators are summarised in Table 3. In addition, a selection of qualitative examples is highlighted to provide context and understanding to the metrics and indicators.

The main limitation of the study is that the approach thus does not capture *all* strategic deliberations, policies, support structures, and actions that a HEI may pursue, as some may not be communicated on the public website. Nevertheless, we consider that RRI action areas are more likely to be communicated externally when HEIs wish to highlight their initiatives in these areas. Institutional websites are a way in which to communicate to stakeholders, staff, and students of the organisation. We are thus confident that the methodology used captures the significant strategies and policies with regard to RRI present in our sample of HEIs.

[4] https://osf.io/63v8m/

Table 4: Indicators derived from the CCN-RPO study

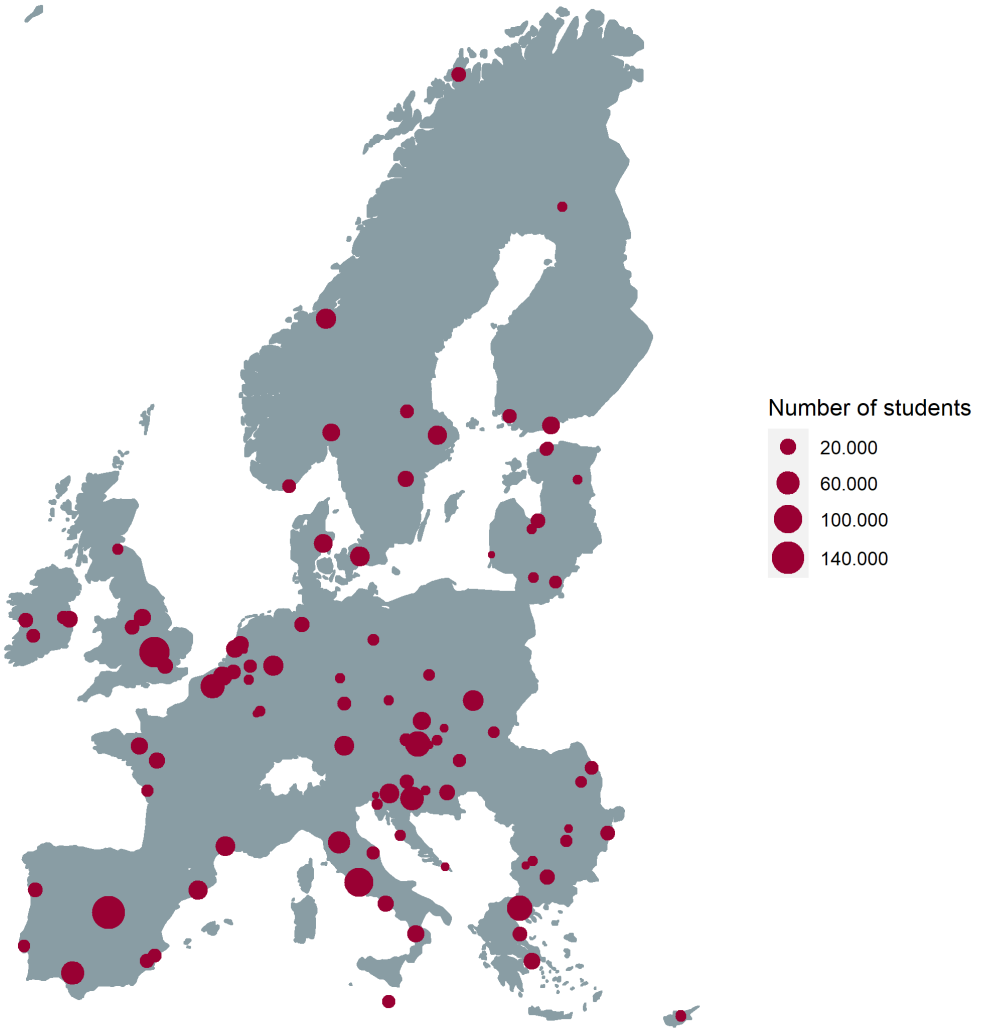
Name	Contents	Section
Strategy/policy Does the HEI include the RRI area in its strategic documents?	1-0 (yes-no)	OA, GE, PE, RE&RI, TM, PE
Priority Degree of strategic prioritisation of an RRI area compared to all RRI areas for each HEI	High, Medium, Low	OA, GE, PE, RE&RI, TM, PE
Aspirational – Practical Does the description of the strategy in this area appear to be mainly aspirational or practical?	1-5	OA, GE, PE, RE&RI, TM, PE

6.2. Overview and summary statistics of the HEI sample

The sampling methodology returned a total of 122 European HEIs for inclusion in the study (Appendix B). The HEIs in the sample range from having 220 to 145.579 students, with an average of 18.358. The sample includes business schools (19 %), liberal arts and humanities universities (4%), technical universities (7%), medical and health universities (8%) as well as traditional comprehensive universities (57%) (Figure 29).

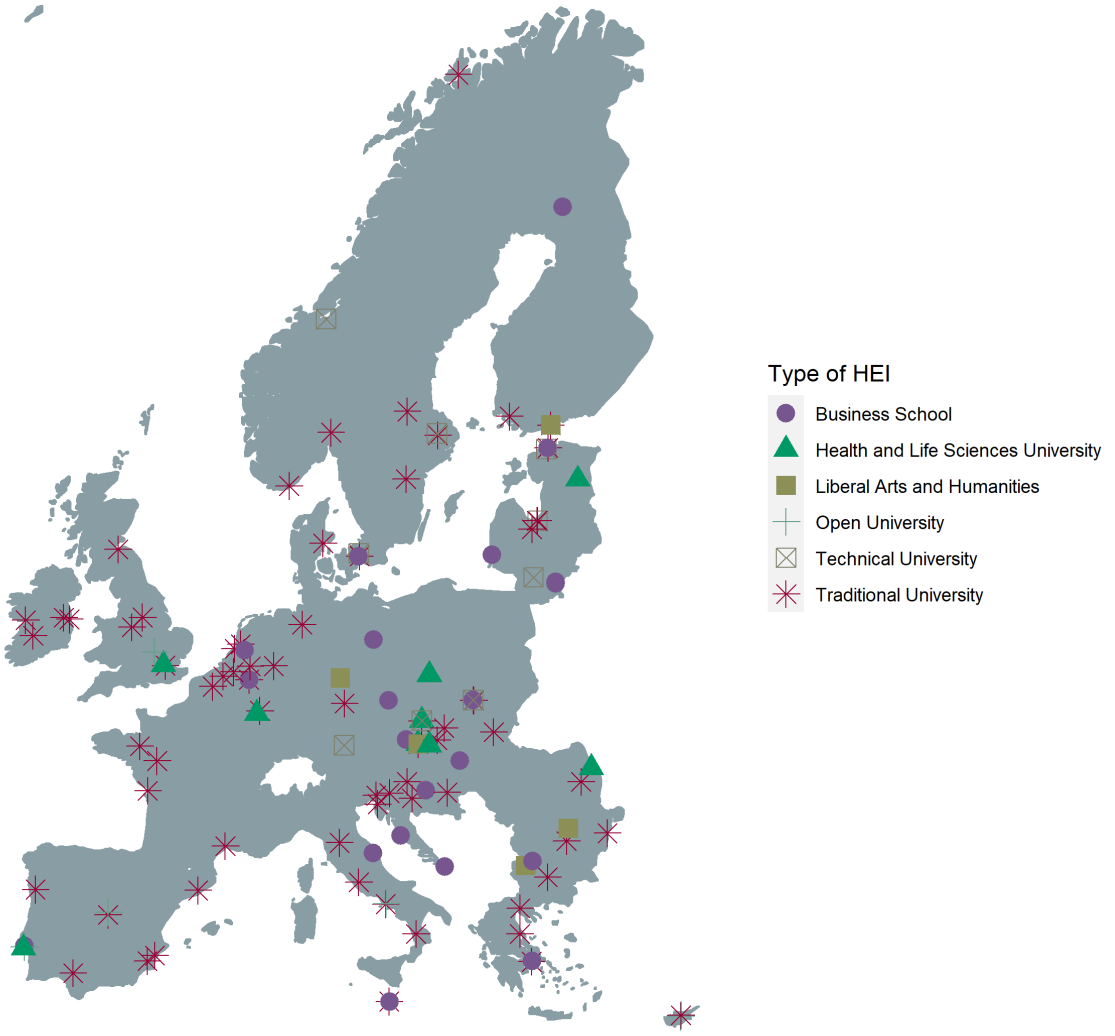
Figure 30 illustrates the differences between HEIs in terms of how much funding they have attracted through the Horizon 2020 framework funding programme. A total of 14% of the HEIs received no funding from H2020, 80% received less than (Euros) 50,000,000 and 20% more than (Euros) 50,000,000. Figure 28, Figure 29 and Figure 30 illustrate how the RPOs vary in terms of size, type of RPO, and level of funding from the H2020 programme respectively on a European map.

Compared to the best available data of European HEIs in ETER the sample is representative of HEIs in Europe (Appendix B) on a selection of variables. The HEI sample includes both high-ranked and well-known metropolitan universities alongside some less prominent regionally based colleges. This sampling strategy provides an opportunity to obtain a realistic picture of how RRI is being supported by a diverse set of HEIs. The sample will allow for future analyses (not included in the report) on co-variation with variables such as European funding, size, research intensity and disciplinary focus that have previously been posited to relate to RRI implementation (Ryan et al. 2021).



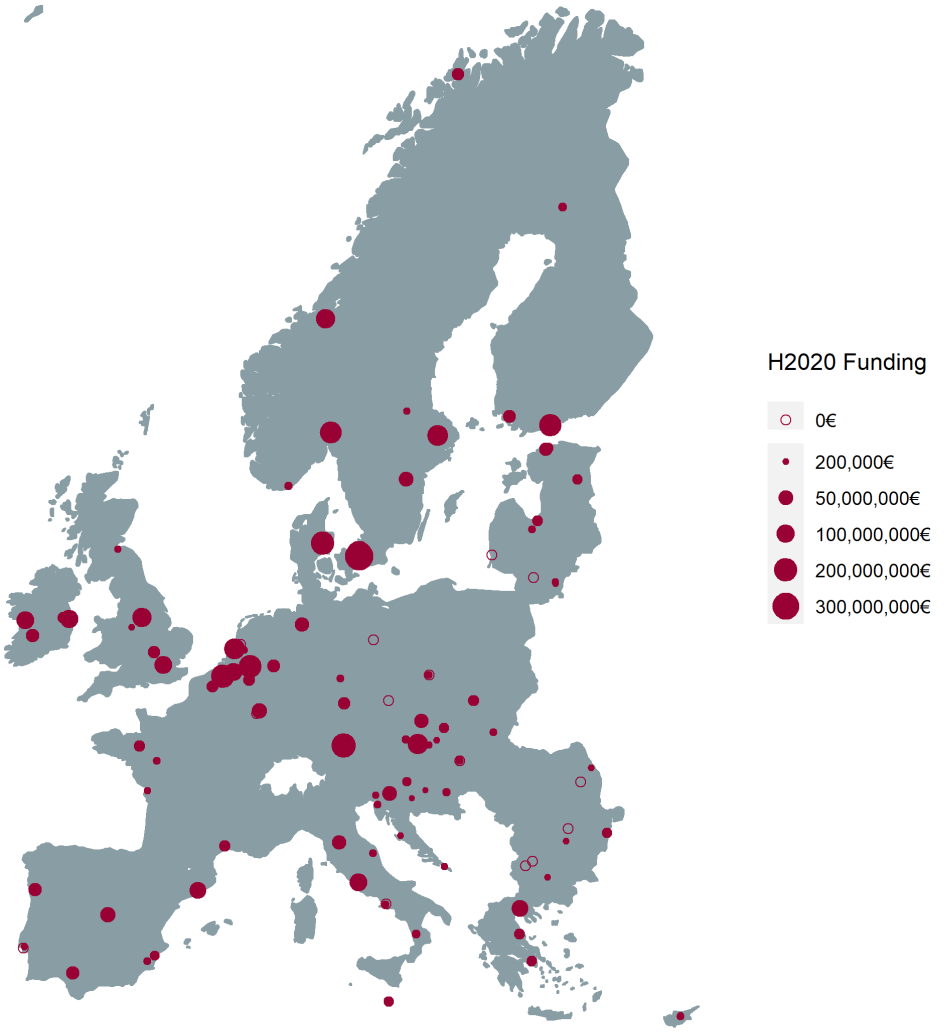
University of New Caledonia is excluded from the map, as to only include European countries.

Figure 28: Map of HEI sample, by number of students



University of New Caledonia is excluded from the map, as to only include European countries.

Figure 29: Map of HEI sample, by HEI type



University of New Caledonia is excluded from the map, as to only include European countries.

Figure 30: Map of HEI sample, by amount of Horizon 2020 funding received

The following sections describe how European universities support and promote RRI and a range of RRI-related areas.

6.3. Responsible research and innovation in HEIs

The websites of the HEIs in the study sample were examined for the presence of the concept of 'responsible research and innovation' (RRI) in policy and/or strategy documents or web presentations. Only a small number of HEIs mention RRI specifically in their strategy and/or policy documents. Of the RPOs that do directly mention RRI, the concept is mainly described as a guide to promote responsible research practice, with the aim to conduct research for and with society to increase societal impact.

Included here are areas such as science communication, gender and diversity, open science, and ethics.

Among those HEIs that make explicit reference to the concept of RRI, one has developed a website providing researchers with concrete information and advice on how to work with RRI. The website includes a section with links to RRI resources, journals, books, blogs, and other sources to help academics embed RRI in their work. This HEI also provides training to staff to help academics incorporate RRI through the entire research process when applying for funded projects. Another HEI hosts RRI workshops and runs a "Science shop", where researchers and members of the public can meet to discuss RRI-related topics.

RRI-related themes are frequently mentioned in the core strategic documents of the HEIs studied. Third mission, and research ethics and integrity, are the most prevalent themes covered in HEIs' core strategic documents. Open science, gender equality, and public engagement also occur frequently in these documents.

Figure 31 below summarizes how many RPOs mention the five RRI-related areas included in this study on their websites. This includes mentions in a core strategy document and/or in other documents describing policies, support structures, or actions. In the following sections HEIs support for each of these six areas will be described in more detail.

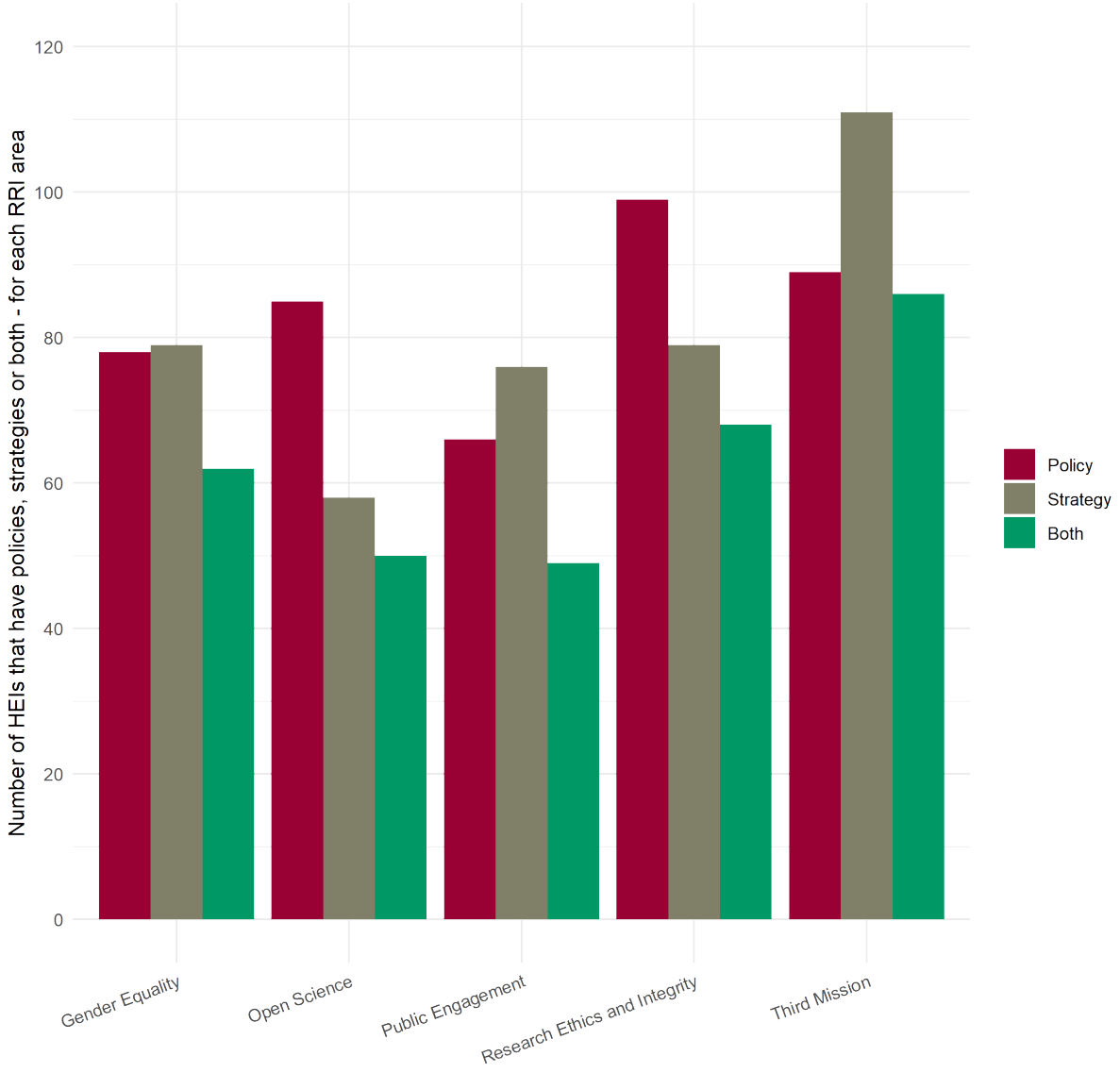


Figure 31: HEIs that include RRI areas on their public websites, by RRI area

All five RRI-related areas being studied were prominent in a majority of HEIs. The most common policy was for research ethics and integrity. The most common strategy found was for third mission, or knowledge and technology transfer activities. A sizeable proportion of universities had both a policy and a strategy in the case of each of the RRI-related areas.

The following five sections provide data and information about the five RRI areas studied. Following this, we provide a summary of the relative strategic priority of these five areas in HEIs and a comparison of the extent to which strategies in these areas are mainly aspirational or mainly practical.

The concept of RRI was not present in the policies or strategies of the HEIs used for international benchmarking in this study.

6.4. Open science in HEIs

The websites of the HEIs in the study sample were examined for the presence of open science in policy and/or strategy documents or web presentations. Open science is a policy priority for the European Commission and a standard method of working under its research and innovation funding programs. It is argued by the EC that open science improves the quality, efficiency, and responsiveness of research.[5] The aims of open science under Horizon Europe are to:

- ensure that beneficiaries retain the intellectual property rights they need to comply with their open access obligations
- require research data to be FAIR and open by default (with exceptions notably for commercial purposes)
- promote the adoption of open science practices, from sharing research outputs as early and widely as possibly, to citizen science, and developing new indicators for evaluation research and rewarding researchers
- engage and involve citizens, civil society organisations and end-users in co-design and co-creation processes and promote responsible research and innovation
- European Open Science Cloud (EOSC) will enter its next stage of development in 2021
- fund the development of an open-access publishing platform to host Horizon 2020 (and later Horizon Europe) beneficiaries' publications

In the study training provided for country correspondents, the following definition of open science was promoted:

> *Open Science refers to efforts "to make the primary outputs of publicly funded research results – publications and the research data – publicly accessible in digital format with no or minimal restriction" (OECD 2015: 7). In a broader sense, Open Science is about promoting openness across all parts of the research cycle, from design through data collection, processing, and storage, to scholarly communication (Open Science and Research Initiative 2014).*
>
> *Examples of Open Science policy elements may include open access publishing policies, open data policies, policies concerning pre-registration and the use of publicly accessible data and publication repositories, policies concerning recognition of data communication in relation to promotion, policies on the use of open source software, etc. It may also include endorsement of external policies or principles, such as FAIR data principles.*
>
> *Examples of supporting structures for Open Science may include institutional repositories for data and publications or a dedicated office for Open Science. Examples of supporting actions may include training in open science practices, appointment of open data champions or advisors, awards for data sharing, etc. (CCN-RPO study protocol)*

This section reports on HEIs initiatives to support OS in four ways. We first summarise the repertoire of initiatives that organisations engage in to promote OS: 1) How HEIs include and discuss aspects of open science in their core strategic documents; and 2) whether HEIs have implemented policies, structures and actions that support open science activities. We then provide categorical assessments of: 3) the strategic priority HEIs place on open science; and 4) the degree to which HEIs' open science strategies are mainly aspirational versus mainly practical.

[5] https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/our-digital-future/open-science_en

6.4.1. Aims and content of Open Science strategies

Open science encompasses many aspects, and HEIs' strategy documents illustrate different ways of working strategically with open science principles. The three key areas of open science strategies found in the policy/strategy documents were research transparency, societal development, and the availability of education for all.

Almost all HEIs mention the traditional research values of transparency and replicability in their strategic aims regarding OS. Their aim in this area is to increase the impact of research by making it available to all interested parties. This increased visibility and knowledge exchange, may then provide new national and international collaboration possibilities for HEIs with industry or other universities. OS principles are also applied to provide maximal disclosure of findings, following the guiding principles of "as open as possible, as closed as needed". By making the research process transparent and storing data in a repository, HEIs are making their research practices observable, and data can be monitored for papers, theses, archives, databases, and educational resources.

At the societal level, the HEIs apply OS principles to contribute to the development of society. This is foreseen through making research data, research results, and the scientific process more easily accessible to more people inside and outside of academia, thereby democratising knowledge. Applying OS principles also brings the opportunity to facilitate citizen science and open innovation with greater transparency and accountability, and to promote public awareness of publicly funded research. Most HEIs work with a repository of data, and for some, this provides the opportunity to protect and safeguard the access to cultural heritage documents. In terms of science communication, some HEIs have a platform used to creatively disseminate open science to the public. As such, OS aims are linked to PE through the focus on science communication to and with the public, and to third mission through its focus on transparency in collaborations with external partners.

In education, the HEIs view the free availability and flow of information as contributing to teaching and learning. Open science principles are applied to provide educational materials to the public as well as researchers and students, again providing insights into current research and academic methods.

Overall, most HEIs have a strategic focus on Open Access, the sharing of data and results, and less strongly on the broader concept of OS.

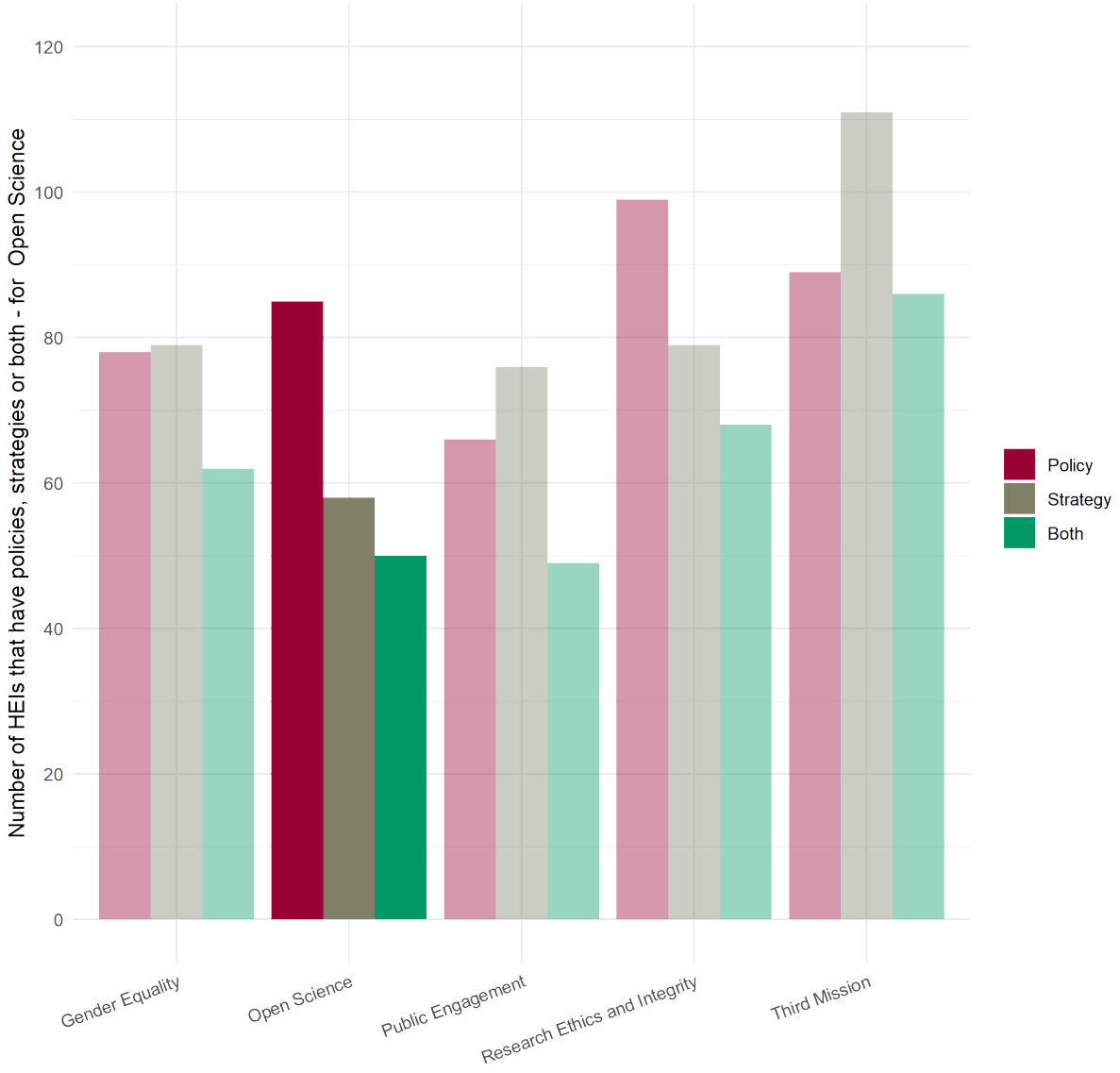


Figure 32: Number of HEIs that include Open Science in their publicly available policy and strategy documents

Figure 32 illustrates the number of HEIs that include open science in their policy and/or core strategic documents. The figure shows that a majority of HEIs have an OS policy and approximately half highlight or mention aspects of open science in core strategic documents. HEIs are included here that do not have an open science policy *per se*, but where floor-level "actions" or stand-alone initiatives in parts of the RPO are observed. Figure 32 furthermore illustrates that a number of HEIs do not highlight open science in their strategic documents but do have some policies, support structures or actions in place that support aspects of open science. More than two-thirds of HEIs have policies, supports structures or actions that relate to open science.

6.4.2. Policies, support structures, and actions for Open Science

Almost all HEIs policies and/or strategies mention that they adhere to national and/or international OA guidelines, such as the FAIR principles and the OpenAIRE initiative. At the national level, some countries manage open data archives, and have a Commission or Board that works with open data.

Further, several HEIs have developed their own OA policies, which often include, or are supplemented by, data management policies. The policy documents typically describe how the HEI works with OA, stating aims and practical implications. Key areas found in these documents, include the digital foundation, recommendations and requirements and funding for OA.

The digital foundation for open science and open access is mentioned as being key to ensuring safe storage and ethical management of documents. Several HEIs already have their own repositories for this purpose, while others are in the process of setting them up. Having their own repositories enables the HEIs to focus on Green open access, storing publications in their own repositories, and adapting their own journals to an OA format. These repositories collect all kinds of data including research papers, theses, books, patents and more. The repositories also encourage re-use of data in research projects and to use OS principles to ensure responsibility and reproducibility. These institutional repositories appear to be the most important structure when working with OS.

Building on an open repository, some HEIs provide researchers and research groups with a more complex research data management infrastructure that includes tools and services for supporting the production, use and sharing of data as well as with the capacity for storage, computing, and processing. Apart from safe storage, the HEIs also use digitalisation to reach and communicate with society.

Some HEIs have developed practical guides for OA for researchers, detailing what OA approach is recommended by the HEI and how to apply it. One HEI mentions direct recommendations that their researchers publish in open access publications and publish their research results as a first publication or as a pre- or post-print on the online publication service. A requirement of archiving in the digital repository makes the publication activity transparent and track able, to monitor to what extent researchers follow these guidelines. As an incentive to publish OA, one HEI also considers OA practices in its recruitment processes for researchers.

For the HEIs that do not yet have a repository or similar structure set up, it is frequently mentioned that more investments in this area are needed. This includes both financial investments, and the development of competencies in digitalization, and many HEIs are currently working with this, allocating funds to OA.

Some university libraries provide an Open Access publication fund to enable publication of research results in Open Access journals. In some cases, requirements to receive these funds include publishing according to “Golden path” or “Green path” principles. Other universities provide their researchers with an online publication service which is free of charge, operated by the university. Some HEIs provide practical support for researchers aiming at publishing open access, for example in the negotiation with publishers or editors.

The “Open Science Taskforce”, or other staff constellations allocated to Open Science, works to ensure that the university provides researchers with the resources needed in e-infrastructure, to provide adequate storage, power, and programs. The task force initiates activities and ensures knowledge sharing across the organisation as well as externally, with the aim that research data management

becomes embedded in the research culture. Many universities hold regular training sessions for staff on OS principles. These are often organized by the taskforce and typically include information on how to submit research material on their OA repository to encourage OA.

This taskforce is frequently organized through the library as a support centre for all things OA. The library can help researchers evaluate the quality, reliability, visibility and accessibility of journals or other publication channels. Information on OA is typically also available online as guidelines for researchers. The taskforces also organize events at the national and international level, for the people working in libraries to talk about collaborative and open libraries, open science, and public participation.

6.4.3. Strategic priority of Open Science

Figure 33 illustrates the strategic priority universities place on OS, as evaluated by the country correspondents (CCs). As described above, HEIs may include OS in their strategic documents in a variety of ways and to different degrees. Some may mention open science in a sentence while others may frame their organisation's strategic agenda around OS. In order to capture the level of priority, CCs were asked to rate how much priority the university placed on OS in their strategic documents, on a five-point scale from low to high.

Country correspondents based their assessment on the scope and depth (detail) of each HEI's strategy documents for a particular area. To arrive at a priority rating, CCs compared the apparent relative strategic importance of each of the different RRI areas for the organisation.

Figure 33 shows that of the approximately 50% of the sample who include OS in their strategy, only a small group were rated as giving a high strategic priority to open science.

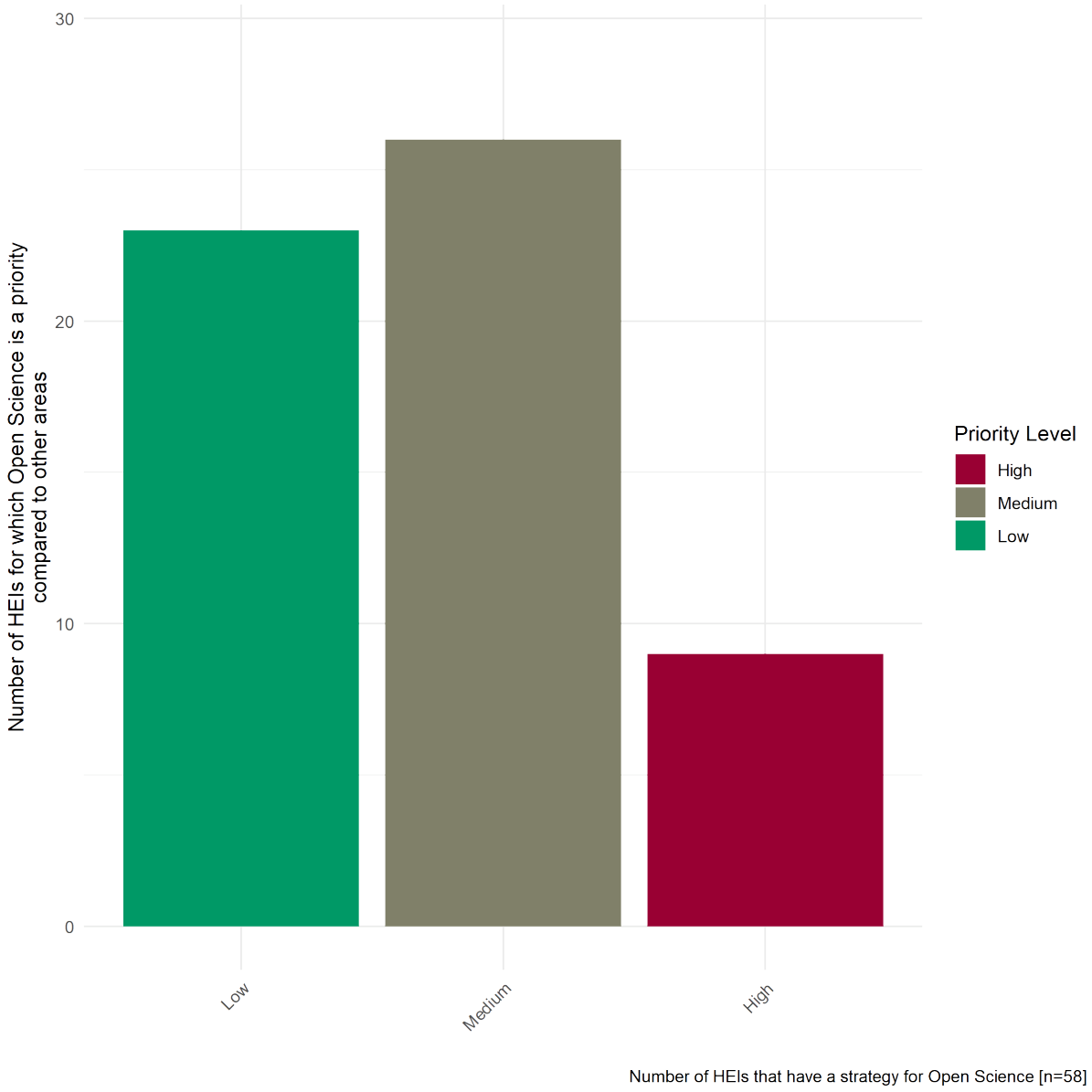


Figure 33: Strategic priority of Open Science in HEIs

6.4.4. Aspirational-practical approach to Open Science

Based on their reading of the strategic documents(s) of each HEI, country correspondents were asked to evaluate whether each university's approach to OS is mainly aspirational or practical. This assessment applied to those HEIs with OS present in their strategy documents. Figure 34 shows the distribution of HEIs on this assessment.

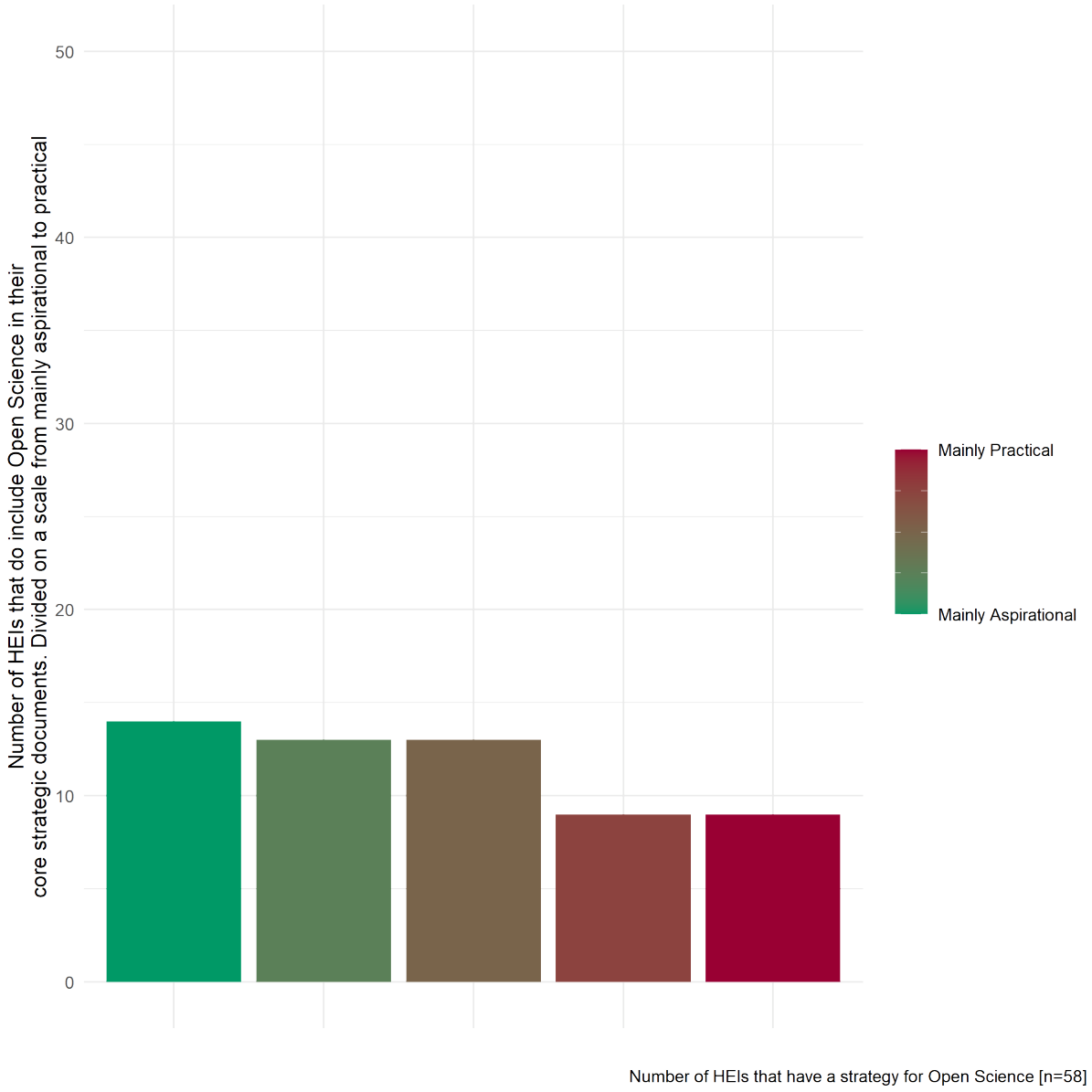


Figure 34: Number of HEIs with a practical-aspirational approach to Open Science strategy

Figure 34 shows that for the 62 RPOs that include OS in their core strategy documents the majority have a mainly aspirational approach. This implies a focus on what the organisation would like to achieve and less attention to concrete means or steps to achieve their OS ambitions, for example setting out milestones or targets as well as specific initiatives. Less than half of the HEIs with an OS strategy lean toward a mainly practical approach.

6.5. Public engagement in HEIs

The websites of the HEIs in the study sample were examined for the presence of public engagement in policy and/or strategy documents or web presentations. Public Engagement (PE) is part of the guidelines of the Horizon 2020 funding instrument. According to Horizon 2020 Public Engagement: "implies establishing participatory multi-actor dialogues and exchanges to foster mutual understanding, co-create research and innovation outcomes, and provide input to policy agendas".[6]

According to Horizon 2020, Public Engagement is an important part of RRI because, it contributes to:

- enhancing creativity in research and innovation design process and results;
- the likelihood that research and innovation outcomes are more societally relevant and desirable;
- achieving shorter time to market and greater consumer acceptability of research and innovation outcomes; and
- providing a breeding ground to foster a more scientifically literate society of knowledge-driven and empowered citizens, able and interested to participate in and support democratic processes, including on decisions of Research and Innovation financing, and evidence-based policy making

In the training provided to CCs, the following definition of public engagement was used as a guide to aid them when reading documentation obtained from the HEI websites.

> *Public Engagement covers "… the diversified set of situations and activities, more or less spontaneous, organised and structured, whereby non-experts become involved, and provide their own input to agenda setting, decision-making, policy-forming, and knowledge production processes" (Bucchi and Neresini 2007: 449). Public Engagement is concerned with the inclusion of citizens and societal stakeholders in these processes.*
>
> *Examples of Public Engagement policy elements may include policies on public communication of science or policies on stakeholder involvement in research activities.*
>
> *Examples of supporting structures for Public Engagement may include a dedicated office for public communication of science, a 'science shop' or similar bodies for dealing with citizen and stakeholder knowledge demands, dedicated resources for citizen science, or a formalised citizen and stakeholder advisory board.*
>
> *Examples of supporting actions may include training activities related to science communication, rewards for citizen science initiatives, public communication awards, cross-organisational events or initiatives like an annual science festival or open university day, open university courses for citizens, ad hoc representation of stakeholders and citizens in decision making bodies of the organisation, etc.*

This section reports on HEIs initiatives to support PE in four ways. We first summarise the repertoire of initiatives that organisations engage in to promote OS: 1) How HEIs include and discuss aspects of PE in their core strategic documents; and 2) whether HEIs have implemented policies, structures and actions that support PE activities. We then provide categorical assessments of: 3) the strategic priority

[6] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/public-engagement-responsible-research-and-innovation

HEIs place on PE; and 4) the degree to which HEIs' public engagement strategies are mainly aspirational versus mainly practical.

6.5.1. Aim and content of Public Engagement strategies

In the strategic documents examined, HEIs have different perceptions of what PE means. For some, it mainly concerns one-way communication, sharing scientific knowledge with the public, informing them about science, and creating awareness of the importance of science. For others it concerns active involvement of members of the public in discussions and citizen science projects, interacting with the community to engage local communities in university work.

A key aim with PE work for most of the HEIs is to encourage dialogue between scientists and the general public, and thereby help shape public opinion based on scientific insights, contribute to knowledge-based conversations and to be present where important discussions take place. HEIs wish to contribute actively to evidence-based public debate with relevant knowledge and provide expert consultancy when needed. By participating in debates, researchers aim to share their research with the public and act as advisors. Further, the aim is to contribute to a knowledge-based democracy and to impact relevant societal decision-making processes.

For some HEIs, this popularization of science is founded in a sense of responsibility of making science accessible to the wider public, including under-represented communities, reflected in the inclusive notion that "knowledge belongs to everyone".

Several HEIs mention an aim to address their social responsibility through PE work. The aim is to work with citizens to identify and address societal issues, and to develop relevant projects to investigate them. This may be done in projects that deal with topics such as social inequality or the environment. In this way, universities envisage connecting with society, and conducting research that has a societal impact. HEIs consider that the inclusion of citizens in projects and co-creation activities will further help to establish a foundation for close collaboration between their organisation and the surrounding society and brings external insights into their research.

Some HEIs mention aiming to heighten young people's interest in science through science communication and to show them the importance and benefits of science in the hope that this may encourage them to choose research careers. More specifically, one aim is to increase the numbers and the diversity of people who engage with the STEM fields, both inside and outside of school.

PE is also viewed as work that can be applied to improve HEI outreach. HEIs mention that they aim to improve their visibility to the public as well as to potential collaborators through extended PE work. This can be viewed as a type of marketing tactic that can help build networks in the community, promote research outcomes, and improve communication amongst researchers, potentially leading to more inter-, multi- and transdisciplinary research. Further, PE work also aims to attract the best students.

Overall, HEI policy and strategic documents foreground aims designed to create an inspiring, inclusive, and diverse culture of public engagement in their organisations, transforming their research and learning through genuine dialogue with local and global communities.

Figure 35 depicts the number of HEIs in the study sample that include Public Engagement in their core strategic documents. It shows that 62% of HEIs include PE in their core strategic documents.

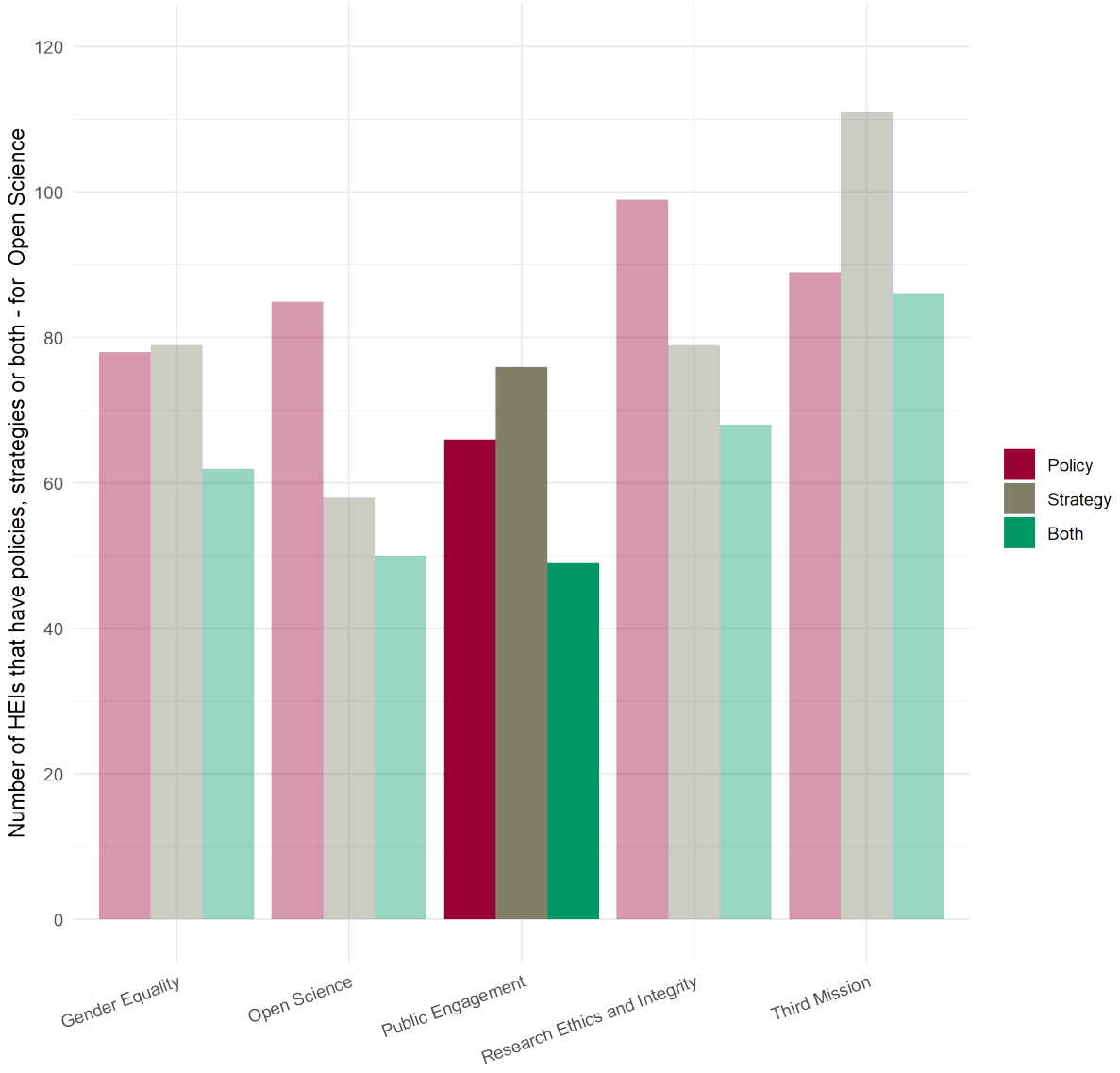


Figure 35: Number of HEIs that include Public Engagement in their publicly available policy and strategy documents

Policies, support structures and actions for Public Engagement

Just over half (54%) of HEIs have policies, supports structures or actions that relate to Public Engagement. This section provides detail on these elements.

6.5.1.1. Structures

Several HEIs have an office that works with PE, but the reports indicate some variation. Most directly, some HEIs have a PE team or advisory group, whose role it is to support researchers in developing PE proposals within research grants and proposals to achieve PE funding. Other universities use their Public Relations or marketing offices for PE work, while some organisations also employ specialists to work with science communication. PE work is sometimes supported by staff at the rectoral level. Finally, individuals at the department level run different types of outreach and dissemination

programs. When the PE activities are run by staff at the department level, the activities are more specific, focusing on areas such as stem cell research. Aside from coordinating and executing events, the PE staff work with planning and monitoring PE work. While some HEIs have set plans and experience in this, others are in the earlier phases and are aiming to develop such plans.

Some HEIs are members of national or international organisations that work with PE. These memberships provide a support structure and foundation for PE work, including professional expertise and resources, and coordination for PE initiatives.

A few organisations mention a "science shop" where members of the community can bring their questions and challenges to the university and they can be partnered up with lecturers, courses and students. In these co-operations, civil and academic knowledge are assigned equal weight – building on the diversity of knowledge, the potential for common and mutual learning and co-creation. Other physical facilities for PE include laboratories where the public is invited in to work with science in a hands-on fashion and museums that are open to the public and where science communication events often take place.

Importantly, some HEIs directly mention that they support and encourage their staff to take up PE work, including participation in debates, workshops and citizen science projects. PE training is frequently provided to researchers, focusing on science communication and interaction with the public. This may be in the form of physical courses or online material that is available to support PE work. Empowering staff and doctoral students with the skills and confidence to engage effectively appears to be a high priority for some HEIs, and many provide science communication training starting at the doctoral level. This may include public speaking, talking to the media and more.

In some cases, the HEIs specify that PE work is acknowledged as academic performance, indicating that it is included as achievement in performance reviews. Some provide pay increases and/or rewards for outstanding examples of PE. The strategy for one university mentions that "employees who are successful in their efforts to develop collaboration or who actively work to increase the visibility of the University will be given due recognition."

In terms of funding, some HEIs have a PE grants scheme, which facilitates the execution of popular science activities and PE research projects. One HEI (Staffordshire) has established a trust to provide high quality, exiting science activities for children, and thereby promote social mobility. The impact of these activities has been proven to be positive, supporting the organisation in its commitment to create a level playing field of opportunity and opening up access to the university to children of all backgrounds.

Several HEIs provide lifelong education to the public, by offering free public lectures and training, which can be shared online as a way to improve accessibility. In some cases, a wide variety of training workshops and even the possibility to gain micro-grades is available. HEIs also aim to engage the elderly population through educational programmes and courses tailored to their demographic.

As mentioned above, some organisations involve interested citizens in different types of citizen science projects, which may be actively supported by the HEI in terms of researcher support and guidance. Finally, some universities have a designated Citizen Science Lab, or other physical facilities for bringing together researchers, citizens, and societal organisations to create new knowledge for science and society. Co-creation of knowledge also takes place in larger collaborations with the wider community.

6.5.1.2. Actions

Research dissemination is key in PE work, and HEIs mention several different types of events that are based around science communication. These range from Open University days and science festivals to short, 3-minute presentations of PhD theses. Most PE activities lean towards a traditional one-way lecture format, but some aim to engage the public in dialogue events where current issues are discussed. Finally, some universities communicate their scientific knowledge through alternative channels, such as short movies, podcasts, and theatre shows, and also use presence in traditional media. HEIs also frequently have their own platforms for PE dissemination, such as an online magazine or newsletter, where new research results can be shared with the public. Some HEIs are also using podcasts, YouTube and social media to connect with the public.

Students at all levels of one university (AU, DK) arrange teaching days at high schools all around the country. The purpose is to show high school students what university level teaching is as well as providing university students with the opportunity to teach. "*Det Rullende Universitet*" ("University on Wheels") is thus a type of research communication as well as a recruitment strategy to attract new students.

Involving citizens, some HEIs organize collaborative challenges where students, teachers and interested members of the public can work together to solve a societal challenge. Several examples of citizen science projects are available, ranging from citizens performing data collection in their location, to involving citizens in the design and scope of research studies.

Several HEIs perform educational PE activities for children and young people, ranging from a "Teddy Bear Hospital" to internships in medicine for high school students. Other HEIs encourage participation in national and international science popularization projects, such as the yearly European Researchers' Night event, Science festivals, open university days and similar. These events often include several different types of science communication, such as workshops, film experiences, participation in experiments, and offer the public an opportunity to engage with scientists.

6.5.1.3. Performance Indicators

Some HEIs use participant feedback from science events as a performance indicator and have set targets for participant satisfaction. Other quantitative measures include the number of events organized for the wider public, the number of participants in PE activities and the number of booklets and popular articles published. In some cases, an annual growth percentage of these numbers is expected. One HEI also measures the quality of interaction of the university staff with various public engagement activities, although it is not specified how this is measured.

6.5.2. Strategic priority of Public Engagement

Figure 36 illustrates the strategic priority universities place on public engagement, as evaluated by the country correspondents (CCs). As described above, HEIs may include PE in their strategic documents in a variety of ways and to different degrees. In order to capture the level of priority of PE in HEI strategy, CCs were asked to rate how much priority the university placed on PE in their strategic documents, on a five-point scale from low to high.

Country correspondents based their assessment on the scope and depth (detail) of each HEI's strategy documents for a particular area. To arrive at a priority rating, CCs compared the apparent relative strategic importance of each of the different RRI areas for the organisation.

Figure 36 shows that of the HEIs (n=76) that include Public Engagement in core strategic documents less than twenty are rated as giving PE a high priority.

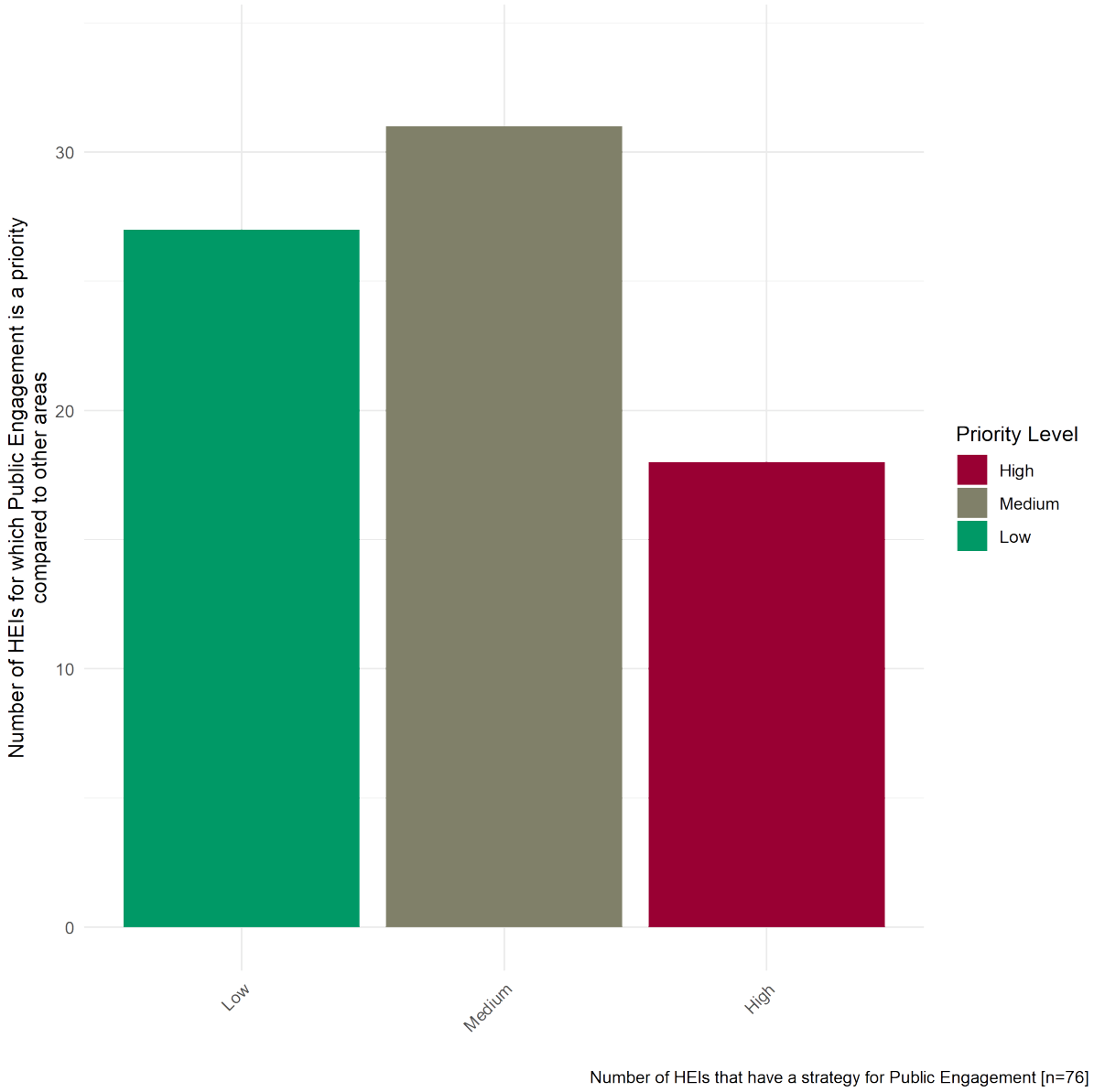


Figure 36: Strategic priority of Public Engagement in HEIs

6.5.3. Aspirational-practical approach to Public Engagement

Based on their reading of the strategic documents(s) of each HEI, country correspondents were asked to evaluate whether each university's approach to OS is mainly aspirational or practical. This assessment applied to those HEIs with OS present in their strategy documents. Figure 37 shows the distribution of HEIs on this assessment.

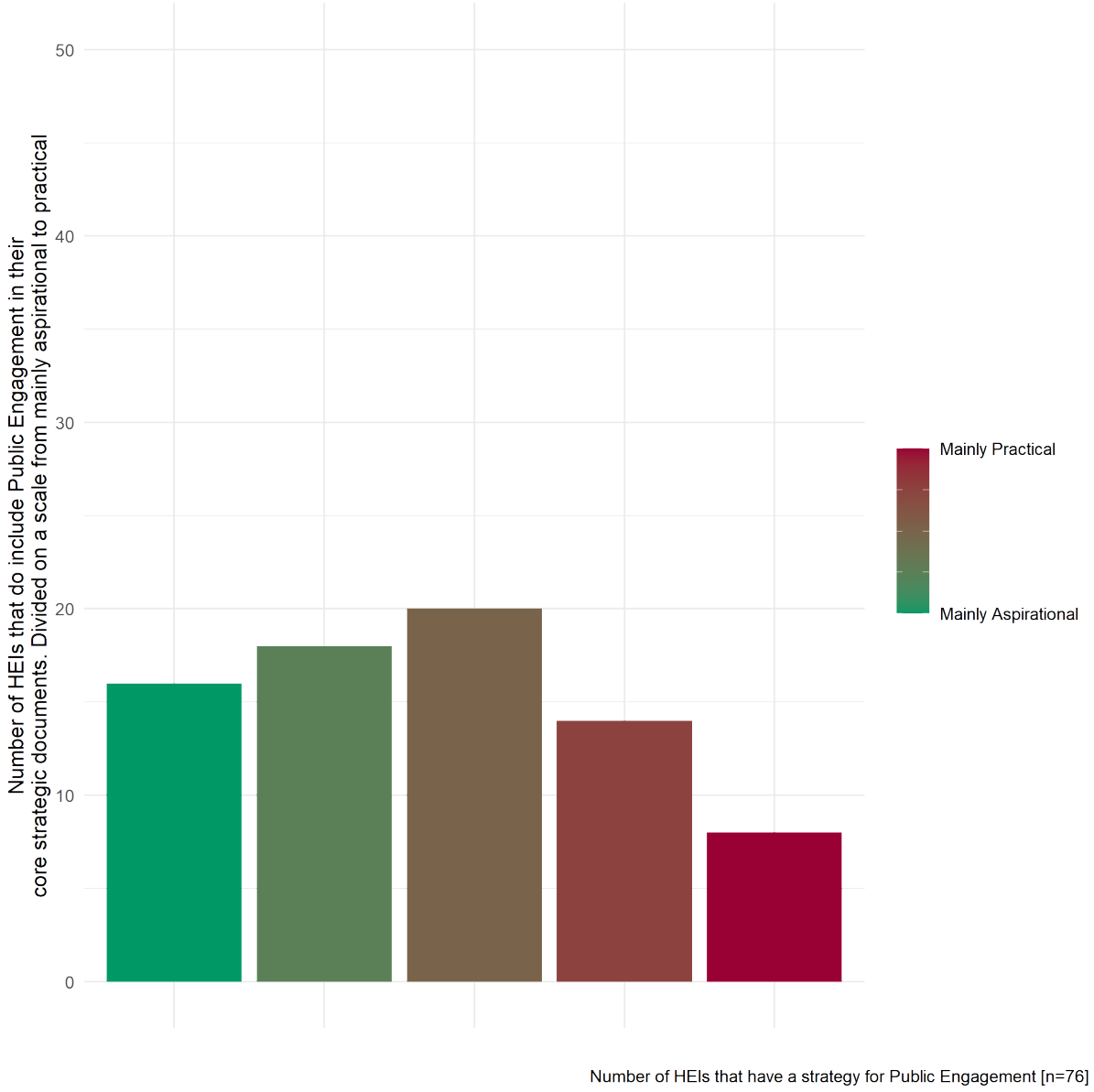


Figure 37: Number of HEIs with a practical-aspirational approach to Public Engagement strategy

Figure 37 shows that for the HEIs that include PE in their core strategy documents (n=76) the majority have a mainly aspirational approach. This implies a focus on what the organisation would like to achieve and less attention to concrete means or steps to achieve their PE goals. Less than half of the HEIs with a PE strategy lean toward a mainly practical approach.

6.6. Third Mission in HEIs

The websites of the HEIs in the study sample were examined for the presence of 'the third mission' or related concepts in policy and/or strategy documents or web presentations. The third mission in can be defined as the activities where knowledge is generated, exploited or otherwise applied outside University environments (Molas-Gallart and Castro-Martínez 2007). As such third mission activities

are thus distinct from other RPO activities that do not involve interaction with external environments. Third mission activities instead involve a diverse set of interactions with external participants (Mejlgaard, Ryan 2017). Third mission is not usually included as a part of RRI as a separate key or policy area. However, it is closely related to notions of public engagement, participation, inclusion and knowledge and technology transfer to, and in collaboration with, societal stakeholders.

During training, country correspondents were provided with the following definition of third mission, to help orient them in read policy and strategy documents obtained from HEI websites:

> *The Third Mission of universities may broadly be defined as "all activities concerned with the generation, use, application and exploitation of knowledge and other university capabilities outside academic environments" (Molas-Gallart et al. 2002). In the context of this study, the Third Mission is primarily understood as the activities concerned with addressing societal challenges or contributing to regional development by informing political decision making and engaging with industrial and commercial actors – since activities related to interaction with citizens are already captured under 'Public Engagement'.*
>
> *Examples of Third Mission policies elements may include policies on collaboration with industrial partners, policies on collaboration with political decision makers, policies on academic freedom, or policies concerned with societal obligations. Third Mission policy elements may also relate to the adoption or endorsement of external agendas or priorities, such as the UN's Sustainable Development Goals.*
>
> *Examples of supporting structures for the Third Mission may include an office for technology transfer or organisational units dedicated to supporting interaction with policy makers. Examples of supporting actions for Third Mission may include training activities, awards for policy relevance, awareness raising initiatives concerning SDGs or other societal goals, recognition of policy-oriented activities in relation to recruitment and promotion, etc.*

This section reports on HEIs initiatives to support the third mission in four ways. We first summarise the repertoire of initiatives that organisations engage in to promote the third mission: 1) How HEIs include and discuss aspects of third mission in their core strategic documents; and 2) whether HEIs have implemented policies, structures and actions that support third mission activities. We then provide categorical assessments of: 3) the strategic priority HEIs place on third mission; and 4) the degree to which HEIs' third mission strategies are mainly aspirational versus mainly practical.

6.6.1. Aim and content of Third Mission strategies

A key aim of HEIs is to create new value for society through collaboration and societal commitment. Universities wish to use the sciences, particularly natural and technical sciences, to promote industrial developments that are useful in society. This requires them to develop strategies of openness to the outside world and to develop proactive strategies focused on generating positive societal benefits with and for other actors.

Figure 38 depicts the number of HEIs in the study sample that include the 'third mission' in their core strategic documents, and/or have and enact related support structures and actions. The figure shows that a majority of HEIs (91%) include the third mission or a related concept in their core strategic documents. Making a societal contribution appears to be a central strategic component for most European universities.

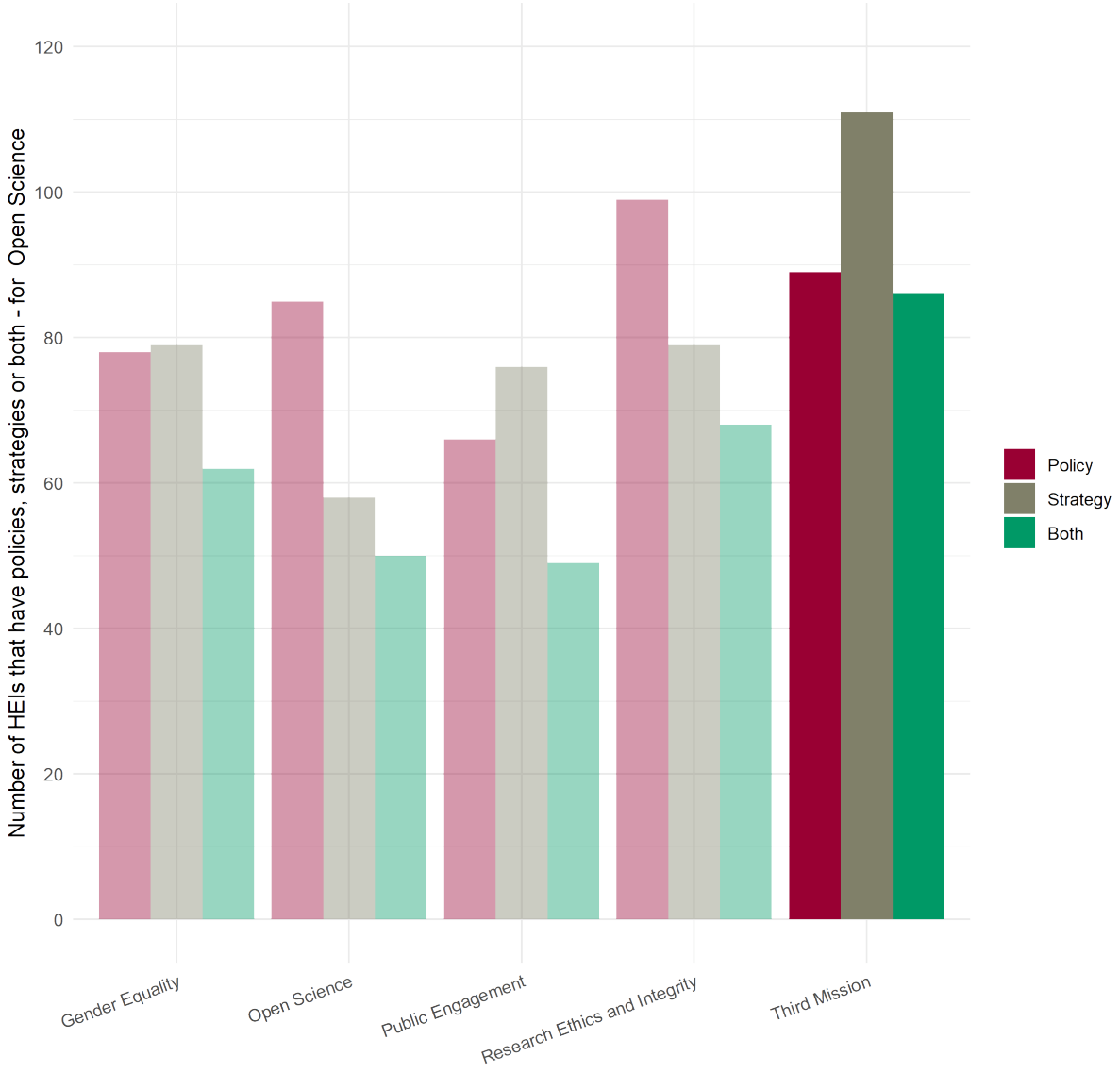


Figure 38: Number of HEIs that include the Third Mission in their publicly available policy and strategy documents

Within the area of third mission policy and strategy a substantial variety of aims and approaches exist. Key areas of third mission policy attention include relevance, dissemination, consultancy, economic development, entrepreneurship, and strategic partnerships.

6.6.1.1. Relevance

Connecting to other organisations, businesses and industry, is at the core of HEIs' third mission work. Several mention that their aim with this work is to ensure maximum relevance and influence of their research. HEIs aim for these external connections to become strong partnerships that can promote innovative technology across all areas. This includes a diversity of fields including the medical field, environmental work, work with refugees and several more. Working with organisations in these fields, the ultimate aim is to improve outcomes in areas such as disease control, environmental impact and

reduce poverty. This reflects how universities can use their role to respond to international issues through the application of research on an international scale.

Given that collaboration is also increasingly emphasised in science policy, strategic development of the third mission is viewed as necessary to successfully compete for research funding. Finally, collaborations with experts are envisaged to help a university achieve greater results than they would be able to on their own.

6.6.1.2. Dissemination

Several HEIs mention the importance of disseminating research results to relevant parties, including the economic and public sector and the media. Maximizing the reach and influence of research is thus an aim in itself. HEIs are aware that increasing visibility of research may provide new opportunities for collaboration with external partners. Such collaboration is then again linked to increased visibility. Further, some organisations aim to become leading forums for policy debate.

Some communication may also be directed at specific groups, who can apply the knowledge and technology in their work practice, such as medical staff or practicing engineers. This targeted communication also ensures that perspectives, ideas, and results become better known and used.

Some HEIs link third mission and PE work, and mention that engagement with the lay public may also be a way to increase the number of more formalised collaborative projects with public institutions, NGOs, and industry, through increased visibility.

Such transfer of knowledge frequently occurs in a research-based exchange process that includes cooperation and dialogue between academics and parties from society, politics, and business. Some HEIs have a specific 'transfer policy', which outlines guidelines for discussing research with external parties, and some highlight that the HEIs should maintain a focus on main social and multidisciplinary challenges. How transfer process should occur is often described and what factors to be aware off are specified, for example confidentiality aspects.

6.6.1.3. Consultancy

Some HEIs aim to contribute to society by providing research-based consultancy services, giving local, regional and foreign policy makers a high-quality foundation of information for decision-making. There is a desire to work with key national and international policy bodies, to support knowledge translation and policy impact.

RPOs view such consultancy as an opportunity to positively affect local and regional development. Over time, it is the aim that the RPOs will become opinion leaders in their field and may continue to support business development.

6.6.1.4. Economic development

HEI strategies emphasize their role as potential drivers of economic development in their local region and with their collaborators. Several mention how leveraging external collaborations can create jobs and provide more efficient solutions to existing problems.

6.6.1.5. Entrepreneurship

For many HEIs, technology transfer has a high level of importance. This is often part of an aim to improve conditions for innovation and entrepreneurship, also for young researchers, as transfer of technologies provides opportunities for commercialization and benefit for society.

A number of universities mention the ambition to further improve innovation environments to facilitate more spin-offs and entrepreneurial activity.

6.6.1.6. Strategic partnerships

Many HEIs mention the aim to establish and strengthen strategic partnerships in common focus areas. They wish to establish more consulting, research and development projects in active co-creation with industry, as well as the public sector. These partnerships should be based on principles of equity and mutual benefit and be driven by a common scientific agenda. Further, they should be ethical and within the rules and guideline for good research practice.

By playing a part in strategically chosen collaborations, be it government departments, commercial organisations or local actors, the HEIs aim to achieve a greater impact of their research and knowledge exchange.

Some HEIs also mention an aim to strengthen their international reputation by encouraging more international dialogue and collaboration between researchers.

Research collaborations with external partners are also seem by HEIs as an opportunity to achieve wider recognition and thereby opening the job market to graduates. Universities are also in contact with companies and institutions about their future needs for skilled workers and develop suitable further education opportunities for the university together with them to ensure that the courses meet societal needs. This is key in enhancing students' employability.

6.6.2. Policies, support structures, and actions on the Third Mission

Third mission policies and strategies are highly varied and can focus on collaboration with industrial partners or political decision makers, or be concerned with societal obligations, for example. Structures associated with third mission promote a variety of initiatives, including training activities, awards for policy relevance, and awareness raising initiatives concerning SDGs or other societal goals. Policies and/or strategies for third mission were more common among HEIs than any of the other RRI-related aspects analysed.

HEI third mission policies include strategies for innovation, patents and entrepreneurship, policies for collaboration with external parties, policies for public sector services and policies for research communication. These policies are in place to ensure good research practices in these collaborations, focusing on integrity, openness, freedom of research and conflicts of interest. The policies mentioned above often include guidelines for work in co-financed research projects and commissioned research collaboration.

6.6.2.1. Structures

The RPOs have a wide range of structures in place to support the third mission. These structures are mainly directed at students, researchers, start-ups, industry, and external partners, respectively. Dedicated offices frequently act as intermediary entities between collaborators outside and inside the HEI.

Several HEIs offer students the opportunity to connect with industry to develop topics for their master's thesis and some also have PhD programs, where the PhD candidate works on the project in collaboration with an industry partner. HEIs typically organise events where people from industry can meet students and collaboration discussions can be initiated. Some HEIs offer coaching to students who would like to combine study and business life. Many universities also have a career development

centre which collaborates with potential industrial partners, aspiring to remove any obstacles hindering communication between educational institutions, businesses, and individual students.

HEIs frequently have one or more offices responsible for external collaborations with private and public entities. This office may assist in setting up collaborations with third parties and/or starting new ventures, while managing intellectual property and other legal and financial support. Frequently, the aim is to increase the number of collaborations. The office may also help attract funding and promote research activity with external parties, provide support for larger international projects, assist in the dissemination of research results and decide on the orientation of research activities.

Many HEIs have a specialised knowledge or technology transfer office. This office offers guidance and support for dealing with commercial stakeholders, potential customers and clients. The objective of the transfer unit is to support researchers to commercially exploit their research outputs for the benefit of the university and the wider community. The office may also offer researchers the expertise of grant advisers, business developers, and legal experts to help determine an impact strategy. The offices typically also produce resources that may include How To Guides, videos, case studies, "contract" templates for working with stakeholders. For some, the focus is strongly on intellectual property, from raising awareness on what it constitutes with brochures, infographics and workshops, to providing support in commercialization and establishing spin off and start-up companies.

A considerable number of HEIs have an "innovation hub" or similar, targeted at incubating new businesses and engaging students and researchers alike in innovation and entrepreneurship. These facilities provide expert support and mentoring for innovative ideas, in collaboration with external companies, with the aim of turning ideas into businesses. Support may include help with funding, business development, patenting, and marketing.

Similar structures may also help connect entrepreneurs with industry and help ensure that society benefits from any inventions made. These programmes aim to connect local businesspeople with aspiring entrepreneurs, thereby providing them with experienced guidance. Some HEIs have an online platform where people from industry can connect with academic or other professional staff.

The platform typically showcases examples of current collaborations, highlighting which external partners the HEI is working with, and serves as a hub for connecting students and business representatives in forming new ones. Any research or innovation project opportunities may be posted on the platform. This platform enables companies to find collaboration partners for commercial or joint-funded projects in the university.

Should an industry partner decide to contact the university, they will typically contact a specific person, who can discuss the collaboration and point industry partners in the right direction. Some HEIs also provide training facilities for companies to educate their staff further.

Some HEIs have a policy engagement centre that aids interaction with policy making circles. With researchers, they may contribute knowledge to official enquiries, and run events with policy makers and think-tanks, as well as conduct informal discussions.

6.6.2.2. Performance Indicators

Most of the HEIs with third mission policies run courses and workshops on entrepreneurship for researchers to develop their skills on valorisation and entrepreneurship. Some workshops focus on sustainable business development while others have a broader start-up focus. As mentioned above,

several have career days and similar events, to facilitate meetings between students and members of industry.

HEIs typically use several performance indicators for their third mission activities, including (but not limited to):

- Attract new collaborations
- Develop more third mission initiatives
- Increase satisfaction level for third mission activities
- Increase number of students engaged in entrepreneurship annually
- Increase number of new businesses developed annually
- Increase number of patents filed
- Increase the total value of projects won in partnerships with external parties
- A percentage of all research that should be performed in collaboration with industry
- A percentage of scientific staff should be involved in projects with external partners
- A percentage of the revenue from cooperation with industry is revenue from the commercialization of intellectual property (IP)

One HEI (Uni Bremen) awards a transfer prize to a collaboration consisting of a scientist from the University and an external cooperation partner for a successful transfer project with exemplary character. Transfer achievements will be considered when applying for and approving a research semester. Transfer is also taken into account in the application of the university's appointment regulations as well as in the general criteria of the tenure board for evaluation agreements for tenure-track professorships.

6.6.3. Strategic priority of the Third Mission

Figure 39 illustrates the strategic priority universities place on the third, as evaluated by the country correspondents (CCs). As described above, HEIs may include the third mission in their strategic documents in a variety of ways and to different degrees. In order to capture the level of priority of the third mission in HEI strategy, CCs were asked to rate how much priority the university placed on the third mission in their strategic documents, on a five-point scale from low to high.

Country correspondents based their assessment on the scope and depth (detail) of each HEI's strategy documents for a particular area. To arrive at a priority rating, CCs compared the apparent relative strategic importance of each of the different RRI areas for the organisation.

Figure 39 shows that of the 111 HEIs that include the third mission in core strategic documents a majority (n=76) give it a high strategic priority.

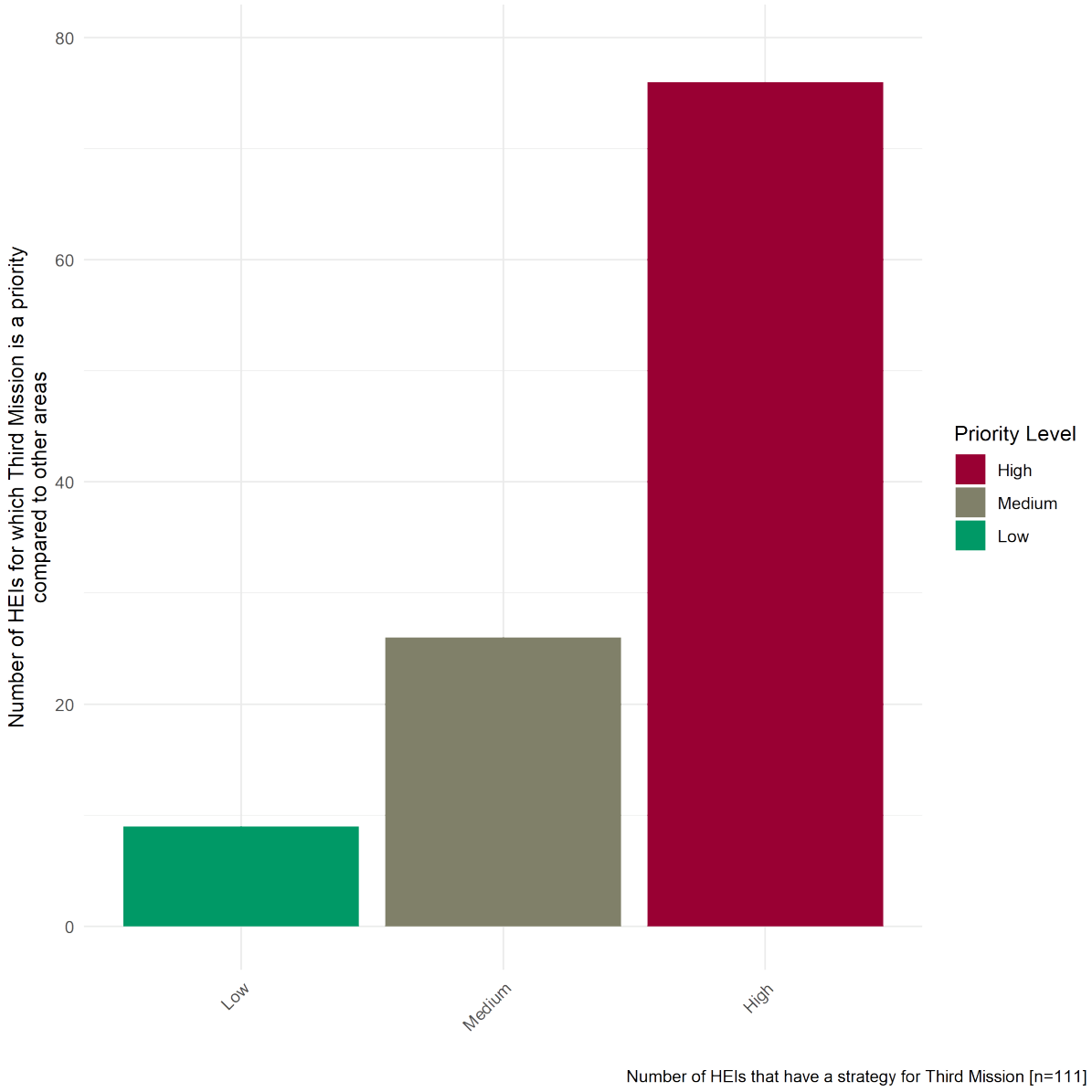


Figure 39: Strategic priority of the Third Mission in HEIs

6.6.4. Aspirational-practical approach to the Third Mission

Based on their reading of the strategic documents(s) of each HEI, country correspondents were asked to evaluate whether each university's approach to OS is mainly aspirational or practical. This assessment applied to those HEIs with OS present in their strategy documents. Figure 40 depicts the distribution of this assessment.

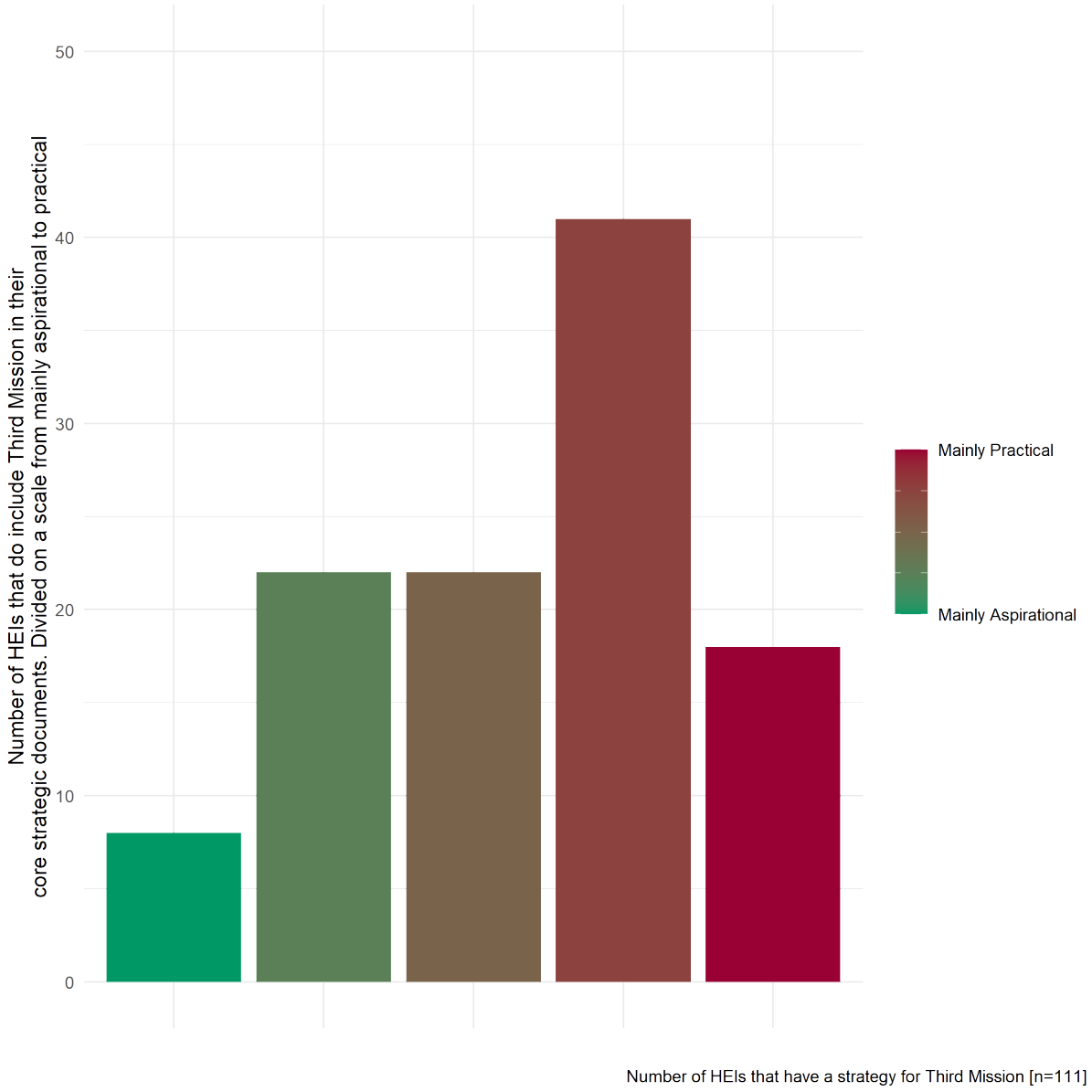


Figure 40: Number of HEIs with a practical-aspirational approach to Third Mission strategy

Figure 40 shows that for the HEIs that include the third mission in their core strategy documents (n=111) a majority have a mainly practical approach. This implies that the organisation strategy is focused on the means or steps required achieve their third mission goals.

6.7. Research Ethics and Research Integrity in HEIs

The websites of the HEIs in the study sample were examined for the presence of research ethics and integrity (REI) in policy and/or strategy documents or web presentations. REI policy at the EU level aims to promote *the highest standards of ethics and integrity in the performance and governance of research and innovation in the EU, both within and beyond Horizon 2020*. And *focus on ensuring a*

dialogue between the EU countries' ethics and integrity bodies and the respective communities.[7] Within the EU there is an emphasis on promoting the European Code of conduct for research integrity through, for example, requirements in funding programmes. Recent attention to misconduct has nationally and internationally also encouraged HEIs to engage in policy developments regarding REI issues.

Country Correspondents were provided with the following definition of REI to orient them when reading documentation obtained from the HEI websites:

> *Research Integrity is recognised as the attitude and habit of the researchers to conduct their research according to appropriate ethical, legal and professional frameworks, obligations and standards. Research Ethics addresses the application of ethical principles or values to various issues and fields of research, including ethical aspects of the design and conduct of research, the way human participants or animals within research projects are treated, whether research results may be misused for criminal purposes, and aspects of scientific misconduct (ENERI 2019a; ENERI 2019b).*
>
> *Examples of Research Ethics and Integrity policy elements may include endorsement of international or national codes (e.g. the European Code of Conduct for Research Integrity), declarations (e.g. the Helsinki Declaration on ethical principles for medical research involving human subjects or declarations on responsible assessment practices such as the Hong Kong Principles or the DORA), or recommendations (e.g. the Vancouver recommendations on authorship). It may also include policies on supervision and mentoring of researchers, data management policies including GDPR compliance, policies on research collaboration across sectors, policies on authorship, or policies on fairness and transparency in assessment, recruitment, and promotion, etc.*
>
> *Examples of supporting structures for Research Ethics and Integrity may include established ethical review procedures or bodies, research integrity advisors, a university ombudsperson or -office, bodies and procedures to deal with misconduct and questionable research practices, whistle blower arrangements, data privacy officers, etc. Supporting actions may include research ethics and integrity training.*

This section reports on HEIs initiatives to support REI in four ways. We first summarise the repertoire of initiatives that organisations engage in to promote REI: 1) How HEIs include and discuss aspects of REI in their core strategic documents; and 2) whether HEIs have implemented policies, structures and actions that support REI activities. We then provide categorical assessments of: 3) the strategic priority HEIs place on REI; and 4) the degree to which HEIs' research ethics and integrity strategies are mainly aspirational versus mainly practical.

6.7.1. Aim and content of Research Ethics and Integrity strategies

The majority of HEIs include research and integrity (REI) in their policy/strategy documents in some way. The aim with REI work is typically to achieve higher levels of research excellence, through adherence to commonly agreed upon research integrity principles and high ethical standards, and to maintain and support public trust in scientific outputs. Figure 41 shows that a majority of HEIs include

[7] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/ethics

REI in both core policy and strategic documents, with a large number (n=99) including REI in their policy documents.

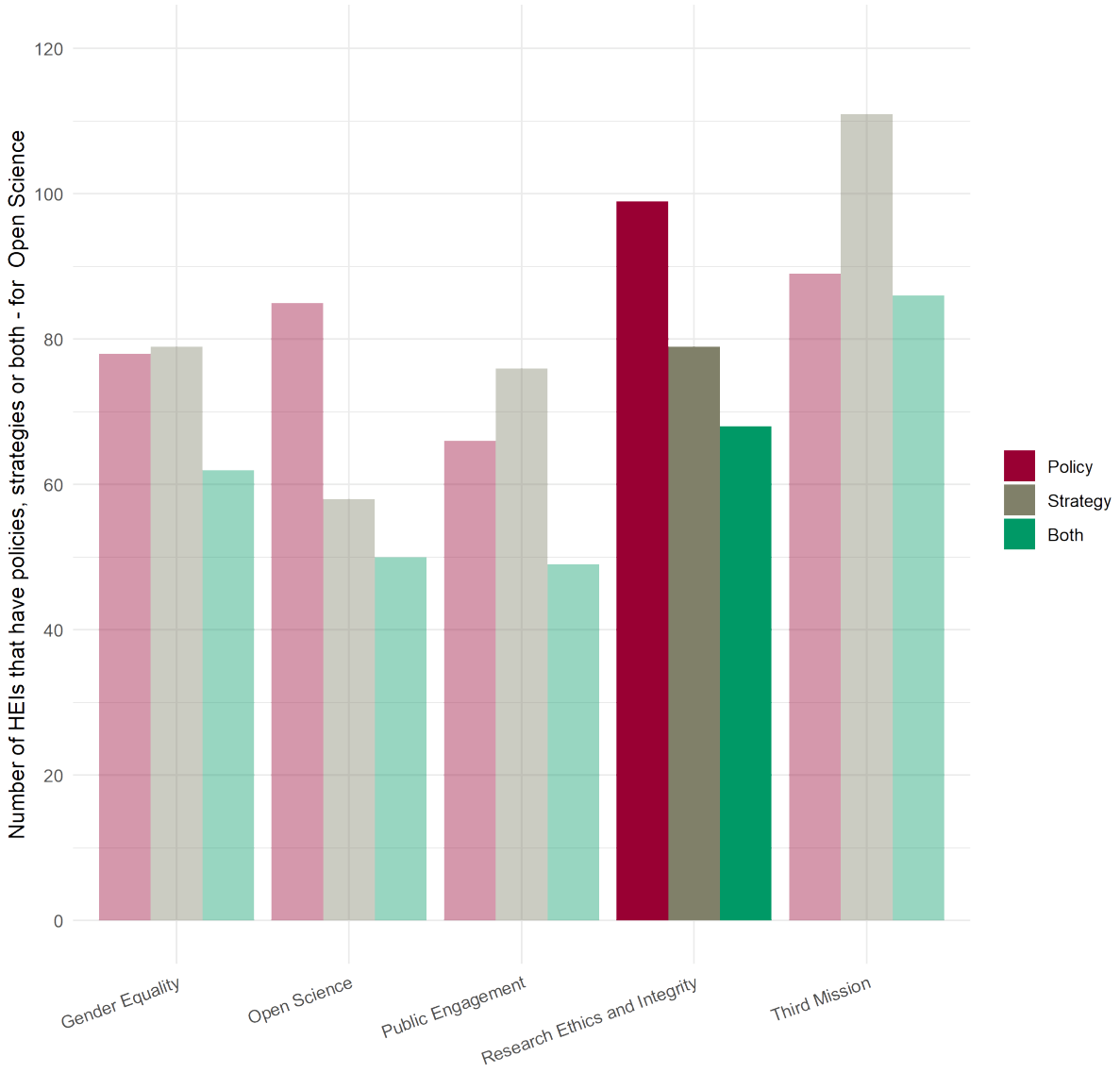


Figure 41: Number of HEIs that include Research Ethics and Integrity in their publicly available policy and strategy documents

In HEIs' policy and strategy documents, REI is usually directly connected to research goals and practices. Some HEIs indicate an awareness that proactive REI work may positively affect the image of the HEI. For example, one organisation strategy mentions that REI work "aims at establishing a modern organisational culture that will maintain and promote the good reputation and esteem of [the HEI] and increase public confidence in the professionalism and morale of the academic staff, students, and employees". For some, another goal is to establish and maintain academic freedom through adherence to the highest principles of research integrity.

A few HEIs mention that the REI work has been sparked by cases of misconduct in the organisation, which has led them to implement REI policies and conduct ethics training for researchers. Finally, quite a few of the HEIs mention a general focus on the principles of REI, but without mentioning specific policies or actions.

6.7.2. Policies, support structures, and actions for Research Ethics and Integrity

Initiatives to support REI in HEIs featured a number of increasingly global policy settings and clustered strongly around a set of well-defined institutional roles and organisational units.

6.7.2.1. Policies

A common set of international guidelines are prominent in the strategic documents of HEIs. These include the European Code of Conduct for Research Integrity, the EU Charter for Researchers, the European Trial Regulation, the FAIR principles, the Singapore agreement, and the Vancouver guidelines. Further REI guidelines operational the national level are also often mentioned. Further, some HEIs have developed REI guidelines specifically targeted to their research areas, such as medical research and animal testing.

Finally, some HEIs include in their strategies the aim to achieve or maintain the HR Excellence in Research Award. This award is the European Commission's official accreditation given to institutions within the European Research Area which have been found to fulfil the principles of the Commission's Charter for Researchers and Code of Conduct for the Recruitment of Researchers.

A code of ethics is a key REI document for many organisations. This document typically sets out moral and academic obligations in research and describes the values of the HEI. The moral obligations are outlined with the intention of maintaining a high degree of professionalism, transparency, objectivity, and trustworthiness, both in the relations between students and teaching staff. The academic obligations describe the importance of research transparency and topics concerning publication, such as plagiarism, authorship, and peer-review.

The research code of ethics also frequently describes how research should be of relevance to the community, provide societal benefits, and be communicated appropriately to the public.

Codes of ethics may also describe ethical aspects of behaviour, such as use of financial resources, confidentiality, contact with the media and third parties, and procedures for dealing with breaches of academic integrity.

HEIs present a wide range of policies within REI, many of which overlap and some that may be included in a more general, broader code of conduct or ethics document. Other more specific policies include:

- policies on handling research data, including GDPR policies;
- policies on authorship and publication;
- mentoring policies;
- policies on public sector services and communication with the press;
- policies on hiring procedures that aim to make the hiring process transparent, to prevent discrimination, and ensure fairness; and
- policies on whistleblowing.

The inclusion and prioritisation of REI within the EU, as well as the increased awareness amongst publishers, researchers, and national institutions, has likely impacted on how HEIs work with and

implement structures around REI. In addition, GDPR legislation at the EU level has created a larger need for information and data management structures within HEIs under the umbrella of REI.

6.7.2.2. Structures

Typical organisation structures include ethical review procedures or bodies, research integrity advisors, a university ombudsperson or office, bodies, and procedures to deal with misconduct and questionable research practices, and whistle blower arrangements. Designated research integrity officers typically work to implement REI policies but are not involved in assessment of researchers or research projects.

Several HEIs have REI supporting structures in place to assess ethical questions and questionable research practice. Such structures include ethics committees, research practice committees and/or an academic council. Further, some organisations have appointed Named Persons and an Ombudsperson.

It is usually role of the university Ethics Committee to settle issues pertaining to research integrity, uphold the code of ethics of the organisation, and to support the Rectorate in ethical matters. They also work to maintain core academic values such as fairness, objectivity, and professionalism in research. In line with the specific policies mentioned above, some HEIs have dedicated ethics committees for areas such as human sciences and medical research. These ethics committees assess research projects in their field.

The main role of research practice committees is to evaluate any cases of suspected academic integrity infringement and, where relevant, to make recommendations regarding an applicable penalty. A university Academic Council is usually responsible for enforcing sanctions for potential misconduct or disregard of the rules. Named Persons are appointed to anonymously counsel researchers on matters regarding good research practice. Finally, Ombudspersons are responsible for resolving conflicts and other concerns regarding the morality or legality of actions conducted within the university. In some cases, an Ombudsperson can also support scientists with quality assurance to support good scientific practice.

HEIs frequently also have an Institutional Research Review Board whose role it is to assess projects involving humans and/or animals. While these structures go by different names in individual organisations, the responsibilities entrusted to them are largely consistent. It is also important to note that not all HEIs have well-developed structures in place for dealing with REI questions. Some are still in the early stages of organising these structures, while other HEIs appear to have more experience in the area and have strategies to develop a more complete set of policies and procedures for assessing ethical questions and questionable research practices.

HEIs' guidelines for research data management require that all research projects involving research data provide data management plans that outline how accountability, completeness, authenticity, integrity, confidentiality, publication, and the registration of, and access to, data will be ensured and managed properly.

To live up to these aspirations, HEIs need to have IT solutions that support ethical data management, is able to detect plagiarism, and works in accordance with GDPR requirements. While many HEIs already have IT infrastructure that supports good research practices and GDPR requirements, some strategies identify this as an area where more work is needed.

Many HEIs provide training, workshops, and policy support for REI work. In some cases, participation in research integrity courses is mandatory for researchers. Several HEIs also mention a goal to reduce the number of complaints related to ethics and integrity misconduct every year.

6.7.3. Strategic priority of Research Ethics and Integrity

Figure 42 illustrates the strategic priority universities place on REI, as evaluated by the country correspondents (CCs). As described above, HEIs may include PE in their strategic documents in a variety of ways and to different degrees. In order to capture the level of priority of PE in HEI strategy, CCs were asked to rate how much priority the university placed on PE in their strategic documents, on a five-point scale from low to high.

Country correspondents based their assessment on the scope and depth (detail) of each HEI's strategy documents for a particular area. To arrive at a priority rating, CCs compared the apparent relative strategic importance of each of the different RRI areas for the organisation.

Figure 42 shows that of the 79 HEIs that include REI in their core strategic documents, for less than twenty is REI rated as a high strategic priority.

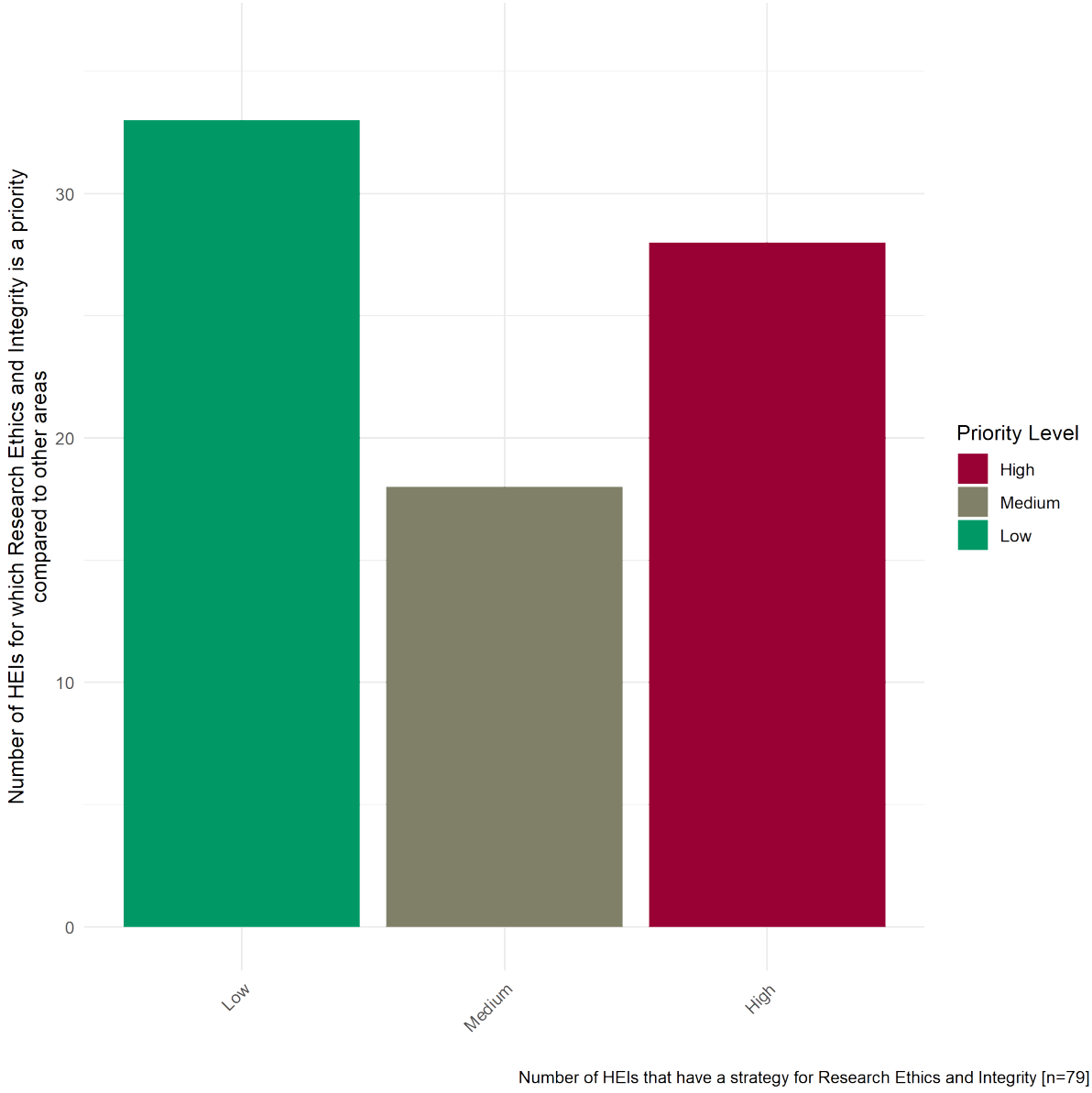


Figure 42: Strategic priority of Research Ethics and Integrity in HEIs

6.7.4. Aspirational-practical approach to Research Ethics and Integrity

Based on their reading of the strategic documents(s) of each HEI, country correspondents were asked to evaluate whether each university's approach to OS is mainly aspirational or practical. This assessment applied to those HEIs with OS present in their strategy documents. Figure 43 shows the distribution of this assessment.

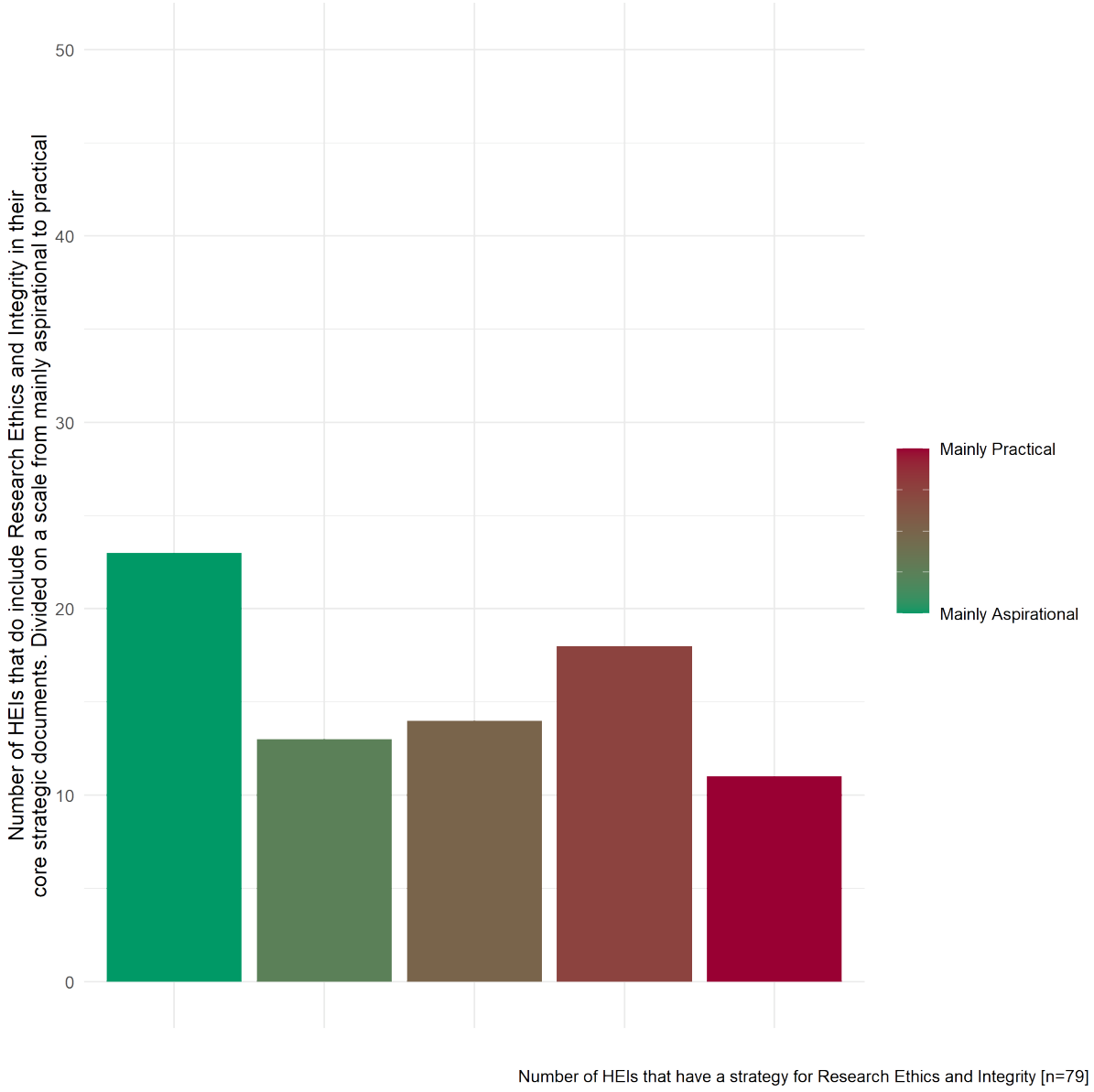


Figure 43: Number of HEIs with a practical-aspirational approach to Research Ethics and Integrity strategy

Figure 43 shows that for the HEIs that include the REI in their core strategy documents (n=79) there is a fairly even split between those HEIs that take have a mainly aspirational approach and those that have a mainly practical approach.

6.8. Gender Equality in HEIs

The websites of the HEIs in the study sample were examined for the presence of gender equality (GE) in policy and/or strategy documents or web presentations. Gender equality is one of the core priority areas within the European Union and is included in the sustainable development goals. Gender equality in the setting of responsible research and innovation refers to a range of issues such as equality in employment, tenure, and wages, as well as equality in research participation and research

content. The way in which organisations work with gender equality varies, and is sometimes included within other broader concepts and policy areas such as diversity and inclusiveness

Country Correspondents were provided with following definition of gender equality to orient them when reading documentation obtained from the HEI websites:

> *Gender Equality is concerned with the measures that the HEIs take to deal with the persistent problem of unequal opportunities for men and women in academia. It is about developing enabling environments for the integration of women in all fields and all levels of research (reduction of horizontal and vertical segregation), breaking down structural barriers, and integrating gender in the content of research to ensure that women's needs and interests are adequately addressed (Wroblewski et al. 2015).*
>
> *Examples of Gender Equality policy elements may include gender equality policies, gender equality actions plans, or endorsement of external policy principles or frameworks such as the Athena Swan Charter.*
>
> *Examples of supporting structures for Gender Equality may include advisory bodies, networks, committees or a dedicated office dealing with issues of gender equality. Examples of gender equality actions may relate to recruitment, career development, leadership, workplace culture, mentoring programmes, affirmative actions, or mainstreaming of gender in research analyses, etc.*

One of the central ways in which the notions of gender equality are translated into action is through the adoption of gender equality goals and aspirations in research organisations' strategic planning and the translations of these goals into organisational policies, support mechanisms and actions.

This section reports on HEIs initiatives to support GE in four ways. We first summarise the repertoire of initiatives that organisations engage in to promote GE: 1) How HEIs include and discuss aspects of GE in their core strategic documents; and 2) whether HEIs have implemented policies, structures and actions that support GE activities. We then provide categorical assessments of: 3) the strategic priority HEIs place on GE; and 4) the degree to which HEIs' gender equality strategies are mainly aspirational versus mainly practical.

6.8.1. Aim and content of Gender Equality strategies

The level of formal policy and strategy attention to GE is not as high as perhaps might be expected given the sustained focus this issue has received in recent decades. The topic of gender equality is frequently discussed as a part of a broader diversity strategy, including other topics such as ethnicity, sexuality, and disability, rather than through a standalone policy and/or strategy. HEIs with strategic approaches in this area wish to promote diversity and work towards gender equality, promote equal opportunities, and support parity in working conditions between men and women. These strategics also acknowledge that all employees should have equal access to the necessary means and opportunities to advance their research agendas, including infrastructure and financial resources.

Strategies to improve GE are also viewed as a step towards improving overall education quality, innovation, and research excellence, by best utilising the talent pool of young researchers. Universities thus wish to attract, develop, and retain scientific talents and have developed diversity initiatives with this as the primary aim. Finally, universities profess a desire to be a workplace characterised by a tolerant professional culture where everyone is treated equally. Finally, promoting a "gender equality

culture" through a broader diversity strategy is said to be designed to achieve a better work and study environment overall.

Figure 44 depicts the number of HEIs (n=77) in the study that include Gender Equality in either their core strategy documents. Approximately half of the HEIs include GE in both their core policy and strategic documents.

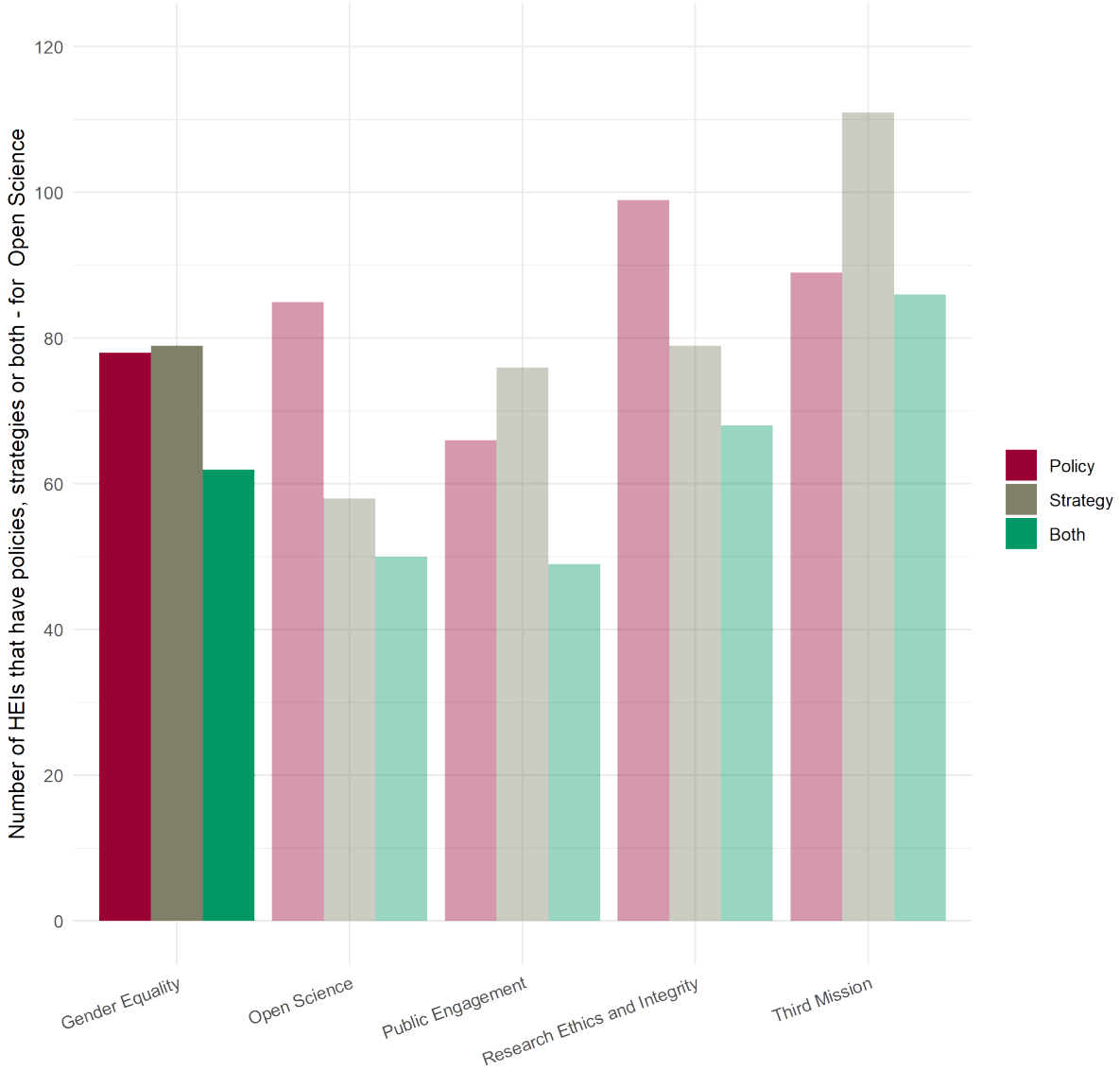


Figure 44: Number of HEIs that include Gender Equality in their publicly available policy and strategy documents

6.8.2. Policies, support structures, and actions for Gender Equality

Common policy or strategy documents that HEIs develop in the ambit of GE include Gender Action Plans, Gender Equality Plans, or similar. In some countries, development of gender policies is required

by national law for larger employers, and gender policies may also be required to gain funding for certain projects.

The policies appear to frequently build on national or international plans, such as the anti-discrimination directives of the European Union. Some are specifically aimed towards achieving Athena SWAN certification, the Human Resource Excellence in Research Award (HRS4R) or similar, where gender aspects are a key requirement. Actively working towards a higher level of accreditation within such a scheme appears to increase the level of practical implementation of gender initiatives within the HEIs.

The policies frequently mention the need to implement strategies and mechanisms into existing university policies and practices to promote the sustainable integration of the gender aspect into all areas of the HEI. This entails implementing gender aspects in existing structures, processes, policies, research content, and research-based teaching, as well as the systematic implementation of diversity perspectives in everyday activities, as opposed to adding gender as a new area of work.

For many HEIs, the gender policies include procedures for reporting and processing instances of sexual harassment and anti-bullying, as well as a code of conduct for staff. In some of these HEIs, the harassment aspect is the only aspect of GE discussed.

A few HEIs mention an aim to close the gender pay gap, particularly for professorships, and an aspiration to develop policies for how to do that. However, plans for concrete actions to support this ambition are lacking.

Some HEIs describe how strategies and policies have been created in a participatory process that involved students, teachers, and other employees at all levels. In these cases, it is emphasized that this development includes people with some degree of power within the organisation. One HEI (DTU, DK) describes how their gender unit has been established by a group of staff and students who are committed to contributing to gender and inclusivity efforts in the organisation. The unit is cross-departmental and includes heads of departments, PhD students, administrative staff, and other students.

The development of gender policies and plans, setting goals, implementing the outlined actions, and conducting annual surveys to track development, are tasks that are often the work of a designated Gender Equality unit, which can be organized as a committee or similar at different levels of the organisation. This group may also coordinate and network between existing activities across the HEI within the gender research field. Many HEIs ensure that these groups have greater visibility, by including people from management in the group, so that their work may have greater impact throughout the organisation. In addition, some have allocated funds to support this work.

The gender equality unit typically supports and advises the rectorate and all heads of department on questions of equality and the advancement of women. Their aim is to reduce structural obstacles for women in science and to increase the proportion of women at all qualification levels, especially in management positions.

Some HEIs also mention the university Ombudsperson, as a person to contact if staff or students feel discriminated against or harassed. Other HEIs mention a need to name a referral person who can be contacted in cases of harassment. Other HEIs have a designated Equal Opportunities Officer who acts as an advisory member in appointment committees, in the university Senate, and in the University

Council in the sense of representing equal opportunities policy objectives within the central steering committees.

In general, HEIs work towards achieving a balanced ratio of women and men in all positions. Some HEIs work with quotas to achieve this and have set targets for women employees at all levels of the organisation. Others only work with quotas at higher levels of the employment hierarchy, while many don't work with quotas at all. Quotas typically aim to achieve a 60/40 balance at certain levels of employment. One HEI states that during the upcoming years, they "intend to fill management positions with women - if they have the same qualifications - until gender parity is achieved in the respective areas." Most HEIs are also aware of gender balance in student uptake, specifically in areas such as STEM.

Several HEIs recognize the difficulties that many staff have managing the balance between work and family life, and actions in this area are frequently mentioned in relation to gender. Some provide on-site childcare, while others encourage a reduction in working hours for parents, and many provide flexible work from home solutions to assist with work-life balance in these contexts. Others again suggest adapting the workload, to avoid creating gender disparity by women working reduced hours compared to men.

The HEIs focus on their recruitment processes to attract more female applicants. This includes working with headhunting and training staff to write gender neutral job advertisements. Advertising attractive incentive systems and equipment possibilities may also contribute to a stronger recruitment of women. Further, many HEIs work to ensure transparency in calls for positions and criteria for recruitment.

HEIs are also aware of gender equality in recruitment committees, and finally, in line with the quotas mentioned above, some aim specifically to recruit women professors as a contribution to reducing gender gaps in professor positions. When staff choose to leave academia, some HEIs have structures in place to collect scientifically sound information in exit interviews on the reasons behind this decision.

Working with a formalised system for monitoring and facilitating career progression is viewed as a path to reducing gender equality.

In some instances, HEIs highlight opportunities for women, including leadership training and mentoring programs for female researchers, and by specifically applying for funding for female professors through a national program. Funding opportunities for diversity projects and female researchers, such as the Irène Curie Fellowship program, are also used to promote professional academic careers among women.

Other examples of gender specific funding include targeted consideration of women in the awarding of scholarships at the PhD and postdoc levels as well as awarding bridging scholarships to promote the transition from Masters to PhD. Finally, some HEIs encourage their female students specifically to pursue a PhD and embark on a scientific career. Several HEIs encourage a balanced ratio of men to women participating in research projects.

Some HEIs mention their focus on integrating the gender aspect into research and the teaching curricula. In research, the HEIs mention that researchers should support the inclusion of gender aspect in their projects. This could entail gender specific analysis or similar.

The inclusion of gender studies as an equal field of study to other scientific fields must be considered in the development of curricula at some HEIs. Some have developed online learning modules to promote the availability of gender studies, while others offer free lectures in the field of gender medicine.

Many HEIs have a website dedicated to gender equality issues, with the aim of reaching a broad audience. These websites highlight what gender work is currently being done in the organisation, and some HEIs post their gender statistics online.

Several HEIs are working to raise awareness about language use that respects and promotes gender equality. They specify that language used in publications and correspondence should be gender inclusive, and some provide training and information sheets on this topic. This also entails promoting the use of inclusive language and avoiding the use of words or phrases which may be perceived as discriminatory or exclusive.

In the strategy documents, the importance of gender equality and diversity is frequently mentioned in broad terms describing aims and aspirations, but with no clear indicators or actions mentioned. However, the policy documents typically outline specific steps to take to achieve the goals.

Several HEIs host gender events, including conferences and symposiums, which promote national and international networking. These may focus on GE in HEIs or include training on awareness of gender issues for students and staff. The aim with such events is frequently to increase competences to staff and students about how to think, act, and interact in a diversity and inclusion-sensitive manner.

Finally, several HEIs have introduced bias awareness into their leadership development programs.

6.8.2.1. Monitoring of GE in HEIs

HEIs use a range of different performance indicators in the GE area. Many produce periodic reporting on gender participation statistics across all levels and units of the university for both staff and students. Working towards GE does not necessarily mean that a 50/50 distribution is the goal, rather a 60/40 distribution appears to be a frequently occurring target. One HEI specifies that “the university has to act to achieve gender equality, when the share of women in a certain field is below 40%”.

Another aims for a 5% increase in women in management positions during a three year period. Others again specify that the pool of applicants for a research position must include a certain balance of men and women, just as assessment committees must have an equal gender distribution.

Goals and actions are monitored both qualitatively and quantitatively and typically reported annually. Key gender development indicators include measures such as the share of women in management, the division of university personnel by gender, and salary by gender.

Finally, as mentioned above, some HEIs work with quotas to try and achieve gender equality. One HEI, (Medical University of Vienna), has a policy to regularly document the share of women in university life and their contributions to research, teaching, and administration, and to share this information in the HEI media.

6.8.3. Strategic priority of Gender Equality

Figure 45 illustrates the strategic priority universities place on GE, as evaluated by the country correspondents (CCs). As described above, HEIs may include GE in their strategic documents in a variety of ways and to different degrees. In order to capture the level of priority of GE in HEI strategy,

CCs were asked to rate how much priority the university placed on GE in their strategic documents, on a five-point scale from low to high.

Country correspondents based their assessment on the scope and depth (detail) of each HEI's strategy documents for a particular area. To arrive at a priority rating, CCs compared the apparent relative strategic importance of each of the different RRI areas for the organisation.

Figure 45 shows that of the 77 HEIs that include REI in their core strategic documents, 31 were rated as giving high strategic priority to gender equality.

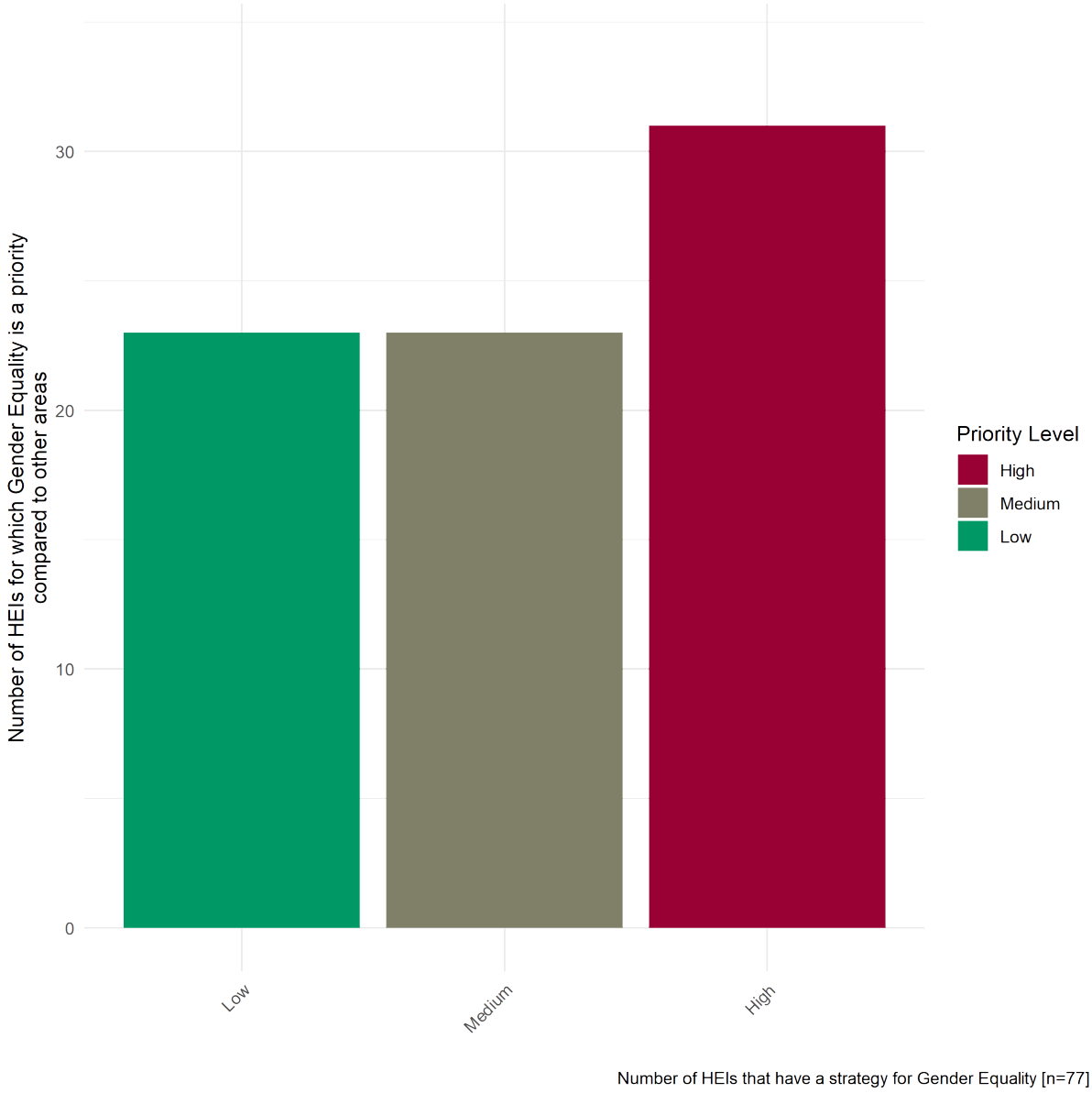


Figure 45: Strategic priority of Gender Equality in HEIs

6.8.4. Aspirational-practical approach to Gender Equality

Based on their reading of the strategic documents(s) of each HEI, country correspondents were asked to evaluate whether each university's approach to OS is mainly aspirational or practical. This assessment applied to those HEIs with OS present in their strategy documents. Figure 46 shows the distribution of this assessment.

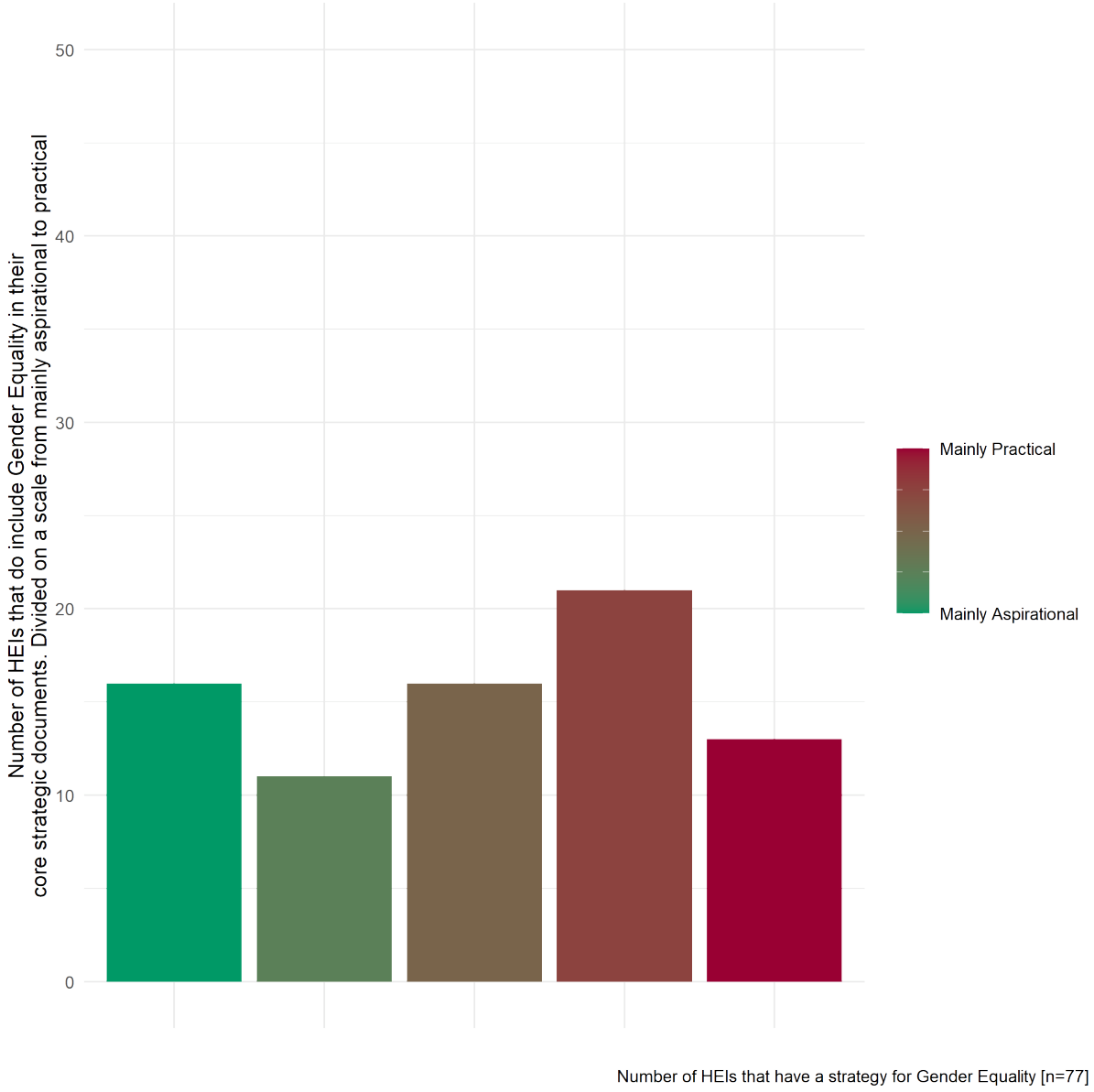


Figure 46: Number of HEIs with a practical-aspirational approach to Gender Equality strategy

Figure 46 shows that for the HEIs that include GE in their core strategy documents (n=77) a larger proportion were rated as taking a mainly practical strategic approach compared to those that were rated as mainly aspirational.

6.9. Strategic priorities and approaches in RRI areas

This section compares the degree of strategic prioritisation and the strategic approach for the five RRI areas assessed. Figure 47 shows the priority ratings for each RRI area, including a comparison with the median for all areas shown as three points connected by a dashed line.

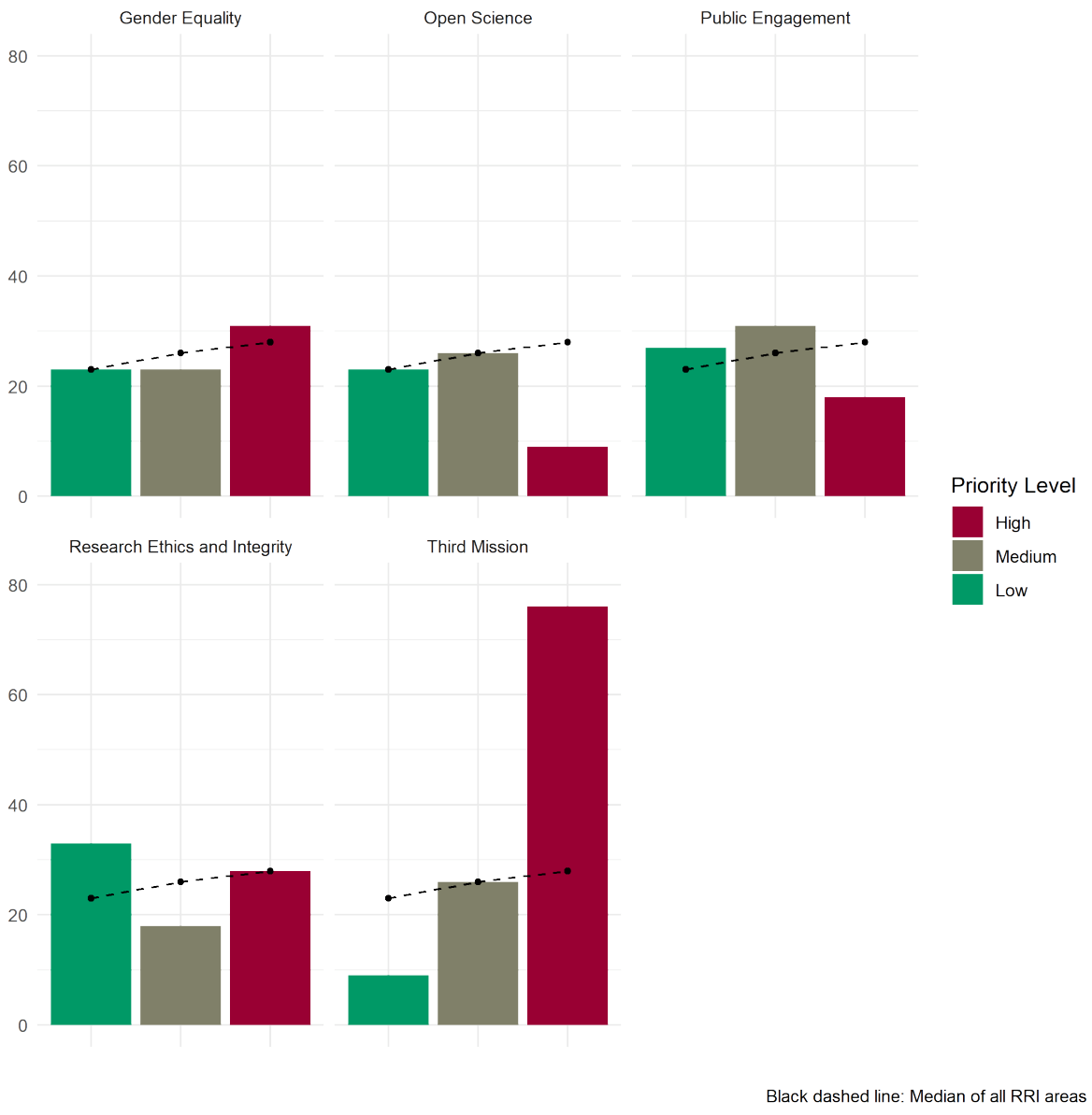


Figure 47: Prioritisation level of HEI strategies, by RRI area, (N)

Third mission strategy is the RRI area that is rated as a relatively high priority for the largest number of HEIs. Gender equality was also above average in being rated as a high priority. Research ethics and integrity and public engagement were above the average for being rated as a relatively low priority. Open science was less likely to be rated as a high priority for HEIs than all the other areas assessed.

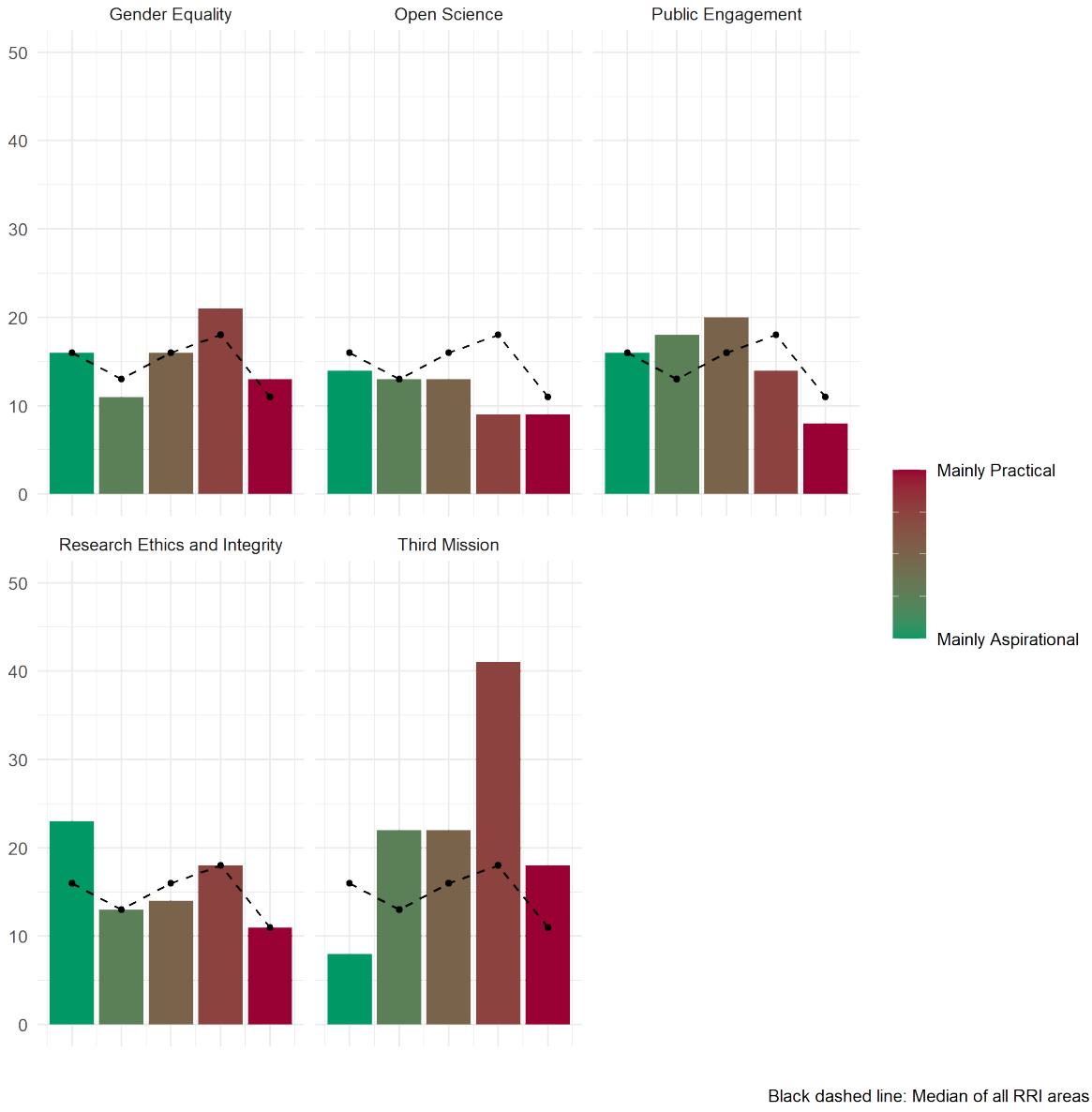


Figure 48: Predominant approach of HEI strategies, by RRI area (N)

Figure 48 shows the assessment of the strategic approach of HEIs toward each RRI area, on a scale between mainly aspirational and mainly practical. A comparison with the median for all areas is included, shown as five points connected by a dashed line.

Gender equality and the third mission are the two RRI areas in which HEI strategies are above the overall average for being rated as mainly practical in orientation. Research ethics and integrity conforms to the average for HEI strategies that are mainly practical in character. Open science and public are the two RRI areas in which HEI strategies are below the overall average for being rated as mainly practical.

6.10. International benchmarking

The previous sections presented information and indicators for 122 European universities. For purposes of comparison, in this section we provide a short description of how international HEIs in Australia (n=3), Brazil (n=2) and the USA (n=2) support RRI through the key areas addressed by the study.

First, all the RRI areas studied in relation to the European HEIs are also mentioned in the policy and strategy documents of all seven international HEIs (see Table 4).

Second, across these seven organisations, the ISPs on average rated the RRI areas to be of medium to high importance strategically to the international HEIs. On average these universities were rated as practically oriented in their strategic approach to these areas.

Third, in terms of the repertoires of structures and actions characterising the international HEIs, the overall impression is that very similar RRI work is being done in European and international contexts. HEIs in Australia and the USA describe several detailed initiatives across the RRI areas. The Brazilian HEIs had less public information available on their websites, highlighting similar aims, structures, and actions, but without the level of detail available elsewhere.

The remainder of this section describes notable international benchmarking highlights for each of the RRI areas.

In the area of Open Science the international HEIs aim to make research accessible to as many people as possible. Primary structures for achieving this are through the use of institutional repositories, and through support for open science communities (OSCs) that work in particular to promote Open Access but also other dimensions of OS. In the USA, Massachusetts Institute of Technology (MIT) has a policy that grants the institution non-exclusive permission to "openly disseminate scholarly articles written by any MIT author."

Gender Equality in Australian HEIs is backed by a national GE plan, which supports Athena SWAN accreditation. For the Brazilian RPOs the gender work appears to be centred mainly around preventing harassment and promoting diversity in broader sense. However, structures such as gender equality committees are also mentioned.

With regards to Third Mission and Research Ethics and Integrity areas, the HEIs from Australia and from the USA consistently show a high level of structure and detail in their strategy, policies and actions that can be considered as more or less equivalent to integrating the dispersed elements of "best practice" in the European HEIs into a coordinated vision across the organisation. Brazilian HEIs also attend to REI issues in their strategies but with less detail. Finally, for Public Engagement all the international HEIs have similar strategies to those most commonly evident in European RPOs.

An inspirational example can be found at RMIT, in Australia, where the #ShapeRMIT campaigns have been developed and implemented to drive the strategic development of the university. These campaigns are run every five years and are a creative way to engage the public in developing the organisation's strategy. Through the #ShapeRMIT website, online discussions and comments, meetings, workshops, public events, presentations, and consultations, RMIT students, staff, alumni, and external partners take part in an open conversation to shape the University's future. To deliver the #ShapeRMIT campaign, a grassroots movement approach to urban environments is implemented with the aim to surprise and delight, inspire, and spark conversation. Newspapers are distributed throughout the University and at local cafes, street art was spray-painted around the campus and a

digital conversation hub was started online. The approach was to use tactics that aren't traditional for a university. Outputs covered everything from street stencils, bill posters and street press, to reports and presentations, to cupcake toppers, hoodies, drink bottles, social media, digital signage and home screens of every University computer, and to murals that loomed large over Swanston Street, one of Melbourne's busiest streets. These campaigns are purposefully designed to drive the inclusion of citizens in RMIT's agenda-setting, decision-making, and policy formation, and as participants in knowledge production processes.

Table 5: International benchmarking, ISP HEIs

	Gender Equality	Open Science	Public Engagement	Research Ethics and Integrity
EU HEIs (n=122)				
Policy	78	84	66	99
Strategy	79	59	76	79
Both	62	50	49	68
ISP HEIs (n=7)				
Policy	7	7	7	7
Strategy	5	3	5	5
Both	5	3	5	5

6.11. Summary and work in progress

This chapter has reported the content of the SUPER MoRRI CCN-RPO study. The study investigated institutional policy, strategy, and structural support for RRI in 122 European universities in the EU27 group of countries, plus Norway and the UK. It did so by examining the public face of these HEIs through the policy documents and strategies they publish on their institutional website. These documents and the website were further analysed to understand the dedication of structural organisational units to the implementation of strategic aims and objectives. The study was performed by the SUPER MoRRI Country Correspondent Network, ensuring that websites and documentation in local languages could be fully accessed and understood. In addition, an international benchmarking exercise was undertaken in seven HEIs in Australia, Brazil, and the USA, through the SUPER MoRRI network of International Satellite Partners.

Results were shown for the presence of five areas of responsible research and innovation in the policies and strategies of HEIs: open science; public engagement, the third mission, research integrity and ethics, and gender equality. An assessment of the degree to which HEIs prioritise each of these five areas was provided. A second assessment of whether each HEI's combination of policy, strategy, and support structures constitutes a mainly aspirational or practical approach was also included. For each of the five RRI areas studied, a descriptive summary of the repertoire of initiatives emerging from the HEI sample was also provided.

The results show that support for RRI areas is strong in the policy and strategies of European HEIs. However, this support does not tend to cover all areas in the case of individual HEIs. The study design, based on a stratified sample of European HEIs, captures a very broad spectrum of HEIs and highlights that institutional action in relation to RRI is not evenly distributed across universities. A key finding

therefore is that ample opportunities continue to exist to further diffuse policy and strategy approaches and appropriate supporting structures for RRI more widely in the university community in Europe. The degree of prioritisation of RRI related policies and strategies is also highly variable, with a picture emerging of seemingly uneven commitments to operationalising the different RRI areas.

This finding was reinforced by the international benchmarking undertaken. Results here showed that HEIs in Australia and the US tended to policies and strategies that covered most, if not all, of the RRI areas with relatively high amounts of detail and consistently high levels of prioritisation. In addition, methods to include staff, students, and stakeholders in the framing of RRI-related policies and strategies appeared more highly developed in some of the international HEIs used for benchmarking.

The categorical data presented in this Report represents an initial wave of coding of the policy and strategy documents retrieved. A descriptive summary of the key policy and strategy elements found in these documents was provided. Work in progress will continue to develop more detailed information and categorisations of the repertoires of policy and strategy initiatives characterising HEIs' institutional support for RRI. Visualisations at the level of repertoires within each of the RRI areas analysed will enable a more comprehensive picture of how HEIs in Europe support RRI and the future initiatives they aspire to implement.

7. Research Funding Organisations, RRI and responsible research cultures

This chapter presents new information derived from the CCN-RFO study, which commenced in June 2020. The initial phase of the project involved pilot testing and the drafting of a project protocol, which was completed after several rounds of internal revision and a training workshop held online with Country Correspondents. The final version of the CCN-RFO Protocol, detailing the full design of the study, was posted publicly on Open Science Framework on 21 December 2020.[8]

Having undertaken desktop research and document collection while the project protocol was finalised and ethics approval obtained, the CCN went into the field in the period January - April 2021, conducting interviews with RFOs in their respective countries. The chapter contains initial outputs from the study, categorical indicators of European RFOs efforts to support RRI and enhance responsibility in research cultures.

RFOs can be differentiated according to a range of factors including their legal and administrative status, degree of institutional autonomy, governance structure, and the scope and scale of their funding activities (Braun 1998). Most public RFOs are the organisational expression of multiple institutional processes required to allocate a percentage of a national or regional budget to scientific research. These processes are particularly interdependent with national fiscal and higher education policies and are often coordinated through a national science and research strategy. RFOs are thus embedded within a structure of authority relations (Whitley, Gläser and Engwell 2010) that influences the degree of autonomy they have to set strategy, design funding programmes and instruments, and implement assessment and grant award procedures. In some countries, the major public RFO (or RFOs) is (are) established as an independent statutory authority with relatively full discretion over their operations, while responding to Ministerial or executive branch changes in national funding priorities or policies. In other countries, major public RFOs are nested within the public administration and a stronger degree of external influence over their operations is retained, often through elected or appointed political positions, such as government Ministers. In addition, in the EU the European Commission (EC) is a major transnational public funder of research across Member States (and beyond), principally through its successive seven-year research and innovation framework funding programmes.

Other types of RFOs include private and non-profit organisations, often established as foundations. Foundations may fund research conducted in public and private settings through open funding calls or focus on funding their own internal research programmes. Funding may be broadly distributed across scientific disciplines, in thematic or technology domains, or in areas of identified need or opportunity. Some private or non-profit funders have substantial funds to distribute, are prominent in the research community and systemically influential. Others are relatively small, target specific communities or research topics, and have a relatively bounded sphere of influence.

RFOs are also learning organisations within a community of practice. In Europe, many of the major public RFOs are affiliated with Science Europe, a peak organisation that operates in their collective interest in terms of policy intelligence and development, knowledge sharing, and best practice exchange and support. Many other funders are members of, and work together through, the European

[8] https://osf.io/84dta/

Foundation Centre funder thematic groups. Whilst these horizontal learning processes could in theory lead toward a degree of institutional isomorphism, individual RFOs tend to retain their own characteristics aligned with existing political-economic organisation, cultural values, and societal expectations. These attributes are historically formed and tend to change at different rates. Hence, whilst major public RFOs fulfil a basically similar function within their national scientific context, a deal of variation exists more broadly in the way RFOs envision and implement their role.

The chapter begins with a short description of the aim and scope of the CCN-RFO study. The second section presents summarises the participating RFOs and the data collections

In a final section, we provide an overview and discussion of the RRI repertoires of European RPOs. In this section we compare to non-European RPOS. We also briefly discuss other areas which RPOs place strategic emphasis on, but which was not directly included as one of the areas of interest in the study.

7.1. Aim and scope of the CCN-RFO study

The overall aim of the CCN-RFO project was to examine the mechanisms through which research funding organisations (RFOs) enhance responsibility in research and innovation. Mechanisms that were the focus of the study were:

1. setting priorities for research funding;
2. designing funding instruments; and
3. conducting assessments of grant proposals (research and researchers).

Country correspondents carried out three main tasks:

1. studied publicly available strategic documents relating to the policies and priorities of the RFO;
2. performed a key stakeholder interview with a suitably place official in the RFO regarding the mechanisms of priority setting, design of funding instruments, and assessment procedures; and
3. produced written summaries of their desk and field research activities.

The CCN-RFO study was not designed to assess or evaluate RFOs either individually or comparatively. The study sought to understand how RFOs work to improve responsibility in research practices and cultures. It also gathered inspiring examples and innovative approaches employed by RFOs.

The focus of data collection was qualitative, designed to build an understanding of the repertoires of policies and practices RFOs use, or are planning to introduce, in order to both shape their own actions and shape research culture to enhance responsibility.

7.2. Participants and data collection

The RFOs that contributed to the study were of diverse types. A major public funding organisation from all EU-27 countries plus Norway and the UK participated, with a second RFO also participating in 27 countries. Figure 47 shows the types of RFOs participating in the CCN-RFO study.

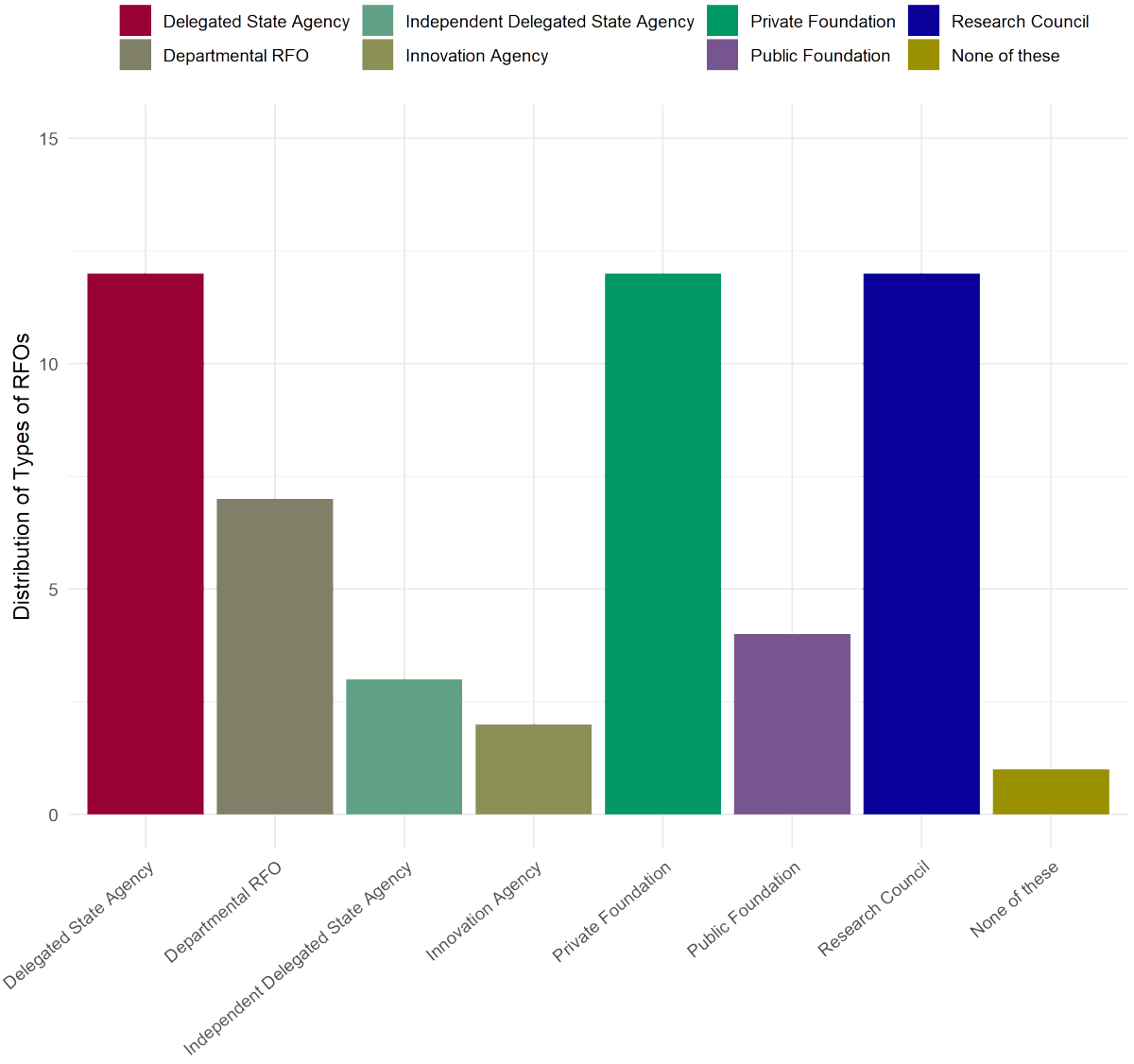


Figure 47: Participant RFOs, by organisation type

Information and data collected in the CCN-RFO study included:

1. each organisation's formal policies to support RRI and responsible research;
2. the characteristics of each organisation's governance as it relates to engagement with scientific and societal stakeholders, and
3. the repertoires of procedures and processes followed by the organisation to a) ensure responsible conduct of its own activities, and b) promote responsibility in the research communities supported by its grants.

The process of extracting information from the qualitative research undertaken involved three steps. First, secondary and primary data collection by the CCN, resulting in two main outputs for each RFO: an archive of policies, funding calls, other relevant documents; and a Case Report summarising the key informant interview and synthesizing this with the secondary information to create and overall profile of the RFO in relation to RRI and support for responsible research cultures. Second, the Case

Reports produced by the CCN were coded by members of the SUPER MoRRI project team according to a predefined coding scheme. The coding process was designed to fully compile the information summarised in points 1) to 3) above. However, it was also recognised that not all Case Reports would provide complete information and cross-validation would be required in a further process involving verifying statements in the archive of documents provided by the Country Correspondents. In addition, new codes were added by coders and had to be checked and integrated into the coding scheme. This third analysis process is currently ongoing. Hence, in some Figures presented in this chapter there are significant numbers of results classified as 'not yet specified'. Continuing coding and validation checks will finalise these cases in due course.

As the title of this Chapter reflects the CCN-RFO study was designed to develop our understanding of RRI, as understood in classic formulations of the Key Areas (EC 2020) and the AIRR framework (Stilgoe et al. 2013), but to not limit the study from capturing RFO efforts to enhance responsibility in the research practices and cultures in which RFOs are important and influential actors. Table 6 summarises the definitions of responsible research practices and cultures used in the CCN-RFO study.

Table 6: Definitions of responsible research practices and cultures (CCN-RFO study)

	Refers to all aspects of doing research
Responsible research practices	Aspects of how research is designed: *gender analysis; pre-registration; reflection on potential negative consequences; citizen science; non-academic partners; consultation with stakeholders about research questions or methods; co-creation of research problems, questions, and approaches with diverse partners; etc.* How a research design is implemented: *openness; reproducibility; research integrity; ethical conduct; transparency regarding design modifications; etc.* How research is reported and disseminated: *FAIR open data deposited; no publication fraud; no p-hacking; dissemination to participants and stakeholders; communication to the public; etc.*
	Refers to all aspects of the research environment
Responsible research cultures	Training of researchers: *open science; FAIR open data; principles of anticipation, inclusiveness, reflection and responsiveness (AIRR); societal readiness thinking tool; research integrity and ethics; cultural sensitivity; engaged research designs; etc.* Assessment of research and researchers: *Declaration on Research Assessment* (DORA) *Recognition of and reward for both researchers' scientific contributions and their societal contributions: employment; promotion; evaluation; grant proposal assessment; alternative CV formats and criteria for assessments of various types; etc.* Recognition of and reward for researchers' interdisciplinary contributions: *evaluation; grant proposal assessment; etc.* Shared and systemic valuing of responsible research practices Support for developing responsible professional competences by leadership at all levels of formal and informal organisation of research: *groups; specialisations; epistemic communities; scientific fields.* Formal support (incentives and rewards) for research careers that make both scientific and societal contributions: *universities; public sector research organisations; research funding organisation; accreditation agencies; evaluation frameworks; etc.* Formal support (organisational procedures) for responsible research cultures: *gender equality in hiring panels, ethics committees, management committees; etc.*

The definitions contained in Table 6 are not exhaustive, but rather provided feasible guidelines for Country Correspondents in their enquiries into the action areas in which RFOs may be exerting 'responsibility pressure' - whether within their own organisation or in the research environment in which they operate.

7.3. RFO support for RRI, responsible research cultures and practices

This section presents monitoring information being developed from the CCN -RFO study. Figure 48 summarises the various RRI and responsibility related policies in the portfolios of our participating European RFOs.

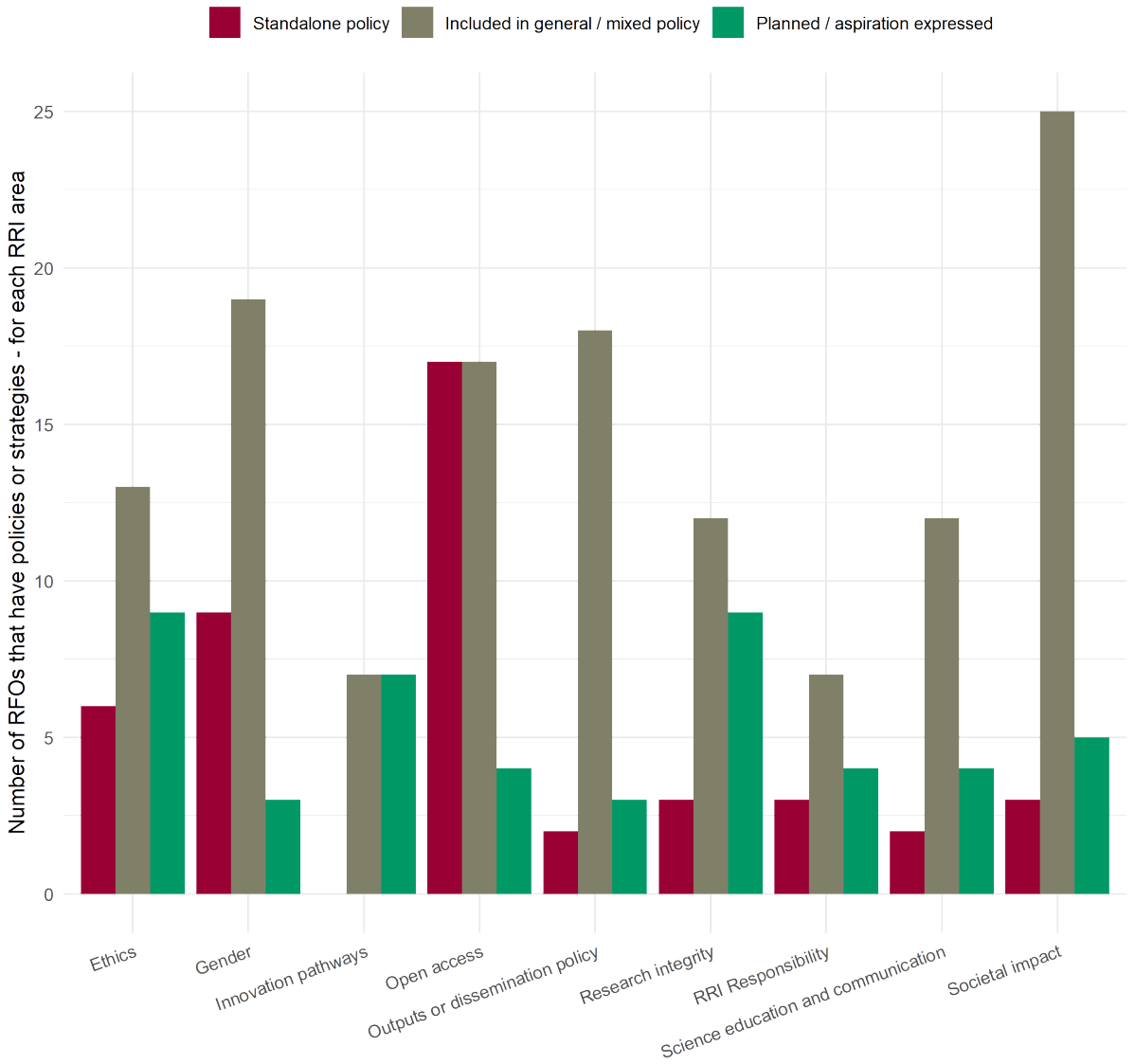


Figure 48: RFO policies supporting RRI and responsible research cultures and practices, by policy areas

Figure 48 shows RFO policies to support responsible research across nine different thematic areas. These thematic areas are categorized according to whether an RFO has a standalone policy or includes the theme within a broader policy document. Finally, an additional category 'planned' is included based on information gathered through the key informant interviews at RFOs. This category refers to

indications from the informant that policy development in this area is under consideration or could be considered as on the organisations 'to do' list. As the figure shows, gender, open access, and open science are the areas in which RFOs are most likely to have a dedicated policy. These same areas, along with ethics, science communication, and societal impact, are also likely to be included in policies with broader multi-thematic focus. While RRI itself was less commonly supported in policy documents, approximately quarter of the participating RFOs included RRI in their policy portfolio.

Table 7: Types of formal advice in RFO governance structures

Type of formal advice	Descriptor 1	Descriptor 2
STEM Scientific Board	Natural and Physical science dominated	No SSH; no societal stakeholders
Multidisciplinary Scientific Board	SSH included	No societal stakeholders
Scientific Expert Board	SSH included;	Some societal stakeholders
Science-Society Expert Board	Even mixture of scientific and societal stakeholders	

Figure 49 shows the major sources of formal advice that are part of RFOs' governance structures. Most RFOs have a Board or expert committee that serves as reference point for the executive of the organisation. Some have more than one, for example a management board and a scientific committee. Here we are referring to the governance body that advises or oversees the organisation management overall. The composition of these sources of advice are interesting as a reflection of which stakeholders have a presence or voice, limited though this may be, in the formal governance structure of the RFO. Table 8 describes the classifications used as the basis for Figure 49. It is possible that this classification schema will be modified following final specification of all cases and cross-validation checks to be completed.

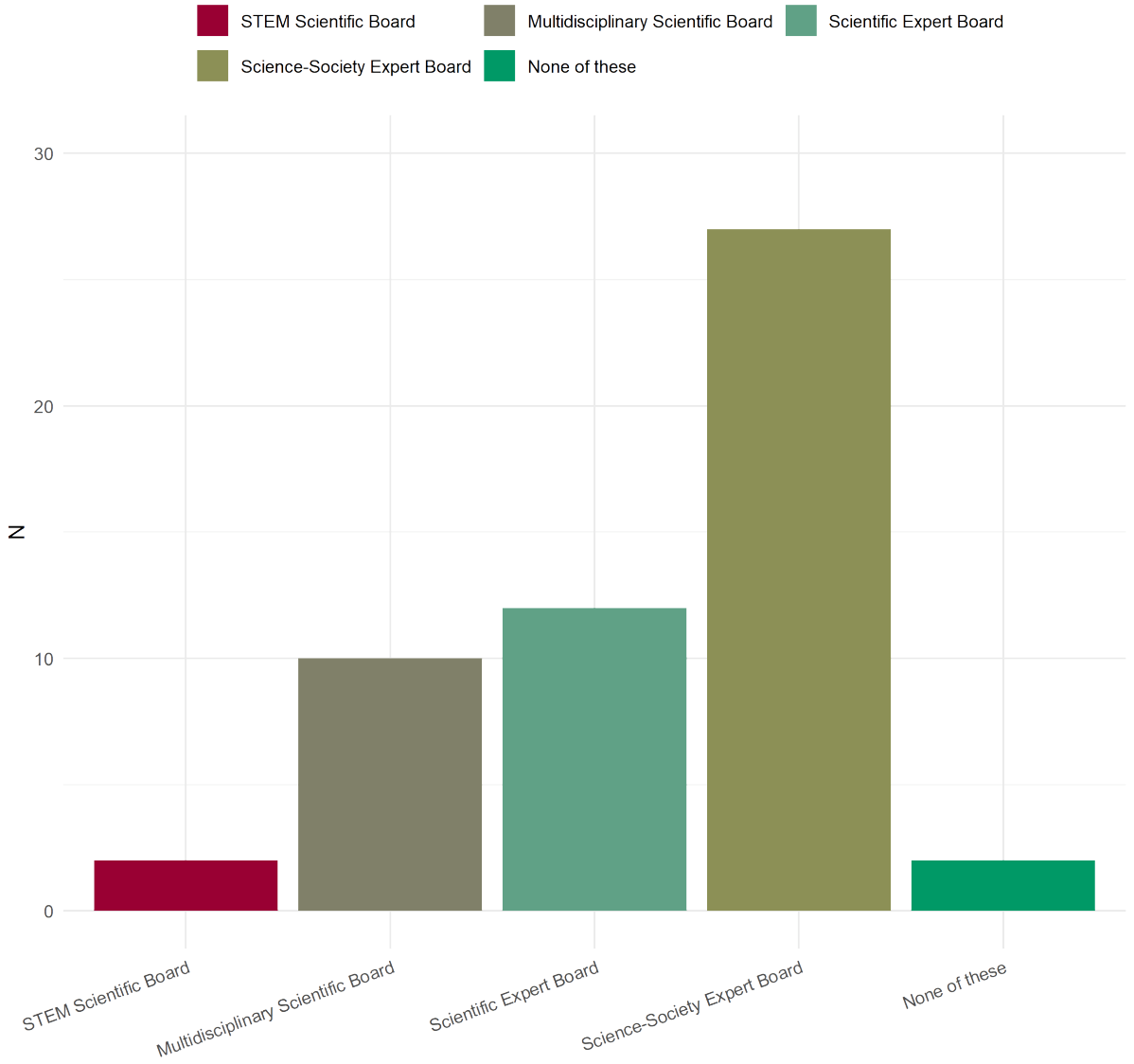


Figure 49: Type of formal advice

As there was only one Narrow Scientific Board in our sample, Figure 49 combines this category with Scientific Board. A substantial number of RFOs have not yet been classified and are shown as 'not yet specified'. A majority of RFOs included societal stakeholders in their governance arrangements for receiving formal advice. A third of all participating RFOs had an expert board composed of an even mix of scientific and societal stakeholders.

As was highlighted above (Figure 48), RFOs have developed a diverse range of policies to support responsibility. One of the key mechanisms through which RFOs can put such policy commitments into practice is through the design of funding instruments. Through a combination of document analysis, particularly recent editions of RFOs major funding programmes, and the key informant interviews an assessment was made regarding the extent to which RRI and related policy elements were integrated in RFOs' funding instruments. The classifications developed for categorising the presence of RR and

related policy elements in funding instruments is shown in Table 8 It should be noted that these classifications were developed based on the pilot interviews, document and analysis and selection of final Case Reports, and RFOs were subsequently assessed during the full Case Report coding process. It is possible that this classification schema could be modified following final cross-validation checks to be completed.

Table 8: Inclusion of RRI and RRI-related elements in research funding instruments, classifications

Classification	Descriptor 1	Descriptor 2
Integrated	RRI and/or broad set of RRI-related elements included in call	Mainly required approaches or actions
Spirit	RRI and/or broad set of RRI-related elements included in call	Mainly preferred approaches or actions
Standard	Typical set of RRI-related elements (3-4 elements)	Mix of preferred and required approaches or actions
Basic	Basic set of RRI-related elements (1-2 elements)	Mainly required approaches or actions
None of these		

Figure 50 illustrates the inclusion of RRI and RRI-related elements in funding instruments. Around one-third of participating RFOs include a standard range of RRI-related elements in funding instruments. More than a third of the RFOs include a broad range of RRI-related elements, including a small number who explicitly include RRI. More than half of these RFOs *require* that grantees adopt most of the responsibility approaches or actions (the Integrated approach), with the remainder (the Spirit approach) mainly *preferring* that a broad range of responsibility elements are adopted.

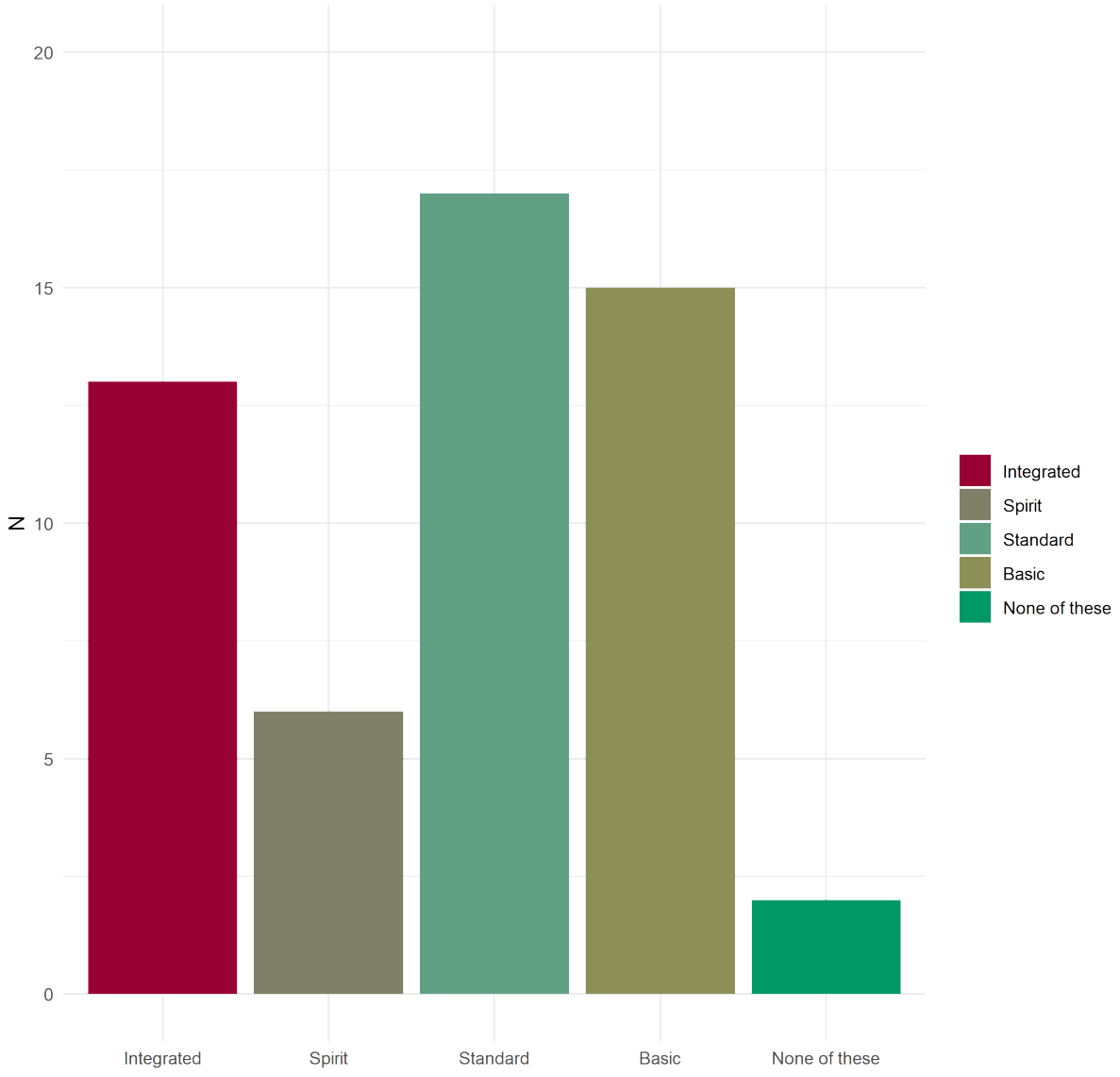


Figure 50: Inclusion of RRI and RRI-related elements in research funding instruments

Research assessment is one of the most important aspects of RFO practice. RFOs are at the forefront of various efforts to reform research assessment and to promote responsible assessment cultures and practices (Science Europe 2020; Curry et al. 2020). RFOs are progressively changing assessment processes and practices in an effort to make the assessment of grant applications more responsible. For example, grant applications are increasingly expected to demonstrate their relevance to societal stakeholders and describe measures by which research results will be disseminated to identified target groups. Involving non-academic experts in assessment processes to help form judgements about these expectations has thus become a concern for many funders. Other aspects of the way in funders conduct research assessment processes have long been flagged as crucial for a level playing field for research career advancement, particularly the elimination of gender bias from assessment processes. Drawing on policy documents, main research programme call documentation, and the expert informant interviews, a qualitative assessment of RFO responsible grant assessment was undertaken.

This classification refers not to the criteria used to assess researchers or research, but to responsibility-relevant qualities of the research assessment process put in place by the RFO. The classifications used in this assessment are shown in Table 9.

Table 9: RFO research grant assessment processes, classification

Classification	Descriptor 1	Descriptor 2
Responsible +	Non-academic experts usually/always included as reviewers and/or members of assessment panels	Gender balanced panels, guidance/training on RRI-related aspects, trans/interdisciplinarity valued, no conflict of interest (COI)
Responsible	Non-academic experts sometimes included as reviewers and/or members of assessment panels	Gender balanced panels, Guidance/training on RRI-related aspects, trans/interdisciplinarity valued, no COI
Balanced	Gender balanced panels/reviewers or non-academic expert included as reviewers and/or members of assessment panels	Interdisciplinarity valued, no COI
Basic	Gender and/or interdisciplinarity valued	No COI
None of these		

Figure 51 summarises selected qualities of the research grant assessment processes put in place by RFOs that can be understood to underpin responsible assessment processes. Around one-quarter of the participating RFOs organise grant assessment processes with multiple responsible assessment elements included, including the use of non-academic peer reviewers or members of assessment panels. Almost half the RFOs use gender balanced panels in their assessment processes. These RFOs also provide guidance, often in the form of guidelines, or training for reviewers and/or assessment panel members regarding RRI-related issues such as gender bias and conflicts of interest (COI). Gender balanced assessment panels is the most common measure employed by RFOs to support responsible assessment processes.

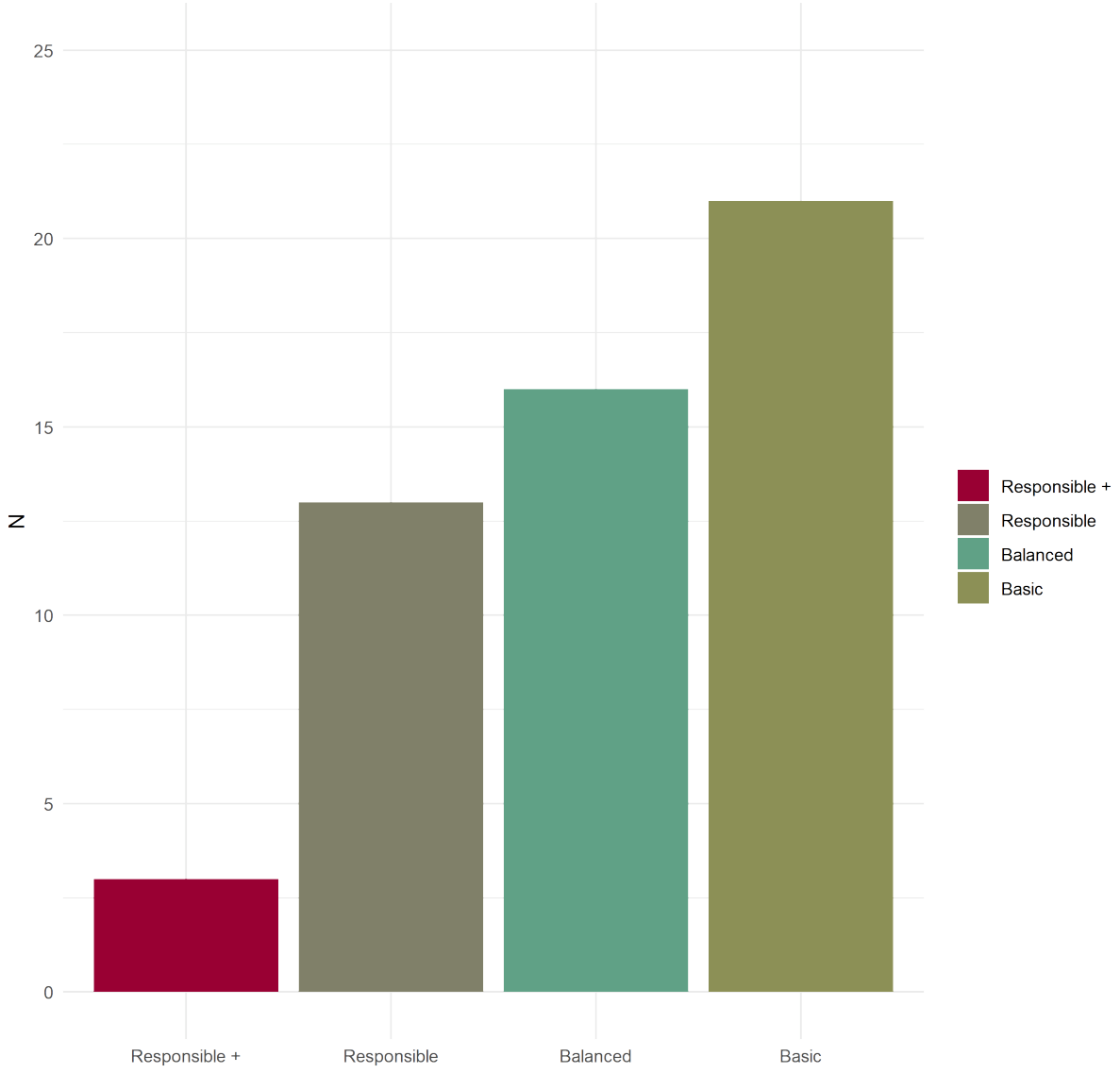


Figure 51: RFO research grant assessment processes

7.3.1. Repertoires of support for responsible research assessment

Experimenting with and adopting responsible research assessment is an area in which RFOs can have direct impact on the transformation of research culture. In the CCN-RFO study we asked RFOs about three aspects of their research assessment approach: 1) the assessment of research projects; 2) the assessment of individual researchers; and 3) the process and procedural aspects of organising and conducting responsible assessments. This section deals with the last of these three aspects of responsible research assessment. The avoidance of conflicts of interest (COI) is standard for individuals to accept roles as reviewers or assessors of grant applications in all RFOs. COI is not included in the repertoires of support for responsible research assessment explored below.

The information we collected on the repertoires of actions being used by RFOs to enhance responsibility in the conduct of research assessment has been allocated to four main categories:

- Composition of assessment panels
- Selection of reviewers
- Training or guidance support

Assessors of research funding applications rank and make decisions about successful and unsuccessful proposals. *Composition of assessment panels* refers to the selection of panel members to participate in assessment panels that make recommendations regarding the funding of grant applications. This category includes inviting assessors from different disciplines and from different types of organisations, the setting up of gender balanced assessment panels, and the presence of societal stakeholders and experts on these panels. *Selection of reviewers* refers to the inclusion of diverse experts in the initial reading, review, and scoring of grant applications. This can include international and national experts, reviewers with scientific and/or societal stakeholder expertise in the topic, selection based on gender representation, etc.

Training or guidance support refers to all areas in which the RFO supports reviewers and assessors by providing specific training, guidelines, or instructions on how to conduct a responsible assessment. This includes training or guidance on how avoid unconscious biases, and for mitigation of gender biases to prevent discrimination against women grant applicants. This includes guidance on assessing achievement relative to opportunities, to better take account of career breaks or periods of underemployment due to maternity or other caring responsibilities that can impact on women researchers' careers. Figure 52 shows the number of RFOs using each of these different sets of practices to support responsible research assessment.

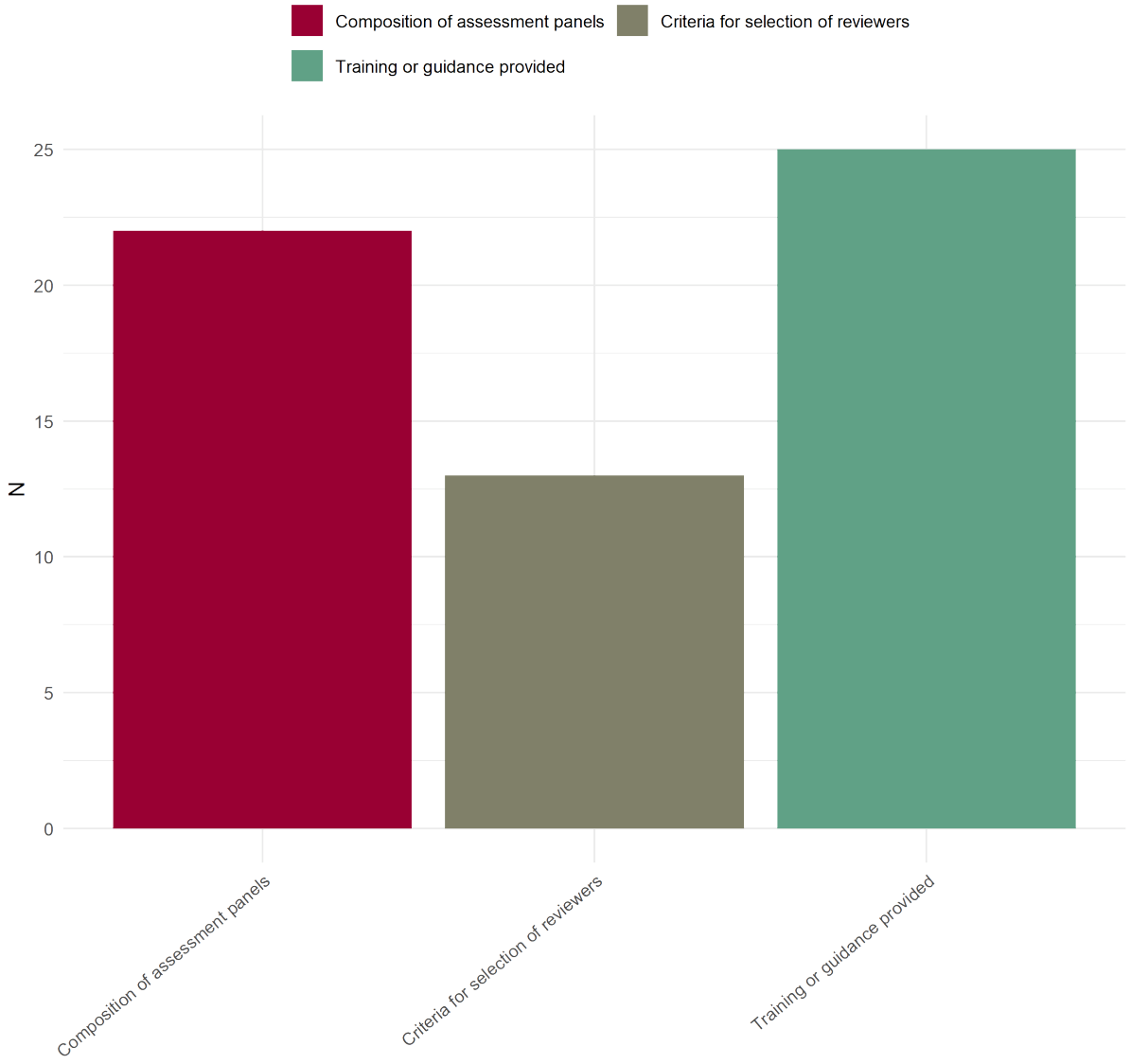


Figure 52: RFOs supporting responsible research assessment practices (n)

A majority of RFOs support responsible research assessment through the design of assessment panels. A slightly smaller majority of RFOs support responsible research assessment by providing training or guidance to grant application reviewers and/or assessment panel members. Criteria for the selection of diverse grant applications reviewers is another popular approach to responsible assessment processes among RFOs. It should be noted that in some cases a metric such as the individual researcher H-index score, which is considered problematic particularly as a standalone criteria, also forms part of a RFO's reviewer selection process.

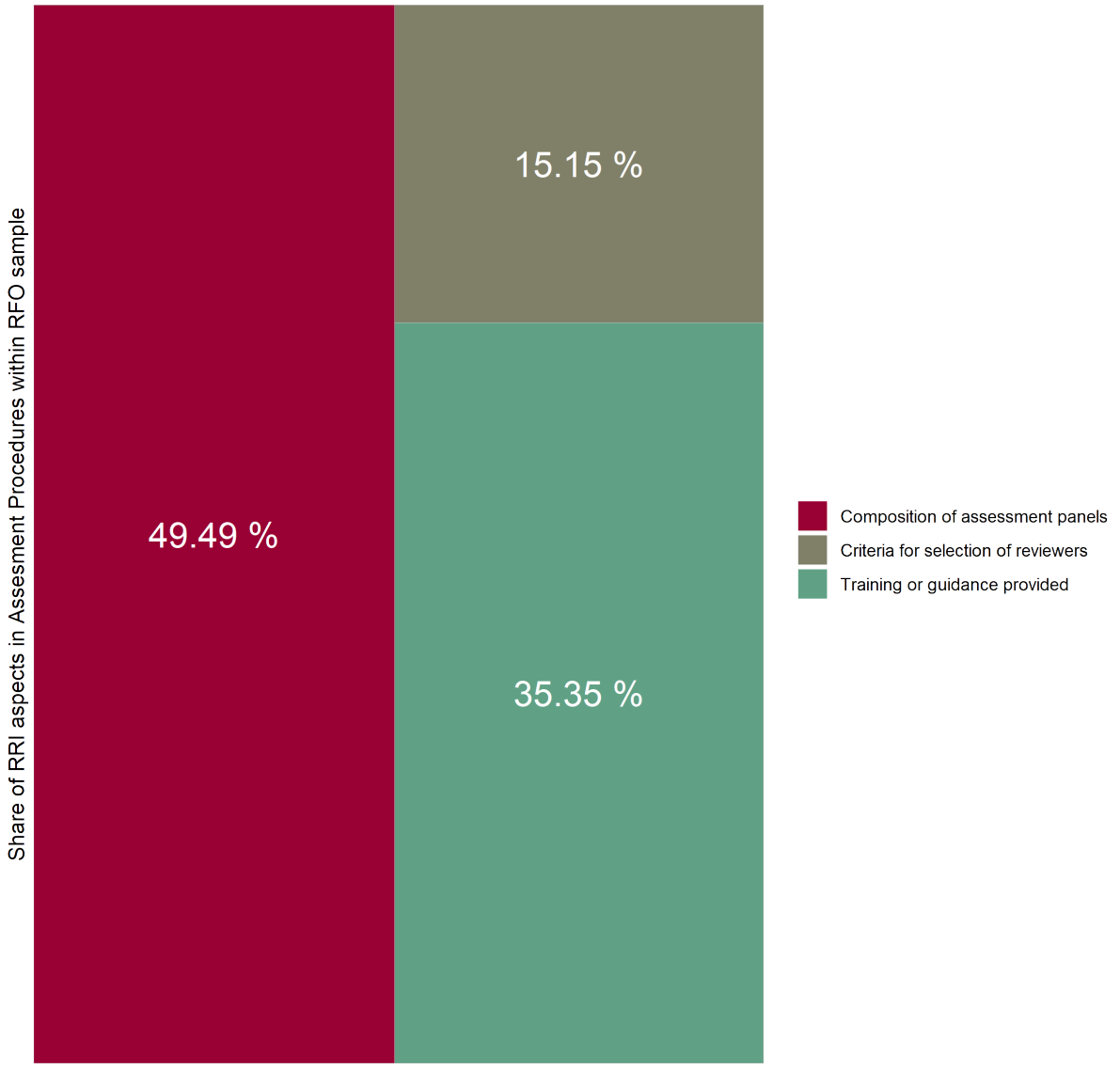


Figure 53: Practices supporting responsible assessment in RFOs (%)

Figure 53 shows the most common areas in which RFOs are implementing responsible assessment of grant applications. The area in which most responsible assessment practices are being implemented is in the composition of assessment panels. The selection of application reviewers is a closely related area in which RFOs are supporting responsible assessment practices. Combining these two categories it is evident that RFOs are exerting considerable effort to ensure that grant applications are considered by experts with diverse backgrounds and characteristics.

Overall, it is apparent that most RFOs that are working towards organising and conducting responsible assessment by including a diversity of stakeholders and perspectives in assessment activities, supporting reviewers and assessors appropriately, and/or seeking to eliminate gender and other unconscious biases from their assessment processes.

7.3.1.1. *International benchmarking*

Comparisons with international RFOs revealed many consistent features of research assessment procedures. A number of innovative approaches were also noted. In one international RFO, unconscious bias training for all assessors is combined with innovative written guidance encouraging members of assessment panels to monitor the emergence of fellow panellists' biases in the interactive meetings that form part of the assessment process.

The inclusion of community assessors in panels selecting grants that will work with vulnerable communities was another innovation noted. In such applications, a statement of community engagement and relevance is also part of the application to be assessed.

Another RFO included technical stakeholders in the assessment of all grant applications with expected market or other outcomes. A relevance threshold had to reached, based on the assessment of whether the application was sufficiently well linked to end-user needs.

7.4. Summary and work in progress

This chapter has provided an introduction to the monitoring of RRI and related initiatives in research funding organisations. RRI itself is not prominent in the policies and practices of a majority of RFOs. However, RRI-related elements such as promoting gender equality, open science, and the inclusion of societal stakeholders in funding processes, are being supported in a different ways in most RFOs to at least some extent.

Data captured by the SUPER MoRRI CCN-RFO study are considerable and work continues in processing and analysing these data. The chapter has presented data about RFO policy portfolios relevant to supporting RRI and the types of stakeholders providing advice to RFOs. An overview of the inclusion of RRI or RRI-related elements in funding instruments and assessment processes was also provided. Repertoires of responsible research assessment practices in RFOs were also illustrated. These data show that RFOs are actively supporting transformation toward more responsible research cultures and practices in a variety of important ways. The opportunity for inter-organisational learning and further dissemination of some of these approaches is also apparent.

Ongoing work will provide a range of further insights about how RFOs are exerting responsibility pressure in their work and their expectations of the research community. This will include insights into priority setting, and the repertoires of RRI and RRI-related elements being included in funding instruments and in the assessment of research and researchers.

8. Gendered Eco-Innovation Study (GenEcoInno)

8.1. Aims and background

The Green Economy and the promotion of gender equality are at the top of the EU R&I policy agenda and the deepening and widening of the new European Research Area (ERA) (EC 2020: EUCO 2021). In this SuperMoRRI case study, these objectives are combined to investigate two broad innovation themes: 1) trends in patenting related to green technology; and 2) women inventors' participation in green-tech innovation.

The first stage of the GenEcoInno study involves new work utilising the data infrastructure the GreenTech Database (GTDB)[9] created and maintained at SUPERMoRRI partner INGENIO (CSIC-UPV). This database identifies patterns of eco-innovations via patent analysis based on respective EU patents geo-coded at national, NUT2 and NUTS3 levels. As part of Work Package 5 of SUPER MoRRI, the GTDB was upgraded to include inventor gender. This new functionality will allow the development of new information and indicators about women inventors in green innovation. This phase of the study addressed a knowledge gap as it refers to patterns of (largely) private sector innovation from an RRI perspective. It will also provide a sampling frame for the selection of cases for qualitative investigation in the second stage of GenEcoInno.

The second stage of GenEcoInno will investigate how gender equality leads to more eco-innovations and how diversity leads to new processes, capacities and attitudes to address ecological and sustainable issues more broadly. This phase of the work will involve qualitative fieldwork with a selection of women inventors working in different institutional contexts. Important context factors to be considered during the field work are the national gender welfare regimes, national gender equality and labour market policies, the overall strengths and weaknesses of the innovation systems (for example, diversity of the R&I actors, R&I expenses, share of public and private funding, inclusiveness of the R&I systems), particularly with regard to the role of the business sector and R&I expenditures.

The two phases of the project will contribute to Deliverables D5.2 and D5.3.

8.1.1. Eco-innovation, technology life-cycles, and gender

The issue of whether and how gender diversity may influence (eco-)innovation can be grafted onto the mutual interdependence between technology and human know-how. Technology evolution is the reflection of higher receptiveness to emerging opportunities and challenges, and of enhanced ability to devise solutions. Likewise, human skill advances as a response to the appearance of known and unknowable shortcomings and bottlenecks. But because both problems and solutions manifest themselves through a myriad of feedback loops, the dual evolution of technology and know-how is uncertain, and often out-of-synch. Moreover, just like technology, the pathways through which human learning advances are multiple, meaning that propitious conditions for successful problem-solving change together with the nature of the perceived problems and of the feasible solutions.

Against this backdrop, we operationalise the study of eco-innovations by focusing on the life-cycle stages of technology, which we interpret as a continuum. In the initial phase, novel technology is raw, the design is highly contestable, the possible variants are manifold, operational efficiency is lower and

[9] https://www.greentechdatabase.com/

market uncertainty is high. As both technology and know-how develop, the maturity stage is characterised by lower variety, consolidated standards, higher operational efficiency and lower market uncertainty. The key is that each step of such an evolutionary path calls upon specific forms of problem-solving abilities. At early stages, when design standards are loose, creativity and ingenuity are needed to explore the multitude of variants, whereas managing mature technology requires more analytical thinking and efficiency management skills. The benefit of framing the analysis in terms of life cycle is that it allows capturing and differentiating progress both at the intensive margin (i.e., within any technological field) as well as the extensive margin (i.e., between different fields), which is important in view of the highly diverse degree of development across environmental domains (Barbieri et al. 2020; Perruchas et al. 2020).

Empirical evidence (see e.g. Østergaard et al, 2011; Díaz-García et al, 2013; Xie et al, 2020) suggests the existence of a positive correlation between gender diversity in R&D teams and innovation, especially in the face of high market uncertainty and task complexity. This yet largely unexplored issue deserves further attention, considering that green technologies are at different stages of the life cycle, which as per above implies great variety of relevant skill types and of forms of learning by doing.

8.2. The Green Tech database (GTDB)

This resource has been developed to study green technologies using patent data. It is based on PATSTAT 2020a, a worldwide database containing patent applications from leading and developing countries, including the European Patent Office and the US Patent and Trademark Office.

All the patent applications related to climate change mitigation and adaptation were identifed in PATSTAT, using the Y02 branch of the CPC classification. This branch contains 44 technologies grouped in 8 families. We also proceeded to the geo-localisation and enrichment of inventor's addresses following Barbieri et al. (2020), enabling the identification of territories where green innovations happen. With both geographical and time dimensions of green technologies' development, we were able to assign a stage of the life cycle to each of them.

8.2.1. SUPER MoRRI development of the GTDB

In order to explore the questions guiding GenEcoInno, the gender of green inventors had to be determined. PATSTAT provides inventor's names in the majority of cases, therefore the first step was to determine each inventor's first name and then to predict their gender using genderize.io (a gender predicting API using names).

The GTDB contains 2.7 million unique inventors (including both first and last names), but once the first names were identified, we could reduce significantly the number of unique first names, and consequently the calls to the genderize.io API.

8.2.2. Green innovations: data overview

There are 1,906,973.41 patent families in PATSTAT 2020a that are identified as related to climate change mitigation and adaptation (tagged with the Y02 CPC class, called "green"), from 1971 to 2020. In order to avoid double counting, we assign to each inventor a fractional count of patent families, and we sum the fractions. That explains why the number of green patent families is not an integer.Table 10 summarises the number of patents by technology groups within the Y02 CPC (green) class.

Table 10: Green patents, by technology group*

CPC Code	Description	Patent families (N)
Y02A	Technologies for adaptation to climate change	226011.103
Y02B	Climate change mitigation technologies (CCMTs) related to buildings, e.g. housing, house appliances or related end-user applications	162510.279
Y02C	Capture, storage, sequestration or disposal of greenhouse gases [GhG]	7762.178
Y02D	CCMTs in information and communication technologies [ICT], i.e. information and communication technologies aiming at the reduction of their own energy use	73831.546
Y02E	Reduction of greenhouse gas [ghg] emissions, related to energy generation, transmission or distribution	492671.436
Y02P	CCMTs in the production or processing of goods	423804.190
Y02T	CCMTs related to transportation	320036.985
Y02W	CCMTs related to wastewater treatment or waste management	200345.732

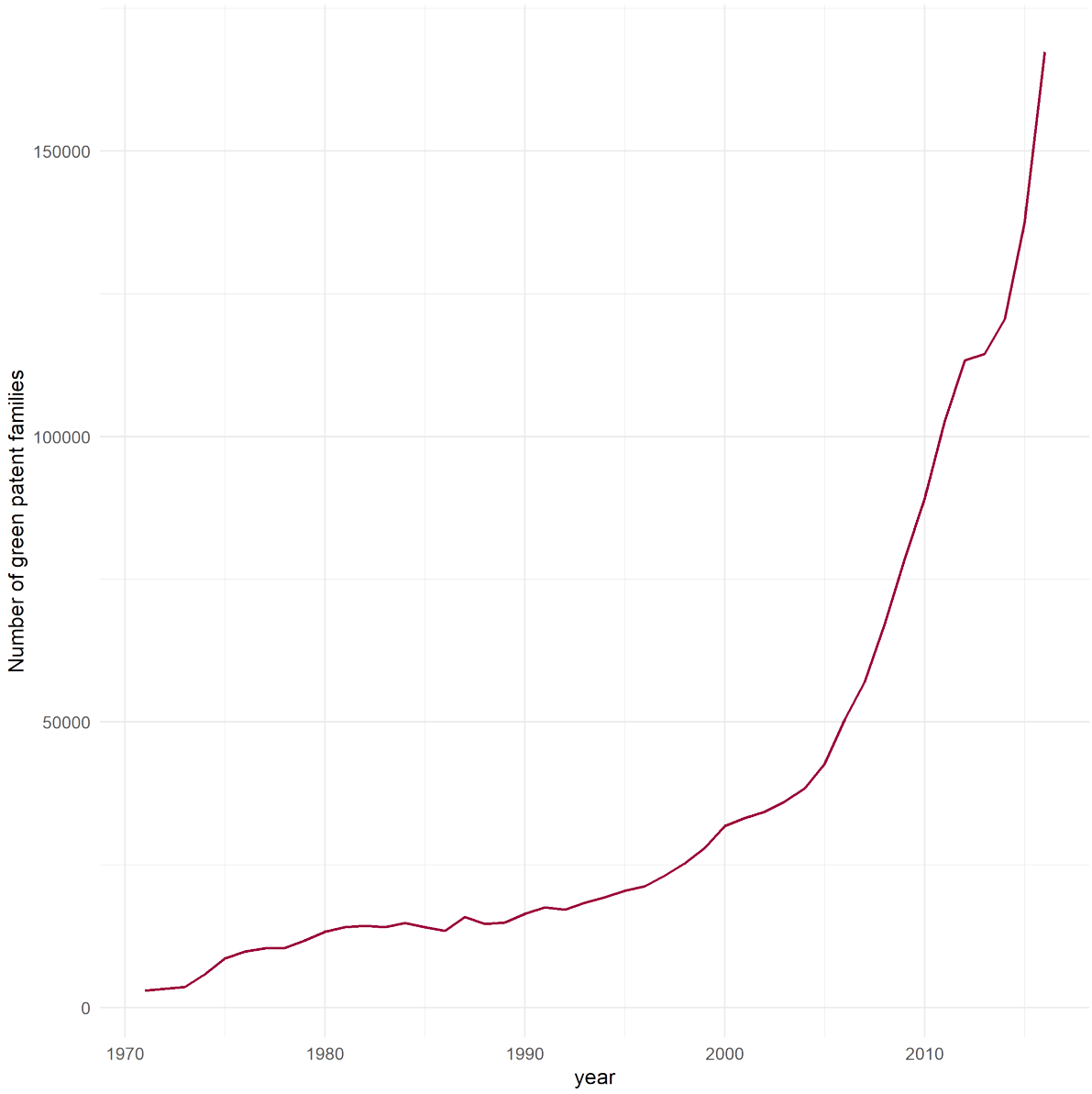


Figure 54: Green Patent Families (fractional counting), 1971-2016

Figure 54 shows the evolution of the number of green patent families per year, fractionally counted. The drop at the end of the series is due to the delay caused by the examination and publication of patent applications.

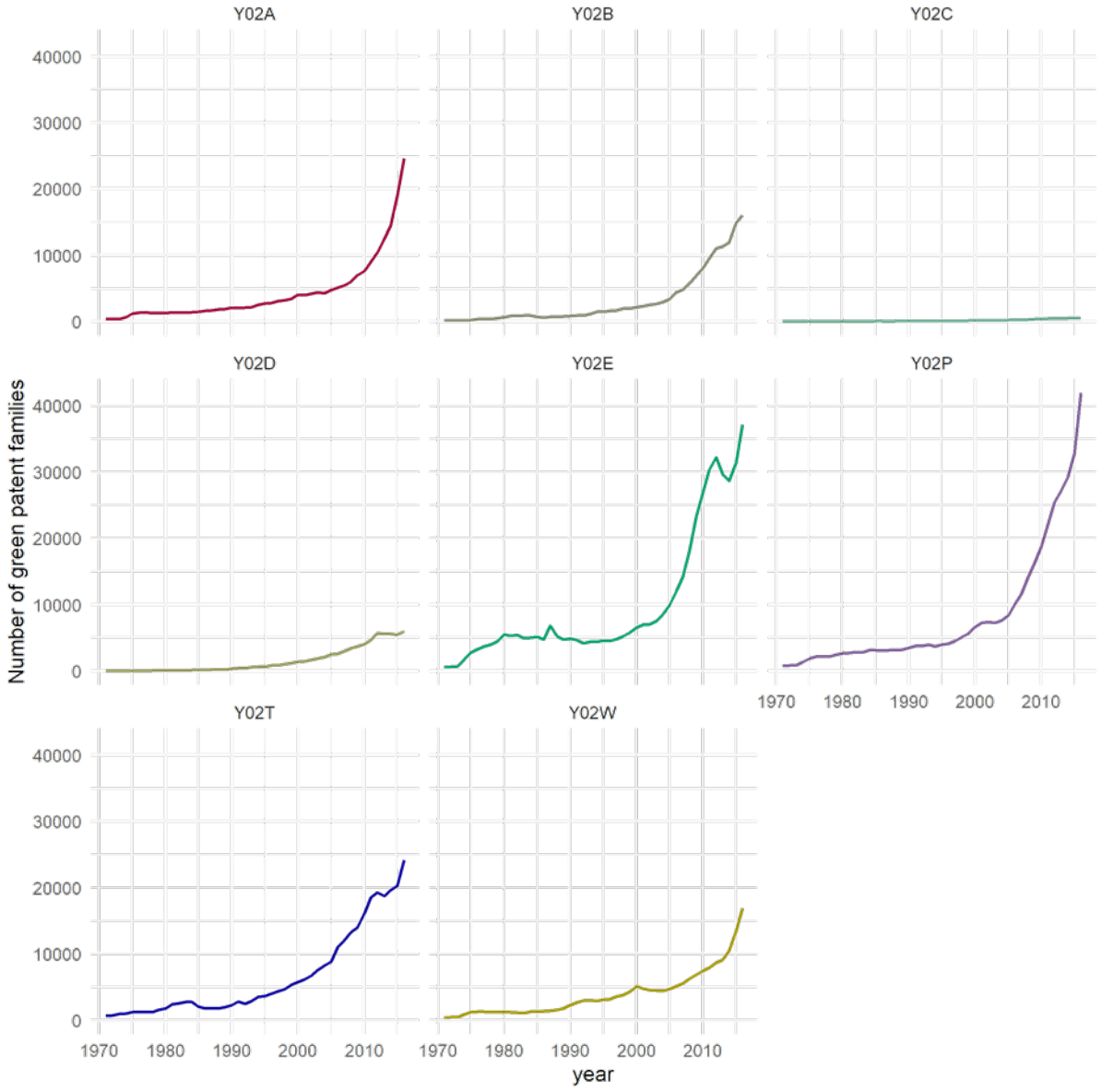


Figure 55: Green patent families, by technology group, fractional count, 1971-2016

Figure 55 represents the evolution of the fractional count of green patent families per technology group. The two most important groups are Climate Change Mitigation Technologies (CCMTs) related to Energy (Y02E) and to the production of goods (Y02P), while the technologies for capture, storage, sequestration or disposal of greenhouse gases (Y02C) is the smallest.

8.2.3. Geography of green innovations

Each inventor has a set of coordinates associated with their address recovered from the patent application, or one the patent application of the patent family. That enables us to project the location of the inventors to territories, whether countries, administrative entities, functional areas, etc.

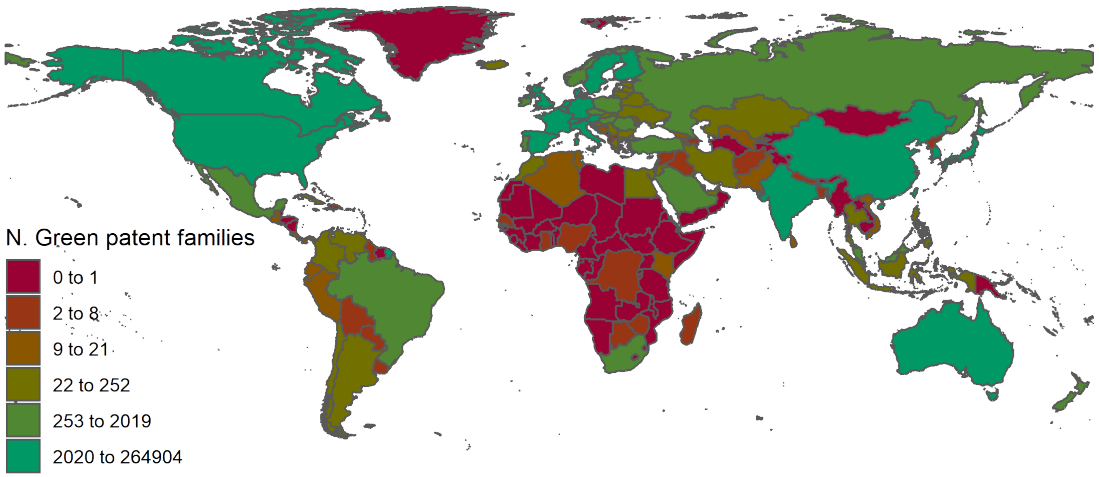


Figure 56: Green patent families, by country, 1971-2020

Figure 56 represents the number of green patent families per country for the period 1971-2020, divided in quintiles.

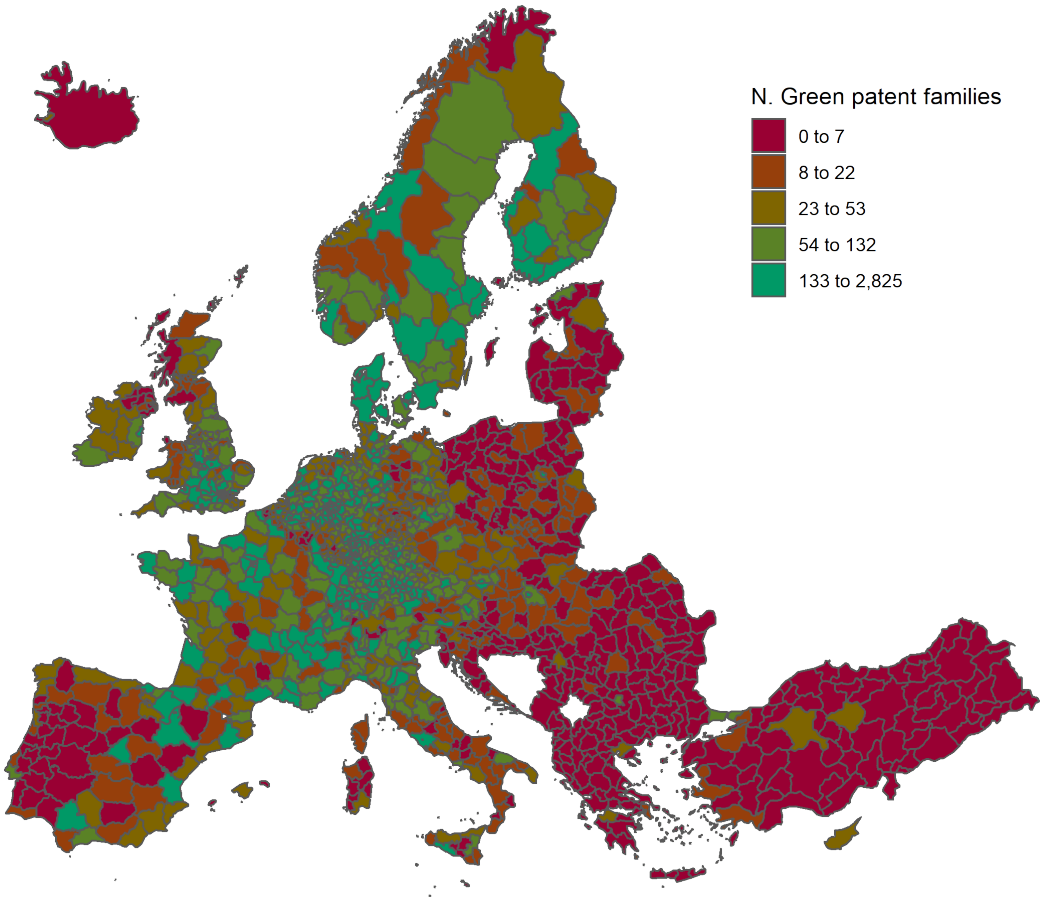


Figure 57: Green patent families, by NUTS3 region, 1971-2020

Figure 57 summarises the distribution of green patenting activity in Europe at NUTS3 level for the period 1971-2020. Germany is the leading country in green patent families, followed by France. North-west Europe and Scandinavia were also relatively highly active areas for green patenting in this period.

8.3. Gender of green inventors

This section describes the participation of women as inventors of sustainability related technologies, as measured by authorships of patent applications.

8.3.1. Methodology

PATSTAT provides a field called person_name with either the inventor or the applicant name for each patent application, with another field tagging if it is an inventor or an applicant. Inventors can be identified with their first names and last names, or only their initials. For example, “John Smith” can be identified as “J. Smith”, “John Smith” or “Smith, J”. Moreover, due to the automatic treatment of the information, applicant are sometimes identified as inventors and there are typing errors (e.g. “Jhon” instead of “John”).

Because of these limitations, we adopted a statistical approach to detect the gender of an inventor, following these steps:

1. Calculation of the frequency of each word in all the inventor names per country. Words have to be at least 3 characters long after removing punctuation marks.
2. If the names contains a comma, we assume that the first name is the first word after the comma ["Smith, John" → first name is "John"]
3. When there are no commas, we assume that the first name is the most frequent word ["John Smith" → "John" has a high frequency than "Smith"].
4. We obtain the gender of the name using *genderized.io* service.

We were able to detect a gender for 92% of the inventors. Table 11 represents the number of green patent families by gender as detected using the methodology described above, for the whole dataset.

Table 11: Green patent families, by gender of inventor

Gender	Green patent families (N)	Distribution (%)
Male	1551469.0	81.4
Unknown	152151.3	8.0
Female	203353.2	10.7
Total	1906973.5	100.0

8.3.2. Gender of green inventors: data overview

This section provides a brief summary of the data parameters available for the development of SUPER MoRRI monitoring elements, including new indicators, related to the gender of green inventors.

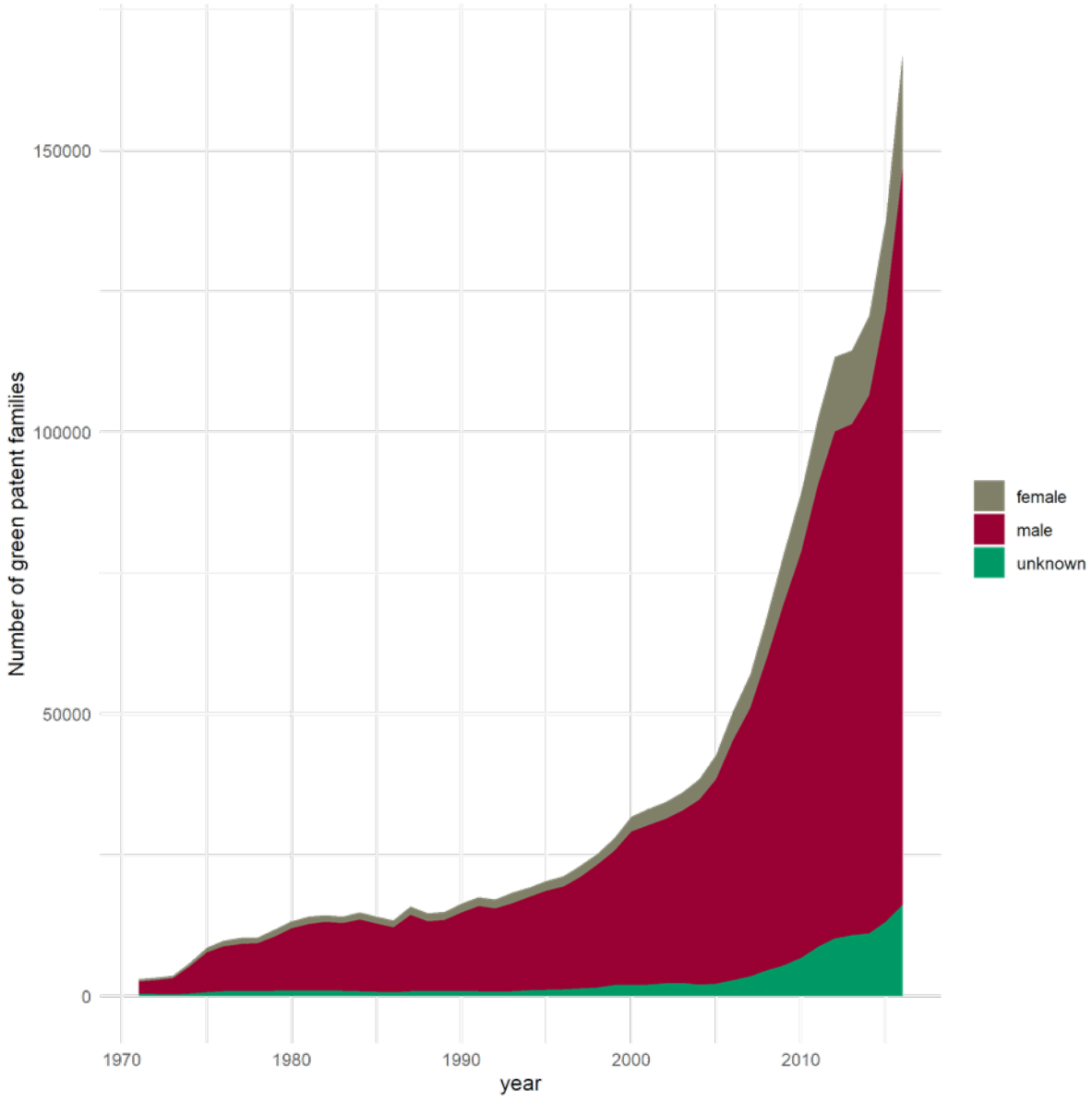


Figure 58: Green patent families, by gender of inventor, 1971-2016

Figure 58 represents the evolution of the number of green patent families per inventor gender. An increase in the presence of women among green inventors can be observed.

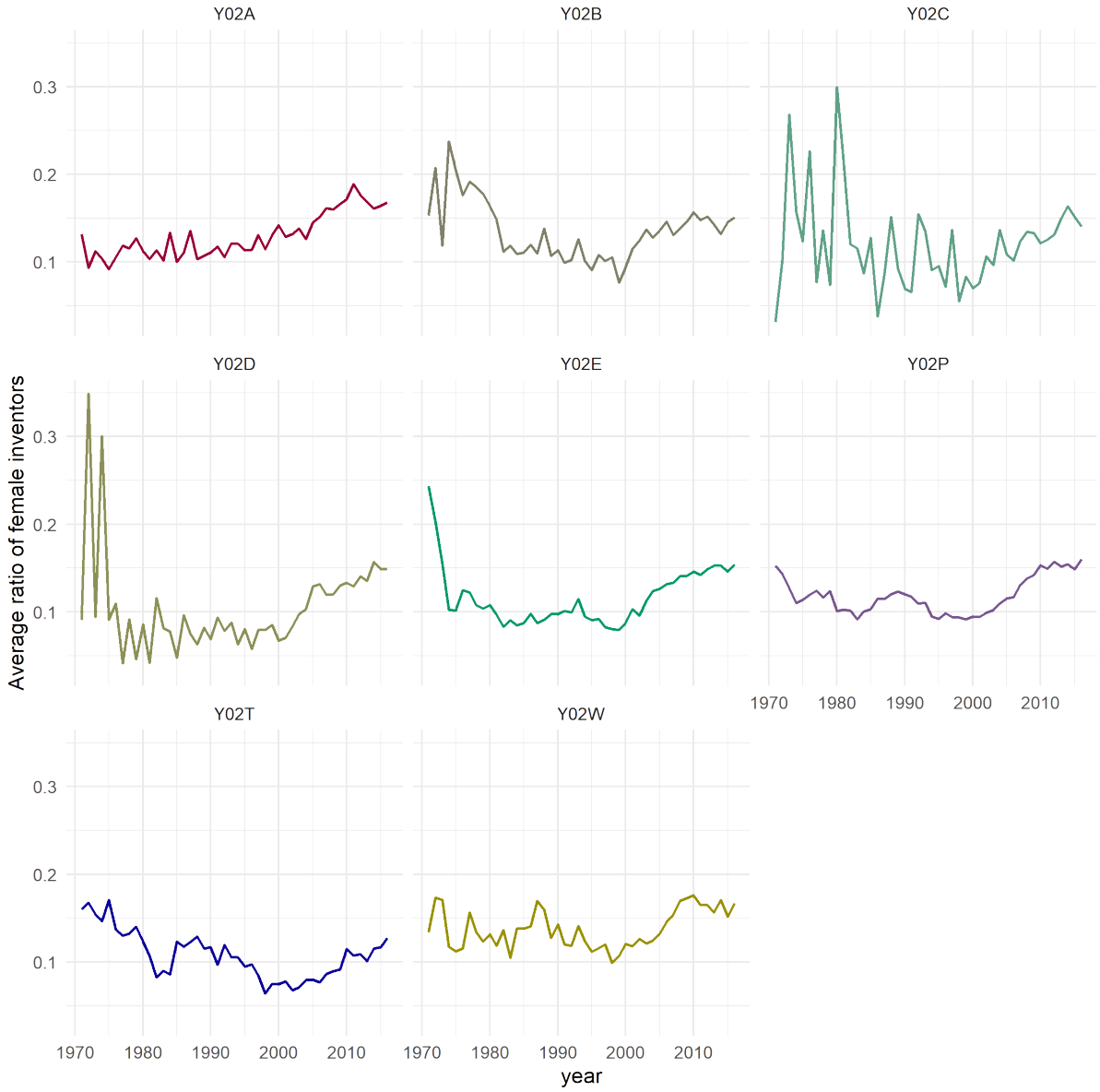


Figure 59: Ratio of women inventors, by technology family, 1971-2016

Considering only those inventors classified as men or women, we can compute a ratio of women inventors for each patent family. Figure 59 represents the evolution of the average of this ratio (which goes from 0 to 1) by technology family, for the period 1971-2020.

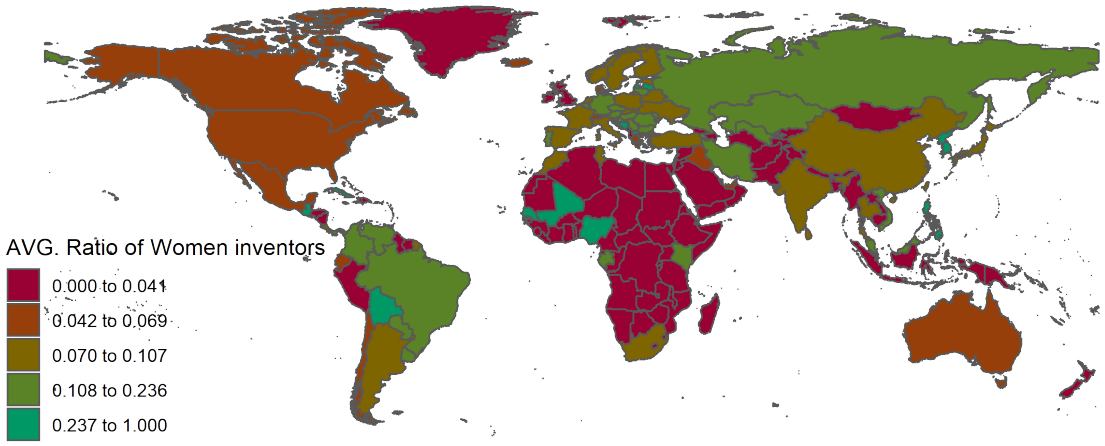


Figure 60: Average ratio of women inventors, by country, 1971-2020

The ratio of women inventors can also be displayed on maps. Figure 60 visualises this ratio at the country level for the world.

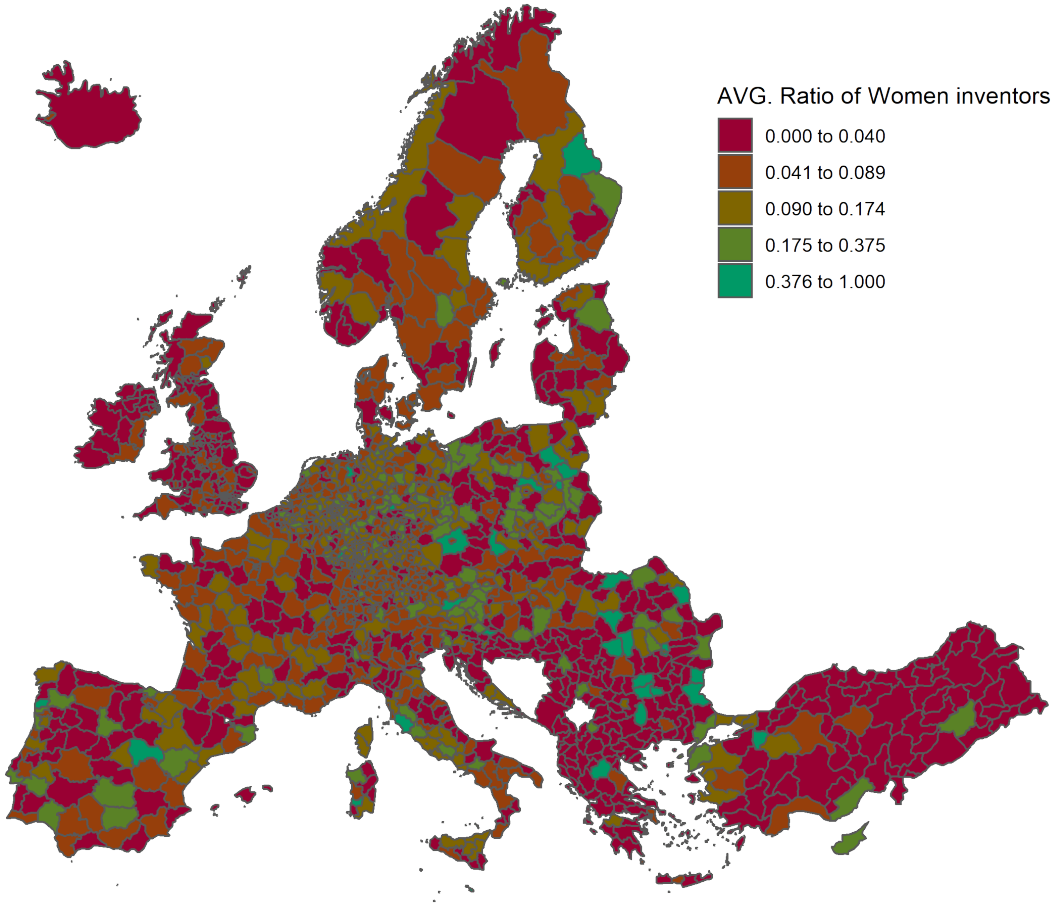


Figure 61: Average ratio of women inventors, by NUTS3 region, 1971-2020

Figure 61 presents the ratio of women inventors at the NUTS3 region level for Europe, for the period from 1971 to 2020.

A summary data table has been prepared at the NUTS2 level (up to 283 rows). Data columns include gender ratio by life-cycle and by technology for each main technology field. Gender ratios are also illustrated by a colour code indicating a ratio above or below the NUTS2 level average. The total number of patent families for each technology field by NUTS2 region is also included.

Table 12: Description of Gender Eco-Innovation datafile

Patent ID	Year	Inventor gender ratio	Geolocalization			Technology		ESPACE.net link
			Country	*NUTS2*	*NUTS3*	*Field*	*Life cycle**	
#			DE					Patent documentation

* See Barbieri et al. (2020)

A full datafile is under preparation with the information shown in Table 12. This datafile provides the necessary information to identify a sample of women inventors for stage two of the GenEcoInno study.

8.3.3. Gendered eco-innovations data process

Having generated a new geolocalized dataset on women inventors the ongoing tasks for the GenEcoInno study will focus on the translation of the available information to relevant monitoring elements for the SUPER MoRRI dashboard (GeoEcoInno Stage 1) and for the pathways reporting (GeoEcoInno Stage 2). Figure 62 summarises the data and output development processes for GeoEcoInno.

The remainder of this chapter focuses on the initial stages of potential indicator development work arising from GeoEcoInno stage one.

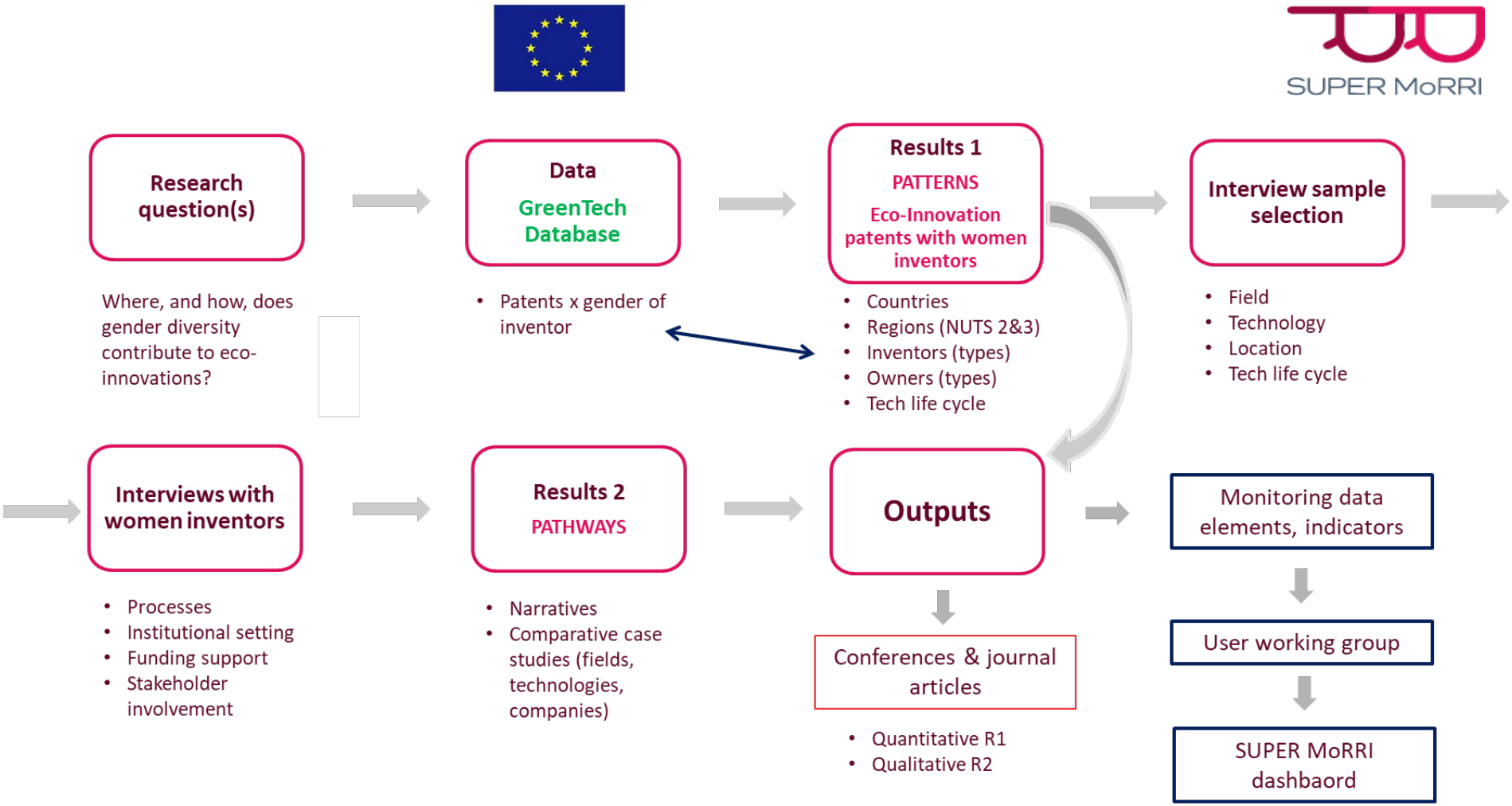


Figure 62: Overview of the Gendered Eco Innovations study data process

8.4. GenEcoInno study: indicator development

This section provides an overview of the work in progress to develop monitoring elements for the SUPER MoRRI monitoring framework. In particular, it focuses on preparation of potential indicators and visualisations for the data dashboard component of the planned monitoring framework. The indicators presented here have been initially selected as the most relevant for the SUPER MoRRI dashboard among the potential indicators under consideration from GenEcoInno. It is possible that further indicators may be developed from the available data, particularly following future discussions with potential interested users of these indicators.

8.4.1. Responsible innovation indicators: green technology patents

Patent data is the most commonly used proxy for innovation activity. As described above, the indicators proposed in this section use data for the class of green patents. These data have be geolocalised globally at the level of countries and in addition at NUTS2 and NUTS3 levels for Europe. A small number of indicators will be developed for the SUPER MoRRI dashboard reporting these data. Table 13 provides short descriptions of these indicators. Complete data fiches for these indicators will be produced following finalisation of the development process.

Table 13: Green-tech innovation, proposed indicators

Provisional indicator name	Short description	Coverage
Green tech innovation	Time series data, Y02 CPC class 'green' patents. Source: PATSTAT. Availability: 1971-2020 inclusive.	Country (World); NUTS 2/3 (Europe)
Green tech innovation, main technology fields	Time series data; Y02 CPC class 'green' patents. Source: PATSTAT. Availability: 1971-2020 inclusive.	Country (World); NUTS 2/3 (Europe)
Green tech innovation, technology life cycle	Time series data; Y02 CPC class 'green' patents. Source: PATSTAT; Green-tech database (GTDB). Availability: 1971-2020 inclusive.	Country (World); NUTS 2/3 (Europe)

Presentation options for these data in the SUPER MoRRI dashboard will include visualisations of the time-series data on evolving geographic maps. National and regional level mapping of these data will be available. These maps will also have functionalities for displaying data by technology fields and by technology life cycles (Barbieri et al. 2020).

8.4.2. Women inventors in green technology fields

The proposed indicators described in this section were made possible by the process of genderising data on green-tech innovation (section 8.3.1). A small number of indicators will be developed for the SUPER MoRRI dashboard reporting on women inventors in green-tech innovation. Table 14 provides short descriptions of these indicators. Complete data fiches for these indicators will be produced following finalisation of the development process.

Table 14: Women inventors in green-tech innovation, proposed indicators

Provisional indicator name	Short description	Coverage
Women inventors in green-tech innovation	Time series data, Y02 CPC class 'green' patents. Source: PATSTAT; Green-tech database (GTDB). Availability: 1971-2020 inclusive.	Country (World); NUTS 2/3 (Europe)
Women inventors in green-tech innovation, main technology fields	Time series data; Y02 CPC class 'green' patents. Source: PATSTAT; Green-tech database (GTDB).. Availability: 1971-2020 inclusive.	Country (World); NUTS 2/3 (Europe)
Women inventors in green-tech innovation, technology life cycle	Time series data; Y02 CPC class 'green' patents. Source: PATSTAT; Green-tech database (GTDB). Availability: 1971-2020 inclusive.	Country (World); NUTS 2/3 (Europe)

Presentation options for these data in the SUPER MoRRI dashboard will include visualisations of the time-series data on evolving geographic maps. National and regional level mapping of these data will be available. These visualisations will also have functionalities for displaying data by technology fields and by technology life cycles (Barbieri et al. 2020) at the national and regional levels described.

8.5. Summary and work in progress

This chapter has provided an overview of the first phase of the Gendered Eco-Innovations project being conducted as part of WP5 of SUPER MoRRI. This phase deals principally with preparing a dataset for use in providing indicators and complementary information to the SUPER MoRRI data dashboard. It also provides a sampling frame for selecting cases for the second phase of the project based on geography and technology field parameters.

As our data overview illustrated, green-tech patenting activity is not randomly distributed geographically. There are also differences in the rate of green-tech patenting by technology family. Over the past fifteen years there has been a rise in the number and proportion of green-tech inventors who are women. These women inventors are also not randomly distributed geographically.

The ongoing work in the first phase of GenEcoInno is focused on the preparation of six indicator fiches and the development of data visualisations and tools that will be included in the SUPER MoRRI data dashboard online. These indicators of innovation in sustainability technologies and of gender participation in sustainability innovation are being prepared at multiple geographical levels. International benchmarking will also be possible. The data sources and methodological approach used will enable these indicators to be updated periodically with relatively low associated personnel costs.

The design and development of other indicators not described in this chapter is also under consideration. As yet, no additional indicators can be outlined here.

9. Conclusion

The SUPER MoRRI project is concerned with promoting responsibility in research and innovation through the provision of a monitoring framework that can support learning and organisational change. The framework will draw on existing resources and data and will also involve primary data collection through the SUPER MoRRI empirical research programme. Three consecutive RRI Monitoring Reports will provide basic data and descriptive analyses as outlined in the project's implementation plan (Mejlgaard et al. 2020).

In Monitoring Report 1, only secondary data were included and all indicators / metrics were presented at the country level, covering EU27, Norway and the United Kingdom. The 26 indicators / metrics provided were drawn from Eurostat, She Figures, Web of Science, Unpaywall, and various Eurobarometers. The majority of these were also included among the MoRRI indicators, covering particularly the key RRI areas of gender equality and open access.

In this second Monitoring Report, most of the data and indicators presented in MR1 have been updated. These data are presented in Chapters 2-5 of this Report, with updated data fiches for each indicator attached at Appendix A. Notably a new Eurobarometer on EU citizens attitudes and perceptions toward science and technology became available prior to this Report. These new data update some long running time-series data.

Chapter 6 presents new data from the SUPER MoRRI study of research performing organisations. The study focused on universities and assessed these organisations policies, strategies, and operational structures dedicated to five RRI areas, open science, public engagement, third mission, research ethics and integrity, and gender equality. The study was based on a representative sample of 122 European universities and the initial results were presented at the level of organisations. The results showed mixed results in terms of the coverage of different RRI areas in HEIs, and the extent to which these areas are strategic priorities. A summary of the repertoire of policy initiatives supporting each RRI area was provided. International benchmarking highlighted more comprehensive approaches to policy and strategy to support responsible research and innovation and innovative approaches to inclusive RRI-related strategy development.

Chapter 7 presents new data from the SUPER MoRRI study of research funding organisations. The study focused on how funders exert responsibility pressure through three main mechanisms: priority setting, funding instruments, and research assessment. More than 50 European funders participated in the study and the initial results were presented at the level of organisations. Initial results covered RFOs' policies, the inclusion of responsibility in the design of funding instruments, and how funders seek to ensure the responsible conduct of research assessment. International benchmarking of research assessment processes suggested processes in European RFOs are consistent with international approaches.

Chapter 8 unveiled new indicators for responsible innovation in green technologies. These indicators ups on the recommendation of the first expert group on monitoring RRI (Strand et al. 2015) suggesting a new focus on sustainability. First, descriptive data was presented for patents in green technology classes associated with climate change mitigation and sustainable socio-economic development. Three indicators were proposed for these data. Second, descriptive data was presented for the presence of women inventors in green technologies. A further three indicators were proposed for these data. All patents for these two groups of indicators are available at the country level and at the

regional level for Europe. Work on how these indicators will be presented in the SUPER MoRRI dashboard is underway.

In the forthcoming Monitoring Report 3 (MR3), scheduled for August 2023, primary data from all SUPER MoRRI's main data collection vehicles (RPO study, RFO study, Researcher Survey) will be available. Work continues on the data already produced in the SUPER MoRRI studies of HEIs and RFOs. Further categorical data visualisations emerging from these studies will be available for MR3. The range of data and indicators presented in this Report will grow accordingly. The inclusion of indicators from the successive Monitoring Reports in the final SUPER MoRRI data dashboard and monitoring framework is also conditional on their relevance to end-users. The relevance and utility of all indicators, including those presented in the Report at hand, will be further assessed in collaboration with stakeholders.

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Appendix A – Secondary Data Fiches

Eurostat Fiches

Share of female researchers by sectors of performance, all sectors

Table 15: Share of female researchers by sectors of performance (all sectors)

Metric/indicator	Share of female researchers by sectors of performance, all sctors
Source	Eurostat
Source website and metadata	https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_p_femres&lang=en https://ec.europa.eu/eurostat/cache/metadata/en/rd_esms.htm
Source methodology	At national level R&D data are compiled by the national statistical authorities: National Statistical Offices, Research Councils and Ministries. The data are collected through sample or census surveys, from administrative registers or through a combination of sources.
Coverage	EU28 & NO (2005-2019)
Data Missing	2005 (AT); 2006 (DK, DE, EL, LU, NL, SE, UK, NO); 2007 (EL); 2008 (AT, DK, DE, EL, LU, NE, SE, UK); 2009 (EL); 2010 (AT, DE, EL, LU, NE, SE); 2012 (AT, BE, LU, SE); 2014 (AT, BE, DK, DE, EL, EI, LT, LU, SE); 2015 (FR); 2016 (AT, BE, DK, DE, EL, IE, LU, SE); 2018 (AT, BE, DK, FR, DE; EL, IE, LU, SU) ; 2019 (FR, UK)
Flagged observations	Break in time series: 2005 (SE); 2007 (DK, SE); 2008 (PO, SI); 2009 (SE); 2010 (FR); 2011 (EL, NL, RO, SI); 2012 (NL); 2013 (PO, SE); 2014 (FR); 2016 (IT); 2018 (HU) Estimated: 2005 (EU28, EU27, SE, UK); 2006 (PT); 2007 (EU28, EU27, LU, SE, UK); 2009 (EU28, EU27, SE, UK); 2010 (EU28, DK, IE, FR, UK); 2011 (FR, UK); 2012 (EU28, FR, UK); 2013(FR, SE); 2014 (FR, UK); 2015 (EU28, EU27, SE): 2016 (SE); 2017 (EU28), 2018 (UK), 2019 (EU28, EU27) Other: FR (2007, 2008, 2009, 2017); SE (2005); DK (2017, 2019)
Data comments	Also reported in She Figures on the basis of Eurostat data
Description	The indicator provides an aggregate measure of how the labour market participation of women researchers is developing over time in the member states.
Extraction date	29.11.21
Unit	Percentage based on head count (HC)
Name in MoRRI	GE2.1

Important definitions	"Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge - including knowledge of humankind, culture and society - and to devise new applications of available knowledge." (§ 2.5, Frascati Manual, OECD 2015)."Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned." (§5.35, Frascati Manual, OECD 2015)

For a visualization for this indicator see Figure 2.

Share of female researchers by sectors of performance, Business enterprise sector

Table 16: Share of female researchers by sectors of performance (business enterprise sector)

Metric/indicator	**Share of female researchers by sectors of performance, Business enterprise sector**
Source	Eurostat
Source website and metadata	https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_p_femres&lang=en https://ec.europa.eu/eurostat/cache/metadata/en/rd_esms.htm
Source methodology	At national level R&D data are compiled by the national statistical authorities: National Statistical Offices, Research Councils and Ministries. The data are collected through sample or census surveys, from administrative registers or through a combination of sources.
Coverage	EU28+NO (2005-2019)
Data Missing	2005 (AT); 2006 (DK, DE, EL, LU, NE, SE); 2008 (DK, DE, LU, NE, AT, SE); 2009 (EL); 2010 (DE, EL, LU, Nl, AT, SE), 2012 (BE, DE, IE, EL, LU, SE); 2014(BE, DK, DE, IE, EL, LT, LU, AT, SE); 2015 (FR); 2016 (BE, DK, DE, LU, AT, SE); 2018 (AT, BE, DK, EU27, EU28, FR, DE , EL, IE, LU, SE); 2019 (UK, DE, EU28)
Flagged observations	Break in time series: 2005 (SE); 2006 (FR); 2007 (DK, SE); 2008 (SI); 2011 (EL, NL, RO, SI); 2012 (NL); 2013 (PO, SE, NL); 2016 (IT); 2018 (LU) Estimated: EU28 (2005, 2009, 2010, 2012, 2015, 2017); EU27 (2005, 2009, 2015, 2019); DK (2010); IE (2010); LU (2007); PO (2006); UK (2005-2009) Other: NO (2007-2014); DK (2017, 2019); FR (2017)
Data comments	Also reported in She-figures on the basis of Eurostat data

Description	The indicator provides an aggregate measure of how the labour market participation of women researchers is developing over time in the member states.
Extraction date	29.11.21
Unit	Percentage based on head count (HC)
Name in MoRRI	GE2.2
Important definitions	"Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge - including knowledge of humankind, culture and society - and to devise new applications of available knowledge." (§ 2.5, Frascati Manual, OECD 2015)."Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned." (§5.35, Frascati Manual, OECD 2015)

For a visualization for this indicator see Figure: 3.

Share of female researchers by sectors of performance, Higher education sector

Table 17: Share of female researchers by sectors of performance (higher education sector)

Metric/indicator	**Share of female researchers by sectors of performance, Higher education sector**
Source	Eurostat
Source website and metadata	https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_p_femres&lang=en https://ec.europa.eu/eurostat/cache/metadata/en/rd_esms.htm
Source methodology	At national level R&D data are compiled by the national statistical authorities: National Statistical Offices, Research Councils and Ministries. The data are collected through sample or census surveys, from administrative registers or through a combination of sources.
Coverage	EU28 & NO (2005-2019)
Data Missing	Data missing: DK (08), EL (06, 07, 08, 09, 10, 14, 16, 18), FR (15, 18, 19), LU (14, 16); AT (05, 08, 10, 12, 14, 16, 18) SE (06, 08, 10 ,12, 14, 16) UK (06, 08, 19); EU28 (06, 08, 19)
Flagged observations	Break in time series: DK (2007); EL (2011); FR (2014); IT (2005); PO (2008), 2013), RO (2011); SI (2011); SE (2015); HU (2018)

	Estimated: EU28 (2005, 2007, 2009, 2010, 2012, 2014, 2015, 2016, 2017, 2018); EU27 (2005-2010, 2012, 2014, 2015, 2016, 2018, 2019); IR (2007, 2011); FR (2010-2014); IT (2015-2019); LU (2007); PO(2006); UK (2008, 2010. 2012, 2014-2019) Other: DK (2017, 2019), FR (2017)
Data comments	Also reported in She-figures on the basis of Eurostat data
Description	The indicator provides an aggregate measure of how the labour market participation of women researchers is developing over time in the member states.
Extraction date	29.11.21
Unit	Percentage based on head count (HC)
Name in MoRRI	GE2.4
Important definitions	"Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge - including knowledge of humankind, culture and society - and to devise new applications of available knowledge." (§ 2.5, Frascati Manual, OECD 2015)."Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned." (§5.35, Frascati Manual, OECD 2015)

For a visualization for this indicator see Figure 4.

Share of female researchers by sectors of performance, Government sector

Table 18: Share of female researchers by sectors of performance (government sector)

Metric/indicator	Share of female researchers by sectors of performance, Government sector
Source	Eurostat
Source website and metadata	https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_p_femres&lang=en https://ec.europa.eu/eurostat/cache/metadata/en/rd_esms.htm
Source methodology	At national level R&D data are compiled by the national statistical authorities: National Statistical Offices, Research Councils and Ministries. The data are collected through sample or census surveys, from administrative registers or through a combination of sources.
Coverage	EU28 & NO (2005-2019)

Data Missing	Data missing: AT (05, 08, 10, 12, 14, 16, 18); DK (08); EL (06-10, 12, 14, 16, 18); FR (15, 18, 19); IE (16, 18); LU (08, 14, 16, 18); NO (06); SE (06, 08, 10, 12, 14, 16, 18); UK (17, 19)
Flagged observations	Break in time series: BE (2012); DK (2007); DE (2014); EL(2011); FR (2010); NL (2012); PO (2013); RO (2011); SI(2011); SE (2005, 2007, 2011, 2013); Estimated: EU28 (2005-2010, 2012, 2014-2016, 2018-2019); EU27 (2005-2010, 2012, 2014-2016, 2018, 2019); FR(2011-2014); SE (2005, 2007, 2009, 2011, 2013, 2015, 2019) Other: DK (2019), DE (2015-2019); FR (2005-2009, 2017); HR (2012-2019); NL (2005-2019); SK (2005-2014); NO (2005, 2007-2009)
Data comments	Also reported in She-figures on the basis of Eurostat data
Description	The indicator provides an aggregate measure of how the labour market participation of women researchers is developing over time in the member states.
Extraction date	29.11.21
Unit	Percentage based on head count (HC)
Name in MoRRI	GE2.3
Important definitions	"Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge - including knowledge of humankind, culture and society - and to devise new applications of available knowledge." (§ 2.5, Frascati Manual, OECD 2015)."Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned." (§5.35, Frascati Manual, OECD 2015)

For a visualization for this indicator see Figure 5.

Intramural R&D expenditure per inhabitant in all sectors

Table 19: Intramural R&D expenditure per inhabitant

Metric/indicator	**2.1.1.1 Intramural R&D expenditure (GERD) per inhabitant in all sectors**
Source	Eurostat
Source website and metadata	https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_e_gerdtot&lang=en https://ec.europa.eu/eurostat/cache/metadata/en/rd_esms.htm

Source methodology	Member state gross domestic expenditure on research and development (GERD) divided by number of member state inhabitants (I). Intramural R&D expenditure is adjusted for inflation, with indicators shown in fixed 2015 prices. Values are deflated using consumer prices indices found at: https://ec.europa.eu/eurostat/databrowser/view/PRC_HICP_AIND__custom_2379395/default/table?lang=en *GERD/I* = Intramural R&D expenditure per inhabitant
Coverage	EU28+NO 2005-2019
Data Missing Flagged observations	No missing data Break in time series: DK (2007); EL (2008); FR (2010); IT (2016); LU (2012); NL (2011, 2012); PT (2008); RO (2011); SI (2008, 2011); SE (2005); UK (2011); HU (2018) Estimated: IE (2009-2014); EL (2006-2010); AT (2005, 2008, 2010. 2012, 2014); PT (2006); SE (2006, 2008, 2010, 2012, 2013, 2014); UK (2008-2010. 2012, 2014, 2016); BE (2018) Other: DK (2019); FR (2015, 2017, 2018); SE (2016); UK (2019)
Data comments	
Description	Current expenditures plus gross fixed expenditure for R&D performed in a country per inhabitant.
Extraction date	26-11-2021
Unit	Euro per inhabitant
Name in MoRRI Important definitions	Not included in MoRRI Intramural R&D expenditures are all current expenditures plus gross fixed expenditure for R&D performed within a statistical unit during a specific period, whatever the source of funds." (§ 4.10, Frascati Manual, OECD 2015).

For a visualization for this indicator see Figure 6.

Intramural R&D expenditure (GERD) as a percentage of GDP in all sectors

Table 20: Intramural R&D expenditure as a percentage of GDP

Metric/indicator	**2.1.1.2 Intramural R&D expenditure (GERD) as a percentage of GDP in all sectors**
Source	Eurostat

Source website and metadata	https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_e_gerdtot&lang=en https://ec.europa.eu/eurostat/cache/metadata/en/rd_esms.htm
Source methodology	Member state gross domestic rxpenditure on research and development (GERD) divided by member state gross domestic product (GDP).
	GERD/GDP = Intramural R&D expenditure as a percentage of GDP
Coverage	EU28+NO 2005-2019
Data Missing Flagged observations	No missing data Break in time series: DK (2007); EL (2008); FR (2010); IT (2016); LU (2012); NL (2011, 2012); PT (2008); RO (2011); SI (2008, 2011); SE (2005); UK (2011) Estimated: IE (2009-2014); EL (2006-2010); AT (2005, 2008, 2010. 2012, 2014); PT (2006); SE (2006, 2008, 2010, 2012, 2013, 2014); UK (2008-2010. 2012, 2014, 2016); BE (2018) Other: DK (2019); FR (2015, 2017, 2018); SE (2016); UK (2017, 2019)
Data comments	
Description	Current expenditures plus gross fixed expenditure for R&D performed in a country as a percentage of GDP
Extraction date	26-11-2021
Unit	Percentage of GDP
Name in MoRRI Important definitions	Not included in MoRRI Intramural R&D expenditures are all current expenditures plus gross fixed expenditure for R&D performed within a statistical unit during a specific period, whatever the source of funds." (§ 4.10, Frascati Manual, OECD 2015).

For a visualization for this indicator see Figure 7.

Patent applications to the EPO by priority year per million inhabitants

Table 21: Patent applicatzions to the EPO by priority year per million inhabitants

Metric/indicator	2.1.2.1 Patent applications to the EPO by priority year per million inhabitants
Source	Eurostat
Source website and metadata	https://ec.europa.eu/eurostat/databrowser/view/tsc00009/default/table?lang=en
Source methodology	Patent applications / Million inhabitants
Coverage	EU28+NO (2006-2017)
Data Missing	NO (2015-2017)
Flagged observations	Estimated EU28+NO (2013-2017) Break in time series EU28 (2015)
Data comments	none
Description	Number of patent applications to EPO per million inhabitants in a given period
Extraction date	12-02-2020
Unit	Patents per million inhabitants
Name in MoRRI	Not available in MoRRI
Important definitions	The total European patent applications refer to requests for protection of an invention directed either directly to the European Patent Office (EPO) or filed under the Patent Cooperation Treaty and designating the EPO (Euro-PCT), regardless of whether they are granted or not. The data shows the total number of applications per country. If one application has more than one inventor, the application is divided equally among all of them and subsequently among their countries of residence, thus avoiding double counting.

For a visualization for this indicator see Figure 8.

She-Figures Fiches

The Glass Ceiling Index

Table 22: The Glass Ceiling Index

Metric/indicator	The Glass Ceiling Index
Source	She Figures 2021 & 2018
Source website and metadata	https://data.europa.eu/euodp/en/data/dataset/she-figures-2018-gender-in-research-and-innovation https://op.europa.eu/da/publication-detail/-/publication/67d5a207-4da1-11ec-91ac-01aa75ed71a1/language-en/format-PDF/source-search https://op.europa.eu/en/publication-detail/-/publication/09d777dc-447c-11e9-a8ed-01aa75ed71a1/language-en
Source methodology	Based on Women in Science database, DG Research and Innovation. The Glass Ceiling Index (GCI) is a relative index comparing the proportion of women in academia (grades A, B, and C) with the proportion of women in top academic positions (grade A positions; equivalent to full professors in most countries) in a given year. The GCI can range from 0 to infinity. A GCI of 1 indicates that there is no difference between women and men in terms of their chances of being promoted. A score of less than 1 means that women are more represented at the grade A level than in academia generally (grades A, B, and C) and a GCI score of more than 1 indicates the presence of a glass ceiling effect, meaning that women are less represented in grade A positions than in academia generally (grades A, B, and C). In other words, the interpretation of the GCI is that the higher the value, the stronger the glass ceiling effect and the more difficult it is for women to move into a higher position.
Coverage	EU28 & NO (2013, 2015, 2016 & 2018)
Data Missing	CZ, EE, LT, MT (2013), (2015); CZ, EE (2016); CZ, EE (2018); CZ, EE
Flagged observations	Exceptions to the reference years: FR: 2012-2015; IE, CY, HU, AT, SI, SE: 2013-2015; BG: 2013-2017; CZ, EE: 2014-2015; RO, UK: 2014-2016; HR: 2014-2017; LU, IL: 2015-2016; IS: 2012; MT (Malta College for Arts, Science and Technology): 2017 Others: Data are in headcounts (HC); Break in time series: DE (Grades B - C): 2016; ES: 2015; UK: 2014; Estimated data: RO (Grade A, 2014); The same person may be counted in several grades and fields of R&D: BE (French speaking community), SE; Totals adjusted to avoid double-counting: SE; Data rounded to nearest multiple of 5: UK; Data do not include persons of unknown sex: PL; Private colleges and other smaller institutions are not included: IE; Grade C data include some persons with M.Sc. only: LT, SK; The base reference population is that of ‚Researchers' as defined in the Frascati Manual (OECD, 2015), with the exception of the following

	countries which used ‚Academic staff' based on the UOE Manual (UNESCO/OECD/Eurostat, 2017): BG, DE, IE, EL, IT, LV, LT, NL, SI, SK, SE, IS, IL.
Data comments	All asterisk notes are copied from the She Figures report. Data is not consistent between She Figures reports, it is therefore not possible to create longer time series.
Description	The Glass Ceiling Index (GCI) is a relative index comparing the proportion of women in academia (grades A, B, and C) to the proportion of women in top academic positions (grade A positions; equivalent to full professorships in most countries), for a given year.
Extraction date	29.11.21
Unit	Index [0-infinite]
Name in MoRRI	GE6
Important definitions	The grades presented in the She Figures reports are based upon national mappings according to the following definitions: A) The single highest grade / post at which research is normally conducted within the institutional or corporate system B) All researchers working in positions which are not as senior as the top position (A) but definitely more senior than the newly qualified PhD holders (C); i.e. below A and above C C) The first grade/post into which a newly qualified PhD (ISCED 8) graduate would normally be recruited within the institutional or corporate system D) Either postgraduate students not yet holding a PhD (ISCED 8) degree who are engaged as researchers (on the payroll) or researchers working in posts that do not normally require a PhD.

For a visualization for this indicator see Figure 9.

Dissimilarity Index (higher education sector)

Table 23: Dissimilarity Index (higher education sector)

Metric/indicator	Dissimilarity index, higher education sector
Source	She Figures 2021, 2018, 2012 & 2009 Based on Eurostat – Statistics on research and development (online data code: rd_p_perssci), UNESCO Institute of Statistics (Researchers by sector of employment and field of R&D).

Source website and metadata	https://data.europa.eu/euodp/en/data/dataset/she-figures-2018-gender-in-research-and-innovation https://op.europa.eu/en/publication-detail/-/publication/ba8dc59b-61b8-4c03-9176-373fd9ddac82/language-en/format-PDF/source-121851667 https://op.europa.eu/en/publication-detail/-/publication/6358e1d9-385c-4961-946e-52ed66de5bbb/language-en/format-PDF/source-121851729 https://op.europa.eu/da/publication-detail/-/publication/67d5a207-4da1-11ec-91ac-01aa75ed71a1/language-en/format-PDF/source-search https://op.europa.eu/en/publication-detail/-/publication/09d777dc-447c-11e9-a8ed-01aa75ed71a1/language-en She Figures 2012 (p. 77), She Figures 2009 (p. 64), She figures 2021 (p.117)
Source methodology	$DI = 1/2 \sum i \mid Fi / F - Mi /M\mid$ Where: (F) Number of female researchers across all fields of R&D. Unit: Head count. (Fi) Number of female researchers in each field of R&D. Unit: Head count. (M) Number of male researchers across all fields of R&D. Unit: Head count. (Mi) Number of male researchers in each field of R&D. Unit: Head count. i denotes a particular R&D field.
Coverage	EU28 & NO (2006, 2009, 2012, 2014, 2015 & 2018)
Data Missing	Data missing: 2006 (BE, EL, FI, FR, NL, PL, UK); 2009 (EL, FR, PL); 2012 (FR, SE); 2014 (FR, UK); 2015 (FR, MT); 2018 (FR)
Flagged observations	From She Figures report 2018: Notes: Exceptions to the reference year: UK: 2013; BG:2014 (HES); Data unavailable for: EU-28, FR, AL, IL, FO, TN; Break in time series for: DE (fields of R&D: natural sciences, engineering and technology, social sciences, humanities); Definition differs for: ME; DE (fields of R&D: social sciences, humanities); FI, NL (GOV); Data estimated for: ES; IT, UK (HES); SE (GOV); PL (2015, GOV, fields of R&D medical sciences, agricultural sciences); MT was excluded due to low number of observations (<30) in each field of R&D; IS (2012) was excluded due to lack of comparability with 2015. Others: '.' indicates that data are unavailable; In HES, ‚not specified' field of R&D was considered for countries with no available data. In GOV, no country had data in this category; Proportions are shown with two decimal digits but the text discusses them at full precision; DI computed from data in head count (HC). She Figures report 2015

	Notes: Exceptions to the reference year: 2011: BE, IE, EL, HR, AT, SE, IS, ME, RS; 2010: DK, PL; 2009: MK; Data unavailable for: EU-28, FR, LI, CH, AL, BA, IL, FO, MD; Definition differs for: NL, SK, FI, SE; Data (HES) estimated for: UK, BE, IE; Break in time series for: EL, SE (GOV); Confidential: PL (GOV);
	Others: Reference year is 2012; ':' indicates that data are unavailable.
	She Figures report 2012
	Exceptions to the reference year: PL, JP: 2008; FI, UK: 2007. Data unavailable: EU-27, EU-25, EU-15, EL, FR, MK, IS, CH, IL, US. Data estimated: BE, IE.
	She Figures report 2009
	Exceptions to the reference year: HES: CZ, EE, MT, SK, NO: 2007; LU, PT, SE: 2005; GOV: CZ, EE, IE, MT, SK: 2007; BE, LU, PT, NO: 2005; TR: 2004; SE: 2003 Data unavailable: EL, FR, NL, FI, UK, IS, CH, IL, BE (HES), PL (HES) Provisional data: HES: MT (2007); GOV: IE (2007), MT (2007) Data estimated: EU-27, EU-25, EU-15 (by DG Research)
	She Figures report 2021
	Notes: Exceptions to reference years: El, AT, SI, SE 2015 (instead of 2014);, BE, BG, DK, DE, EE, IE, EL, ES, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR: 2017 (instead of 2018);. Estimated: UK, ES, IT (2017) Other data issues: BG (2017), SI(2017), DE (2017), DK (2017) CZ (2018)
Data comments	PL 2009 not included because the index is 0.86 which seems like an outlier.
Description	The Dissimilarity Index (DI) indicates the percentage of either women or men (all scientific fields combined) who would have to move across different scientific fields to ensure that the proportions of women (out of the total number of women across all scientific fields) and men (out of the total number of men across all scientific fields) were equal in each scientific field. Note that this does not ensure parity of the sexes in each scientific field.
Extraction date	29.11.21
Unit	Index [0-1]
Name in MoRRI	GE4.1
Important definitions	**Researchers are professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques instrumentation, software or operational methods (§5.35, Frascati Manual, OECD, 2015).**

For a visualization for this indicator see Figure 10.

Dissimilarity index (government sector)

Table 24: Dissimilarity Index (government sector)

Metric/indicator	Dissimilarity index, Government sector
Source	She Figures 2021, 2018, 2012 & 2009
Source website and metadata	https://data.europa.eu/euodp/en/data/dataset/she-figures-2018-gender-in-research-and-innovation https://op.europa.eu/en/publication-detail/-/publication/ba8dc59b-61b8-4c03-9176-373fd9ddac82/language-en/format-PDF/source-121851667 https://op.europa.eu/en/publication-detail/-/publication/6358e1d9-385c-4961-946e-52ed66de5bbb/language-en/format-PDF/source-121851729 https://op.europa.eu/en/publication-detail/-/publication/09d777dc-447c-11e9-a8ed-01aa75ed71a1/language-en
	She Figures 2012 (p. 77), She Figures 2009 (p. 64)
Source methodology	$DI = 1/2 \sum i \mid Fi / F - Mi /M\mid$ Where: (F) Number of female researchers across all fields of R&D. Unit: Head count. (Fi) Number of female researchers in each field of R&D. Unit: Head count. (M) Number of male researchers across all fields of R&D. Unit: Head count. (Mi) Number of male researchers in each field of R&D. Unit: Head count. i denotes a particular R&D field.
Coverage	EU28 & NO (2006, 2009, 2012, 2014, 2015 & 2018)
Data Missing	Data missing: 2006 (BE, EL, FI, FR, NL, PL, UK); 2009 (EL, FR, PL); 2012 (FR, SE); 2014 (FR, MT, UK); 2015 (FR, MT); 2018 (FR, MT)
Flagged observations	From She Figures report 2018:
Data comments	Notes: Exceptions to the reference year: UK: 2013; BG:2014 (HES); Data unavailable for: EU-28, FR, AL, IL, FO, TN; Break in time series for: DE (fields of R&D: natural sciences, engineering and technology, social sciences, humanities); Definition differs for: ME; DE (fields of R&D: social sciences, humanities); FI, NL (GOV); Data estimated for: ES; IT, UK (HES); SE (GOV); PL (2015, GOV, fields of R&D medical sciences, agricultural sciences); MT was excluded due to low number of observations (<30) in each field of R&D; IS (2012) was excluded due to lack of comparability with 2015. *Others: ':' indicates that data are unavailable; In HES, ‚not specified' field of R&D was considered for countries with no available data. In GOV, no country had data in this category; Proportions are shown with two decimal digits but the text discusses them at full precision; DI computed from data in head count (HC).* *She Figures report 2015*

	Notes: Exceptions to the reference year: 2011: BE, IE, EL, HR, AT, SE, IS, ME, RS; 2010: DK, PL; 2009: MK; Data unavailable for: EU-28, FR, LI, CH, AL, BA, IL, FO, MD; Definition differs for: NL, SK, FI, SE; Data (HES) estimated for: UK, BE, IE; Break in time series for: EL, SE (GOV); Confidential: PL (GOV); *Others: Reference year is 2012; ':' indicates that data are unavailable.* *She Figures report 2012* Exceptions to the reference year: PL, JP: 2008; FI, UK: 2007. Data unavailable: EU-27, EU-25, EU-15, EL, FR, MK, IS, CH, IL, US. Data estimated: BE, IE. *She Figures report 2009* Exceptions to the reference year: HES: CZ, EE, MT, SK, NO: 2007; LU, PT, SE: 2005; GOV: CZ, EE, IE, MT, SK: 2007; BE, LU, PT, NO: 2005; TR: 2004; SE: 2003 Data unavailable: EL, FR, NL, FI, UK, IS, CH, IL, BE (HES), PL (HES) Provisional data: HES: MT (2007); GOV: IE (2007), MT (2007) Data estimated: EU-27, EU-25, EU-15 (by DG Research) *She Figures report 2021* Notes: Exceptions to reference years: BE, BG, DK, DE, EE, IE, El, ES, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO: 2017 (instead of 2018);. Estimated: SE (2015), ES (2017). Break in time series: DE (2014, all fields for GOV other than "not specified"); PL (GOV 2014: Engineering and Technology, Medical and Health, Social Sciences and Humanities; GOV, 2017: Agricultural Sciences and Social Sciences), SI (HES, 2017: Natural Sciences, Engineering and Technology, Agricultural Sciences (men); GOV, 2017: Engineering and Technology and Agricultural Sciences); Definition differs: HR (Gov, 2014: Natural Sciences (men only), Humanities), NL, SK (GOV, 2014: all fields other than "not specified"), FI (GOV, 2014: all fields other than "not specified" and Medical and health (men only)), DE, NL, FI, TR (GOV, 2017: all fields other than "not specified");Other data issues: HR, NL, SE, PL, FI, DE. *Flagged observations text is taken from each of the She Figures reports and reported as direct quotes.*
Description	The Dissimilarity Index (DI) indicates the percentage of either women or men (all scientific fields combined) who would have to move across different scientific fields to ensure that the proportions of women (out of the total number of women across all scientific fields) and men (out of the total number of men across all scientific fields) were equal in each scientific field. Note that this does not ensure parity of the sexes in each scientific field.
Extraction date	29.11.21
Unit	Index [0-1]
Name in MoRRI	GE4.2
Important definitions	Researchers are professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques instrumentation, software or operational methods (§5.35, Frascati Manual, OECD, 2015).

For a visualization for this indicator see Figure 11.

Percentage of a country´s publications with a sex or gender dimension in their research content

Table 25: Percentage of publications with a sex or gender dimension

Metric/indicator	Percentage of a country´s publications with a sex or gender dimension in their research content
Source	She Figures 2021 & 2018
Source website and metadata	https://data.europa.eu/euodp/en/data/dataset/she-figures-2018-gender-in-research-and-innovation https://op.europa.eu/en/publication-detail/-/publication/09d777dc-447c-11e9-a8ed-01aa75ed71a1/language-en Described in more detail She Figures Handbook 2018
Source methodology	(Percent of a country's publications integrating SGDRC)CYS = $PSGDRCcysPcys$ Where: ($Pcys$) Number of publications in a given country (C), year (Y) and field (S). Unit: Number. ($PSGDRCCYS$) Number of publications integrating SGDRC in a given country (C), year (Y) and field (S). Unit: Number
Coverage	EU28 & NO (2013-2017 Pooled, 2015-2019 Pooled)
Data Missing	Data missing: none
Flagged observations	None
Data comments	Reported in She-figures 2018 and 2021 on the basis of scopus data
Description	The indicator shows the proportion of peer-reviewed publications that integrate gender or sex-sensitive analysis
Extraction date	06.01.20
Unit	Percentage of publications
Name in MoRRI	Not available in MoRRI
Important definitions	This indicator shows the number of a country's publications that have a sex or gender dimension in their research content, divided by the total number of publications from this country and then converted to a percentage. Sex and gender related content is thereby identified through a search query using the title and the abstract of the scientific publications.

For a visualization for this indicator see Figure 12.

Gender pay gap within scientific research & development

Table 26: Gender pay gap within scientific research & development

Metric/indicator	The Gender Pay Gap in within 'Scientific research & development', 2010 & 2014
Source	She figures 2018
Source website and metadata	https://data.europa.eu/euodp/en/data/dataset/she-figures-2018-gender-in-research-and-innovation https://data.europa.eu/euodp/en/data/dataset/she-figures-2015-gender-in-research-and-innovation
Source methodology	Source: Eurostat – Structure of Earnings Survey (SES) (custom extraction based on online data code: earn_ses14_12). Gender Pay Gap (GPG) = (Mi−Fi)/Mi Where: (Fi) Average gross hourly earnings of female employees by economic activity. Unit: National Currency per hour. (Mi) Average gross hourly earnings of male employees by economic activity. Unit: National Currency per hour. (i) Denotes selected two defined sets of NACE economic activities: scientific and development research – Section M, Division 72; total economy, defined here as the aggregate of Sections B to S, excluding Section O.
Coverage	EU28 & NO (2010 & 2014)
Data Missing	Data missing: MT (2010, 2014)
Flagged observations	None
Data comments	Also reported in She-figures 2018 and 2015 on the basis of Eurostat data
Description	The indicator provides a metric of the difference between the average gross hourly earnings of paid male employees and of paid female employees as a percentage of the average gross hourly earnings of paid male employees.
Extraction date	06.01.20
Unit	Wage gap as percentage
Name in MoRRI	GE
Important definitions	Scientific research & development services statistics ('Sci. R&D services statistics') are based on NACE Rev. 2 Division 72; Total economy is based on NACE Rev. 2 Sections B to S, excluding Section O (public administration and

	defence; compulsory social security); Data were computed by Eurostat (NACE 72 data are not available online).

For a visualization for this indicator see Figure 13.

The women to men ratio in number of inventorships

Table 27: The women to men ratio in number of inventorships

Metric/indicator	Women to men ratio of inventorships, all International Patent Classification (IPC) sections
Source	She figures 2018, 2015 (based on Patstat)
Source website and metadata	https://data.europa.eu/euodp/en/data/dataset/she-figures-2018-gender-in-research-and-innovation https://data.europa.eu/euodp/en/data/dataset/she-figures-2015-gender-in-research-and-innovation
Source methodology	Source: Computed by Science-Metrix using European patent applications in PATSTAT Ratio of inventorships for Women to Men, for a given country (C), year (Y) and IPC section (I) = $WICYI/TICYI)/MICYI/TICYI$=$WICY$I/$MICYI$ Where: ($WICYI$) Sum of fractionalised inventorships for women in a given country (C), year (Y) and section (I, based on the International Patent Classification [IPC]). Unit: Total of fractionalized counts. ($MICYI$) Sum of fractionalised inventorships for men in a given country (C), year (Y) and IPC section (I). Unit: Total of fractionalized counts. ($TICYI$) Sum of fractionalized inventorships across women and men in a given country (C), year (Y) and IPC section (I). Unit: Total of fractionalized counts. ($NCYI$) Total number of fractionalized inventorships in a given country (C), year (Y) and IPC section (I). Unit: Total of fractionalized counts.
Coverage	EU28 & NO (2010-2013 Pooled & 2013-2016 Pooled)
Data Missing	Data missing: none
Flagged observations	None

Data comments	Other: Error bars represent the 90 % confidence intervals, accounting for potential biases due to the inability to infer the sex of inventors on some patent applications. It assumes that the attribution of a sex to an inventor's name is 100 % accurate (i.e. that the gender attributed to a given inventor name is always the correct one; in other words, that there are no misattributions). Source: Computed by using European patent applications (kind codes A1 and A2) in PATSTAT.cable for: MT, FO, AL, ME, MK, BA, MD; Exceptions to the reference period: MT: 2002–2013;
Description	This indicator is the ratio of women to men inventorships, or equivalently, the ratio of the proportion of women inventorships (in total inventorships) compared to the equivalent proportion for men. The absolute number of inventorships used in computing this indicator is based on fractionalised counts of patent applications across their corresponding inventors: for example, if a patent application involves 10 inventors, each inventor is attributed an equal fraction of the inventorships (i.e. 1/10 of the invention). A score above 1 indicates that women in a given country produced a larger proportion of the country's inventions than men, whereas a score below 1 means the opposite.
Extraction date	06.01.20
Unit	
Name in MoRRI	GE
Important definitions	

For a visualization for this indicator see Figure 14.

The women to men ratio in number of corresponding authorships

Table 28: The women to men ratio in number of corresponding authorships

Metric/indicator	Women to men ratio of corresponding auhtorship in all fields of R&D
Source	She figures 2018, 2015
Source website and metadata	https://data.europa.eu/euodp/en/data/dataset/she-figures-2018-gender-in-research-and-innovation https://data.europa.eu/euodp/en/data/dataset/she-figures-2015-gender-in-research-and-innovation

Source methodology	See She figures handbook 2018
Coverage	EU28 & NO (2011-2013 Pooled & 2013-2017 Pooled)
Data Missing	Data missing: MT (2011-2013)
Flagged observations	None
Data comments	Values represent the average yearly ratio for the period 2013-2017;
Description	This indicator is the ratio of publications authored by a woman to those authored by men. It is based on peer-reviewed scientific publications (articles, reviews, conference papers). A score above 1 indicates that women in a given country contribute more to the research output than men whereas a score below 1 means the opposite.
Extraction date	06.01.20
Unit	Ratio
Name in MoRRI	GE
Important definitions	

For a visualization for this indicator see Figure 15.

Eurobarometer Fiches

Interest in scientific discoveries

Table 29: Interest in scientific discoveries

Metric/indicator	Percentage of the EU-public interested in scientific discoveries
Source	Eurobarometer Surveys: EB 38.1, EB 224, EB 340 & EB 516
Source website and metadata	https://library.carleton.ca/sites/default/files/find/data/surveys/pdf_files/eurob381-92-gid.pdf http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_224_report_en.pdf

	http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_340_en.pdf
Source methodology	Item formulation: "For each issue (New scientific discoveries) I read out, please tell me if you are …" (1992, 2005). "In everyday life, we have to deal with many different problems and situations, where we feel more or less interested and confident. I am going to read you a number of statements (New scientific discoveries and technological developments). For each of them, please tell me whether you are …" (2010). "In everyday life, we have to deal with many different issues, where we feel more or less interested. For each of the following, please tell me whether you are very interested, moderately interested, or not interested at all about it" (2020). Response options : "Very interested", "Moderately interested", "Not at all interested" & "Don't know" (1992, 2005, 2010, 2020).
Coverage	1992: EU12 2005 & 2010: EU27 + CH, IS, NO, TR & UK 2020: EU28 + NO
Data Missing	No data missing
Flagged observations	No flagged observations
Data comments	
Description	The accumulated yearly proportion of respondents replying that they are either "*Very interested*" or "*Moderately interested*.
Extraction date	08-09-2020 (EB 38.1, EB 224, EB 340); 16-09-2021 (EB 516)
Unit	Percentage of population.
Important definitions	

For a visualization for this indicator see Figure 16.

Science efficacy

Table 30: Feeling of science efficacy

Metric/indicator	Percentage of the EU-public that feels informed about science
Source	Eurobarometer Surveys: EB 38.1, EB 224, EB 340 & EB 516
Source website and metadata	https://library.carleton.ca/sites/default/files/find/data/surveys/pdf_files/eurob381-92-gid.pdf http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_224_report_en.pdf http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_340_en.pdf
Source methodology	Item formulation: "I would like you to tell me for each of the following issues (New scientific discoveries) in the news if you are …" (1992). "For each of the following issues (New scientific discoveries) in the news do you feel ... about it?" (2005). "Would you say that you are … in scientific research" (2007). "I would like you to tell me for each of the following issues in the news if you feel …" (2010). "In everyday life, we have to deal with many different issues, where we feel more or less well informed. For each of the following, please tell me whether you feel very well informed, moderately well informed, or poorly informed about it." (2020). Response options : "Very well", "Moderately well", "Poorly" & "Don't know" (1992). "Very well informed", "Moderately well informed", "Poorly informed" & "Don't know" (2005, 2010, 2020).
Coverage	1992: EU12 2005 & 2010: EU27 + CH, IS, NO, TR & UK 2020: EU28 + NO
Data Missing	No data missing
Flagged observations	No flagged observations

Data comments	
Description	The accumulated yearly proportion of respondents that answer either “Very well” or “Moderately well”, “Very well informed” or “Moderately well informed”, “Very well informed” or “Fairly well informed” .
Extraction date	08-09-2020 (EB 38.1, EB 224, EB 340); 16-09-2021 (EB 516)
Unit	Percentage of population.
Important definitions	

For a visualization for this indicator see Figure 17.

Science knowledge

Table 31: Science knowledge

Metric/indicator	Percentage of correct science quiz answers in the EU-public
Source	Eurobarometer Surveys: EB 38.1, EB 55.2, EB 224 & EB 516
Source website and metadata	https://library.carleton.ca/sites/default/files/find/data/surveys/pdf_files/eurob381-92-gid.pdf http://ec.europa.eu/research/press/2001/pr0612en-report.pdf http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_224_report_en.pdf
Source methodology	Quizz questions: 1. “The oxygen we breathe comes from plants” (1992, 2001, 2005, 2020). 2. “The continents, on which we live have been moving for millions of years and will continue to move in the future” (2001, 2005, 2020). “The continents on which we live have been moving *their location* for millions of years and will continue to move in the future” (1992). 3. “Antibiotics kill viruses as well as bacteria” (1992, 2001, 2005, 2020). 4. “Lasers work by focusing sound waves” (1992, 2001, 2005, 2020). Response options : “*True*”, “*False*” & “*Don’t know*” (1992, 2001, 2005, 2020).

Coverage	1992: EU12 2001: EU15 2005: EU27 + CH, IS, NO, TR & UK 2020: EU28 + NO
Data Missing	No data missing
Flagged observations	No flagged observations
Data comments	Question deleted
Description	The yearly proportion of correct quiz anwers, measured as an average for each respondent.
Extraction date	08-09-2020 (EB 38.1, EB 55.2, EB 224); 16-09-2021 (EB 516)
Unit	Percentage of correct answers.
Important definitions	

For a visualization for this indicator see Figure 18.

Trust in scientists

Table 32: Trust in scientists

Metric/indicator	Percentage of the EU-public that believes that scientists are among the best qualified to explain the Impact of Scientific and Technological Developments
Source	Eurobarometer Surveys: EB 224, EB 340, EB 401 & EB 516
Source website and metadata	http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_224_report_en.pdf http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_340_en.pdf http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_401_en.pdf
Source methodology	Item formulation:

	"Among the following categories of people and organisations, which three are best qualified to explain to you the impacts of scientific and technological developments on society?" (2005). "Among the following categories of people and organisations working in (OUR COUNTRY), which are the best qualified to explain the impact of scientific and technological developments on society?" (2010, 2013). Response options : 1. "Scientists working at a university or government laboratories" (2005, 2010, 2013). 2. "Scientists working in industrial laboratory" (2005, 2010). "Scientists working in private company laboratories" (2013). 3. "*Newspaper journalists*" (2005, 2010, 2013). 4. "*Television journalists*" (2005, 2010, 2013). 5. "*Politicians*" (2005, 2010, 2013). 6. "*Consumer organisations*" (2005, 2010, 2013). 7. "Environmental protection associations" (2005, 2010, 2013). 8. "*Industry*" (2010, 2013). "The industry" (2005). 9. "*The military*" (2005, 2010, 2013). 10. "Religious leaders or representatives" (2005). "Representatives of different religions" (2010, 2013). 11. "The Government" (2005) "Government representatives" (2010, 2013). 12. "*Medical doctors*" (2005, 2010, 2013). 13. "Writers and intellectuals" (2005, 2010, 2013). 14. "Other (SPONTANEOUS)" (2005, 2010). *15. "*None (SPONTANEOUS)*"* (2005, 2010, 2013). 16. *"Don't know"* (2013). (2005, 2010, 2013).
Coverage	2005 & 2010: EU27 + CH, IS, NO, TR & UK 2013: EU28 2020: EU28 + NO
Data Missing	No data missing
Flagged observations	No flagged observations
Data comments	
Description	The yearly proportion of respondents choosing scientists, either publicly or privately employed, as part of their answer. Respondents could choose either one, two or three of the response options as their answer.

Extraction date	08-09-2020 (EB 224, EB 340, EB 401); 16-09-2021 (EB 516)
Unit	Percentage of respondents choosing scientists, divided between publicly and privately employed scientists.
Important definitions	

For a visualization for this indicator see Figure 19.

Engagement and co-creation (Meetings and debates)

Table 33: Engagement and co-creation (meetings and debates)

Metric/indicator	Percentage of the EU-public that attends public meetings or debates about science and technology
Source	Eurobarometer Surveys: EB 224, EB 340 & EB 516
Source website and metadata	http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_224_report_en.pdf http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_340_en.pdf
Source methodology	Item formulation: "How often do you attend public meetings or debates about science and technology?" (2005). "And now, there will be a few questions on how you engage with science and technology. Do you attend public meetings or debates about science and technology?" (2013). Response options : "Regularly", "Occasionally", "Hardly ever", "Never" & "Don't know" (2005). "Yes, regularly", "Yes, occasionally", "No, hardly ever", "No, never" & "Don't know" (2013).
Coverage	2005 & 2010: EU27 + CH, IS, NO, TR & UK 2020: EU28 + NO
Data Missing	No data missing

Flagged observations	No flagged observations
Data comments	
Description	The accumulated yearly proportion of respondents that answer either "*Regularly*" or "*Occasionally*", "*Yes, regularly*" or "*Yes, occasionally*".
Extraction date	08-09-2020 (EB 224, EB 340); 16-09-2021 (EB 516)
Unit	Percentage of respondents.
Important definitions	

For a visualization for this indicator see Figure 20.

Engagement and co-creation (Petitions and demonstrations)

Table 34: Engagement and co-creation (petitions and demonstrations)

Metric/indicator	Percentage of the EU-public that sign petitions or join street demonstrations on science and technology matters
Source	Eurobarometer Surveys: EB 224, EB 340 & EB 516
Source website and metadata	http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_224_report_en.pdf http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_340_en.pdf
Source methodology	Item formulation: "How often do you sign petitions or join street demonstrations about nuclear power, biotechnology or the environment?" (2005). "And now, there will be a few questions on how you engage with science and technology. Do you sign petitions or join street demonstrations on matters of nuclear power, biotechnology or the environment?" (2013). Response options : "Regularly", "Occasionally", "Hardly ever", "Never" & "Don't know" (2005).

	"Yes, regularly", "Yes, occasionally", "No, hardly ever", "No, never" & "Don't know" (2013).
Coverage	2005 & 2010: EU27 + CH, IS, NO, TR & UK 2020: EU28 + NO
Data Missing	No data missing
Flagged observations	No flagged observations
Data comments	
Description	The accumulated yearly proportion of respondents that answer either "*Regularly*" or "*Occasionally*", "*Yes, regularly*" or "*Yes, occasionally*".
Extraction date	08-09-2020 (EB 224, EB 340); 16-09-2021 (EB 516)
Unit	Percentage of respondents.
Important definitions	

For a visualization for this indicator see Figure 21.

Open Access Indicators

Percentage of open access publications

Table 35: Percentage of open access publications

Metric/indicator	Percentage of open access publications (All)
Source	CWTS Leiden based on WoS and Unpaywall data
Source website and metadata	https://www.cwts.nl/blog?article=n-r2w2a4&title=indicators-of-open-access-publishing-in-the-cwts-leiden-ranking-2019 https://unpaywall.org/
Source methodology	Martín-Martín, A., Costas, R., van Leeuwen, T., & Delgado López-Cózar, E. (2018). Evidence of open access of scientific publications in Google Scholar: A large-scale analysis. Journal of Informetrics, 12(3), 819-841. https://doi.org/10.1016/j.joi.2018.06.012

	Piwowar, H., Priem, J., Larivière, V., Alperin, J. P., Matthias, L., Norlander, B., … Haustein, S. (2018). The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles. PeerJ, 6, e4375. https://doi.org/10.7717/peerj.4375 van Leeuwen, T.N., Meijer, I., Yegros-Yegros, A., & Costas, R. (2017). Developing indicators on open access by combining evidence from diverse data sources. In Proceedings of the 2017 STI Conference. https://arxiv.org/abs/1802.02827
Coverage	EU27 & NO (2010-2020)
Data Missing	No data missing
Flagged observations	No flagged date
Data comments	Data is a linking of Unpaywall data to WoS data. An issue is the way the data are linked, namely via DOIs, whereby Unpaywall is a fully DOI-based system, while WoS is not. If we would measure OA uptake across all WoS publications, including the ones that do not carry a DOI, we would create a somewhat distorted perspective on OA uptake, which is underrepresenting the real situation. Therefore we take out the WoS publications without a DOI, and do produce OA uptake percentages after this has been taken care off. This is now more accurate, but one has to keep in mind that this is only a partial representation of OA uptake, given this a-symmetry between WoS and Unpaywall, on top of already known problems with WoS coverage regarding some domains (SSH in particular).
Description	Proportion of publications fro WoS (with DOI) that are registered as published in an open access publication by unpaywll in a given year for a given country.
Extraction date	15/02/2022
Unit	Percentage of publications
Name in MoRRI	OA
Important definitions	Open Access as defined in CWTS Leiden's labels for OA access. More specifically does this metric include publications with all OA labels except for Bronze, i.e. Gold, Green and Hybrid. The publications that are solely labelled as Bronze are not included as CWTS Leiden defines these as unsustainable.

For a visualization for this indicator see Figure 22.

Percentage of open access publications (Green)

Table 36: Percentage of open access publications (Green)

Metric/indicator	Percentage of open access publications (Green)
Source	CWTS Leiden based on WoS and Unpaywall data
Source website and metadata	https://www.cwts.nl/blog?article=n-r2w2a4&title=indicators-of-open-access-publishing-in-the-cwts-leiden-ranking-2019 https://unpaywall.org/
Source methodology	Martín-Martín, A., Costas, R., van Leeuwen, T., & Delgado López-Cózar, E. (2018). Evidence of open access of scientific publications in Google Scholar: A large-scale analysis. Journal of Informetrics, 12(3), 819-841. https://doi.org/10.1016/j.joi.2018.06.012 Piwowar, H., Priem, J., Larivière, V., Alperin, J. P., Matthias, L., Norlander, B., … Haustein, S. (2018). The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles. PeerJ, 6, e4375. https://doi.org/10.7717/peerj.4375 van Leeuwen, T.N., Meijer, I., Yegros-Yegros, A., & Costas, R. (2017). Developing indicators on open access by combining evidence from diverse data sources. In Proceedings of the 2017 STI Conference. https://arxiv.org/abs/1802.02827
Coverage	EU27 & NO (2010-2020)
Data Missing	No data missing
Flagged observations	No flagged date
Data comments	Data is a linking of Unpaywall data to WoS data. An issue is the way the data are linked, namely via DOIs, whereby Unpaywall is a fully DOI-based system, while WoS is not. If we would measure OA uptake across all WoS publications, including the ones that do not carry a DOI, we would create a somewhat distorted perspective on OA uptake, which is underrepresenting the real situation. Therefore we take out the WoS publications without a DOI, and do produce OA uptake percentages after this has been taken care off. This is now more accurate, but one has to keep in mind that this is only a partial representation of OA uptake,

	given this a-symmetry between WoS and Unpaywall, on top of already known problems with WoS coverage regarding some domains (SSH in particular).
Description	Proportion of publications fro WoS (with DOI) that are registered as published in an open access publication by unpaywll in a given year for a given country.
Extraction date	15/02/2022
Unit	Percentage of publications
Name in MoRRI	OA
Important definitions	Green OA is a form of OA publishing in which publications are stored in an openly accessible database, also called an archive or repository.

For a visualization for this indicator see Figure 23.

Percentage of open access publications (Gold)

Table 37: Percentage of open access publications (Gold)

Metric/indicator	Percentage of open access publications (Gold)
Source	CWTS Leiden based on WoS and Unpaywall data
Source website and metadata	https://www.cwts.nl/blog?article=n-r2w2a4&title=indicators-of-open-access-publishing-in-the-cwts-leiden-ranking-2019 https://unpaywall.org/
Source methodology	Martín-Martín, A., Costas, R., van Leeuwen, T., & Delgado López-Cózar, E. (2018). Evidence of open access of scientific publications in Google Scholar: A large-scale analysis. Journal of Informetrics, 12(3), 819-841. https://doi.org/10.1016/j.joi.2018.06.012 Piwowar, H., Priem, J., Larivière, V., Alperin, J. P., Matthias, L., Norlander, B., … Haustein, S. (2018). The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles. PeerJ, 6, e4375. https://doi.org/10.7717/peerj.4375 van Leeuwen, T.N., Meijer, I., Yegros-Yegros, A., & Costas, R. (2017). Developing indicators on open access by combining evidence from diverse data sources. In Proceedings of the 2017 STI Conference. https://arxiv.org/abs/1802.02827
Coverage	EU27 & NO (2010-2020)

Data Missing	No data missing
Flagged observations	No flagged date
Data comments	Data is a linking of Unpaywall data to WoS data. An issue is the way the data are linked, namely via DOIs, whereby Unpaywall is a fully DOI-based system, while WoS is not. If we would measure OA uptake across all WoS publications, including the ones that do not carry a DOI, we would create a somewhat distorted perspective on OA uptake, which is underrepresenting the real situation. Therefore we take out the WoS publications without a DOI, and do produce OA uptake percentages after this has been taken care off. This is now more accurate, but one has to keep in mind that this is only a partial representation of OA uptake, given this a-symmetry between WoS and Unpaywall, on top of already known problems with WoS coverage regarding some domains (SSH in particular).
Description	Proportion of publications fro WoS (with DOI) that are registered as published in an open access publication by unpaywll in a given year for a given country.
Extraction date	15/02/2022
Unit	Percentage of publications
Name in MoRRI	OA
Important definitions	Gold OA relates to publications in OA journals. To identify Gold OA publications, we expand beyond the DOAJ list, a directory of OA journals, and select publications identified by Unpaywall in OA journals in general.

For a visualization for this indicator see Figure 24.

Percentage of open access publications (Hybrid)

Table 38: Percentage of open access publications (Hybrid)

Metric/indicator	Percentage of open access publications (Hybrid)
Source	CWTS Leiden based on WoS and Unpaywall data
Source website and metadata	https://www.cwts.nl/blog?article=n-r2w2a4&title=indicators-of-open-access-publishing-in-the-cwts-leiden-ranking-2019 https://unpaywall.org/
Source methodology	Martín-Martín, A., Costas, R., van Leeuwen, T., & Delgado López-Cózar, E. (2018). Evidence of open access of scientific publications in Google Scholar: A

	large-scale analysis. Journal of Informetrics, 12(3), 819-841. https://doi.org/10.1016/j.joi.2018.06.012 Piwowar, H., Priem, J., Larivière, V., Alperin, J. P., Matthias, L., Norlander, B., … Haustein, S. (2018). The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles. PeerJ, 6, e4375. https://doi.org/10.7717/peerj.4375 van Leeuwen, T.N., Meijer, I., Yegros-Yegros, A., & Costas, R. (2017). Developing indicators on open access by combining evidence from diverse data sources. In Proceedings of the 2017 STI Conference. https://arxiv.org/abs/1802.02827
Coverage	EU27 & NO (2010-2020)
Data Missing	No data missing
Flagged observations	No flagged date
Data comments	Data is a linking of Unpaywall data to WoS data. An issue is the way the data are linked, namely via DOIs, whereby Unpaywall is a fully DOI-based system, while WoS is not. If we would measure OA uptake across all WoS publications, including the ones that do not carry a DOI, we would create a somewhat distorted perspective on OA uptake, which is underrepresenting the real situation. Therefore we take out the WoS publications without a DOI, and do produce OA uptake percentages after this has been taken care off. This is now more accurate, but one has to keep in mind that this is only a partial representation of OA uptake, given this a-symmetry between WoS and Unpaywall, on top of already known problems with WoS coverage regarding some domains (SSH in particular).
Description	Proportion of publications fro WoS (with DOI) that are registered as published in an open access publication by unpaywll in a given year for a given country.
Extraction date	15/02/2022
Unit	Percentage of publications
Name in MoRRI	OA
Important definitions	Hybrid OA is a form of OA publishing in which the author(s) of a publication pay for OA publishing in a non-OA journal, thereby creating open accessibility to a single publication in an otherwise toll access journal.

For a visualization for this indicator see Figure 25.

Percentage of open access publications (Bronze)

Table 39: Percentage of open access publications (Bronze)

Metric/indicator	Percentage of open access publications (Bronze)
Source	CWTS Leiden based on WoS and Unpaywall data
Source website and metadata	https://www.cwts.nl/blog?article=n-r2w2a4&title=indicators-of-open-access-publishing-in-the-cwts-leiden-ranking-2019 https://unpaywall.org/
Source methodology	Martín-Martín, A., Costas, R., van Leeuwen, T., & Delgado López-Cózar, E. (2018). Evidence of open access of scientific publications in Google Scholar: A large-scale analysis. Journal of Informetrics, 12(3), 819-841. https://doi.org/10.1016/j.joi.2018.06.012 Piwowar, H., Priem, J., Larivière, V., Alperin, J. P., Matthias, L., Norlander, B., … Haustein, S. (2018). The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles. PeerJ, 6, e4375. https://doi.org/10.7717/peerj.4375 van Leeuwen, T.N., Meijer, I., Yegros-Yegros, A., & Costas, R. (2017). Developing indicators on open access by combining evidence from diverse data sources. In Proceedings of the 2017 STI Conference. https://arxiv.org/abs/1802.02827
Coverage	EU27 & NO (2010-2020)
Data Missing	No data missing
Flagged observations	No flagged date
Data comments	Data is a linking of Unpaywall data to WoS data. An issue is the way the data are linked, namely via DOIs, whereby Unpaywall is a fully DOI-based system, while WoS is not. If we would measure OA uptake across all WoS publications, including the ones that do not carry a DOI, we would create a somewhat distorted perspective on OA uptake, which is underrepresenting the real situation. Therefore we take out the WoS publications without a DOI, and do produce OA uptake percentages after this has been taken care off. This is now more accurate, but one has to keep in mind that this is only a partial representation of OA uptake,

	given this a-symmetry between WoS and Unpaywall, on top of already known problems with WoS coverage regarding some domains (SSH in particular).
Description	Proportion of publications fro WoS (with DOI) that are registered as published in an open access publication by unpaywll in a given year for a given country.
Extraction date	15/02/2022
Unit	Percentage of publications
Name in MoRRI	OA
Important definitions	Bronze OA is a form of OA publishing where publishers make publications openly accessible without a clear license. According to the criteria outlined above, this is not a sustainable form of OA.

For a visualization for this indicator see Figure 26.

Percentage of co-publications with industry

Table 40: Percentage of co-publications with industry

Metric/indicator	Percentage of publications classified as industry co-publications
Source	CWTS Leiden based on WoS and Unpaywall data
Source website and metadata	https://www.leidenranking.com/information/indicators#collaboration-indicators https://unpaywall.org/
Source methodology	Number of publications with industry collaboration(IC) divided by the number of publications(P) times 100. IC/P*100 Furthermore, most the publications comply with the following criteria : - The publication has been written in English. - The publication has one or more authors. (Anonymous publications are not allowed.) - The publication has not been retracted. - The publication has appeared in a core journal. A publication is defined as co-publication when it has been co-authored with one or more industrial organisations. All private sector for profit business enterprises, covering all manufacturing and services sectors, are regarded as industrial organisations. This includes research institutes and other corporate R&D laboratories that are fully funded or owned by for profit business enterprises. Organisations in the private education sector and private

	medical/health sector (including hospitals and clinics) are not classified as industrial organisations.
Coverage	2010-2019 EU28 + NO
Data Missing	No data missing
Flagged observations	No flagged
Data comments	
Description	Proportion of publications from WoS that are categorised as being part of a collaboration between a University actor and an industry actor.
Extraction date	07/10/2020
Unit	Percentage of publications
Name in MoRRI	Not included in MoRRI
Important definitions	

For a visualization for this indicator see Figure 27.

Appendix B – CCN-RPO study sampling selection

The CCN-RPO study is interested in examining how basic organisational properties may condition the repertoires that RPOs make use of to promote responsibility. The size of the organisation, its research intensity, its research orientation, and its funding base are expected to have an impact on the nature and range of the organisational priorities, policies, and structures to promote responsible research.

To ensure a reasonable coverage across all countries covered by the study, either two, four, or six HEIs were selected for inclusion depending on the size of the country. For the Republic of Cyprus, Luxembourg, and Malta, two RPOs are selected. For Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Latvia, Lithuania, Netherlands, Norway, Portugal, Romania, Slovakia, Slovenia, and Sweden, four RPOs were selected. For Germany, France, Italy, Poland, Spain, and the UK, six RPOs are selected. For international benchmarking, the ISPs selected a convenience sample of RPOs within their respective countries.

To capture diversity in basic organisational properties across the RPOs selected for inclusion in the study, a sampling frame has been built from the publicly available European Tertiary Education Register (ETER) database. The database covers Higher Education Institutions (HEIs) in Europe across three categories: 1) University; 2) University of applied science/college, which are organisations that can typically not offer doctoral programmes and are often heavily oriented towards (professional) education; and 3) Other, which cover e.g. military schools and some art academies. As this study is focused on organisations performing research as a main component of their mission, only organisations in category 1 (universities) were included, with Malta as the only exception, since only one Maltese HEI was classified as university. It should further be observed that only two HEIs were classified as a 'university' in Luxembourg and four in Slovenia (equivalent to the number of organisations to be included in the study), thus sampling was not possible in these countries.

The established sampling frame for the countries included in the study is 1.038, including the HEIs from Luxembourg, Malta and Slovenia. The data in the ETER database stems from information that has been collected at different times. The year of collection thus differ among the HEIs, but for 923 out of 1.038 HEIs that year is 2016. Most often the information has been collected nationally at the same time, and difference in time should therefore not affect the sampling on a national level. Overall, of the 1.038 HEIs included for the sampling, the year of data collection is distributed as follows: 75 in 2017, 923 in 2016, 4 in 2015, 6 in 2014, 9 in 2013, 17 in 2012, and 4 in 2011.

Information about Horizon 2020 funding was acquired through the publicly available Community Research and Development Information Service (CORDIS) of the European Commission. Funding data was obtained for 647 out of the 1.038 HEIs. The remaining institutions have either not received any funding through Horizon 2020 or could not be located in the CORDIS database even following extensive manual searches. CORDIS contains records of projects that have received funding rather than systematic coverage of organisations. Due to the number of HEIs with missing information about Horizon 2020 funding, this variable was not included in the sampling of RPOs in all countries (see details in Table 41).

Four variables were used for sampling, three of which are available in the ETER database of HEIs: 1) Size of the organisation, measured by total number of staff plus total number of students; 2) Research intensity, measured by the ratio of students to academic staff; 3) Research orientation, understood as

the degree of plurality (as opposed to concentration) within the organisations' research activities[10], measured based on the relative allocation of students across different academic fields; and 4) the total amount of funding received from Horizon 2020.

In some countries, not all variables can be populated with information, resulting in the sampling being conducted somewhat differently across countries. For some countries, e.g., Size is instead measured as total number of students, as this was the only data available related to the size of the organisations. Table 41 describe each country included in the study, together with the number of organisations chosen for each country and comments on the variables used for the sampling.

Table 41: Comments related to sampling

Country	Variable Comments	Number of RPOs
Austria		4
Belgium		4
Bulgaria	Horizon 2020 funding not included for the sampling	4
Croatia		4
Czech Republic	Horizon 2020 funding not included for the sampling	4
Denmark	Variables available for sampling: *Total number of students* and *H2020 Funding*	4
Estonia	Variables available for sampling: *Total number of students, Academic Plurality and H2020 Funding*	4
Finland	*Size* is calculated by total number of academic staff + total number of students	4
France	Variables available for sampling: *Total number of students* and *Academic Plurality*	6
Germany		6
Greece	Horizon 2020 funding not included for the sampling	4
Hungary		4
Ireland	Horizon 2020 funding not included for the sampling	4
Italy	*Ratio of Students to Staff* is calculated by total number of staff	6

[10] Specifically, plurality is measured by the standardised square root of the squared sum of differences between theoretical mean of each academic subject, assuming an equal distribution, and the empirical number of students in each academic field. This variable is thus standardised across all available universities in the ETER database from European countries included in the study. The other variables used for the sampling process are also standardised, however these are standardised within each of the countries. This makes sure that the differences between the universities of each country are proportional, ensuring a representative national sampling.

Country	Variable Comments	Number of RPOs
Latvia	*Ratio of Students to Staff* is calculated by total number of staff	4
Lithuania	*Ratio of Students to Staff* is calculated by total number of staff. Horizon 2020 funding not included for the sampling	4
Luxembourg	Sampling not possible, only two Universities found in the ETER database	2
Malta	Sampling not possible, only one University and one University College found in the ETER database	2
Netherlands		4
Norway		4
Poland	*Size* is calculated by total number of academic staff + total number of students. Horizon 2020 funding not included for the sampling	6
Portugal	Horizon 2020 funding not included for the sampling	4
Republic of Cyprus	Horizon 2020 funding not included for the sampling	2
Romania	No variables available for sampling, sampling is thus completely random	4
Slovakia		4
Slovenia	Sampling not possible, only four Universities found in the ETER database	4
Spain		6
Sweden		4
United Kingdom	Horizon 2020 funding not included for the sampling	6

Due to the limited number of organisations needed from each country, stratified sampling in the conventional sense is not possible for the selection of organisations in this study. Instead, the sampling is conducted by clustering all available organisations within each country, based on the variables available in the country. The clustering algorithm is then tasked with finding a number of clusters for each country, corresponding to the number of organisations needed from the country. One organisation from each cluster is consequently chosen at random. This gives a representative sample of RPOs from each country, based on the available variables, and therefore also a fairly representative sample of all RPOs in the EU (see Table 42 and Figure 63).

Table 42: Comparison of distributions of all 1038 the RPOs to the 122 RPOs in the final sample

	All HEIs (N=1038)	Sample (N=122)
Number of enrolled students		
Mean (SD)	13513.48 (461.81)	18508.35 (2176.59)
[CI 95%]	[12607.23, 14419.72]	[14197.34, 22819.37]
Size (full time staff + students)		
Mean (SD)	16153.39 (633.62)	21338.36 (2620.94)
[CI 95%]	[14909.45, 17397.33]	[16137.86, 26538.87]
Orientation (mono/plural)		
Mean (SD)	1292.01 (55.05)	1498.54 (177.75)
[CI 95%]	[1183.97, 1400.04]	[1146.31, 1850.77]
Student/Academic Staff Rat		
Mean (SD)	16.38 (0.61)	18.81 (2.02)
[CI 95%]	[15.19, 17.57]	[14.80, 22.83]
H2020 Funding		
Mean (SD)	25737975€ (1895284)	44964683€ (7382339)
[CI 95%]	[22016336, 29459613]	[30286615, 59642750]

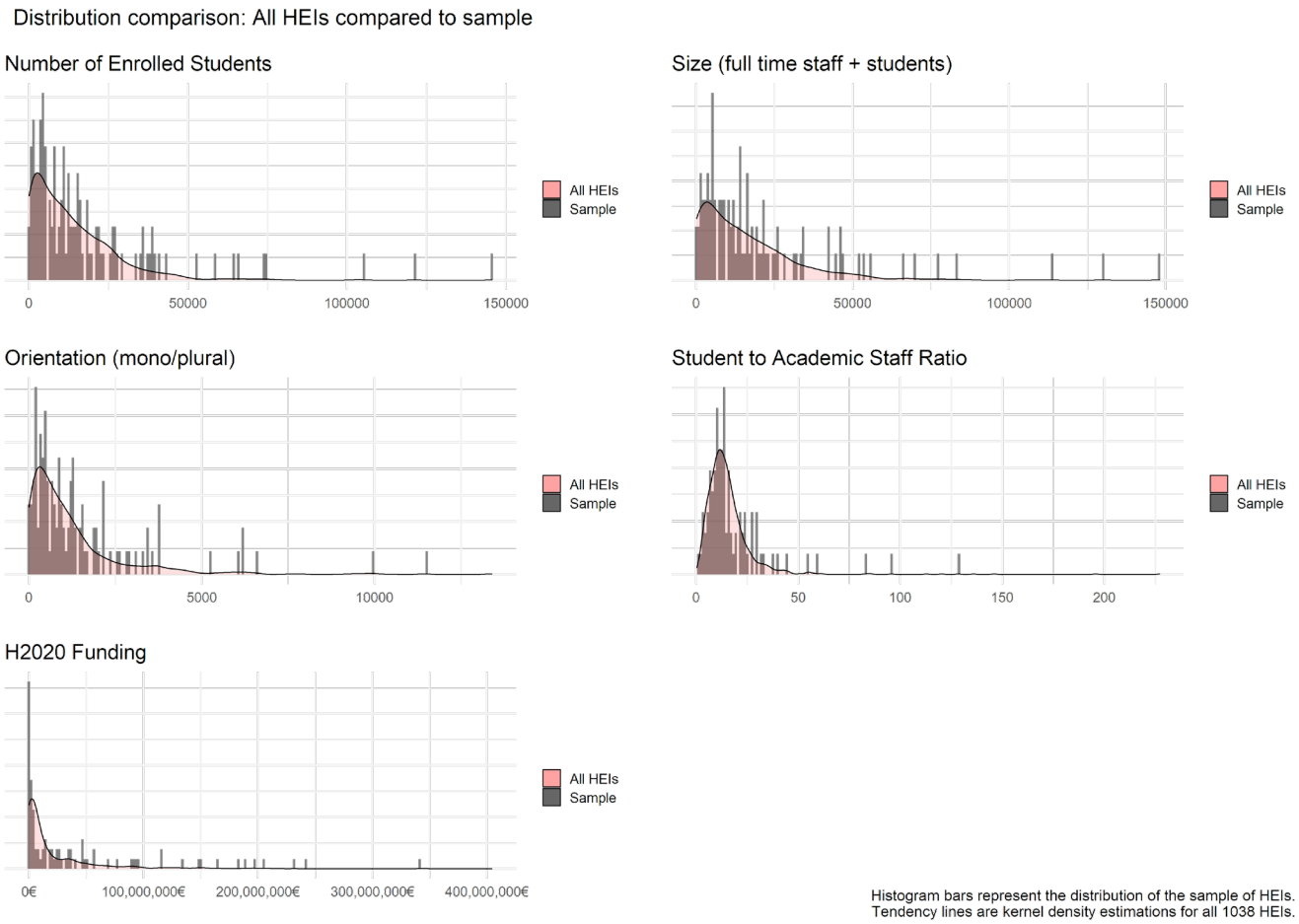

Figure 63: Comparison of distributions of all 1038 the HEIs to the 122 HEIs in the final sample

After the sampling was conducted, the members of the CCN were able to raise any concerns with the RPOs in the sample from their respective countries. For different reasons, 10 of the initial 122 RPOs were deemed not suitable to include in the study, and were thus interchanged with another RPO. When possible the RPO was exchanged for another RPO at random from the same cluster. As the goal of the sampling is not to achieve representative samples from each country, but to achieve as representative a sample as possible for the EU as a whole, national concerns about representivity, geographic or otherwise, have not caused organisations to be deemed unsuitable. Rather, reasons have been either 1) practical e.g. very limited websites without any information to include in the qualitative part of the study, or 2) institutional, e.g. the included RPO was not a *proper* RPO for all intents and purposes. Table 43 provides an overview of the change in RPOs together with reasons for the changes. The final RPOs included in the study are presented in Table 44. Figure 63 and Table 42 similarly include the final sample of RPO from after the exchange in RPOs.

Table 43: Overview of post sample exchanges for RPOs

Country	Original Unsuitable RPO	Final RPO	Reason for the RPO to be deemed unsuitable
France	Université Paris Descartes	Université de Rennes 1	In 2020, Paris-Descartes merged with Paris Diderot and the Earth Sciences Institute (Institut de physique du globe) to form the University of Paris. The university does thus not exist in the form that it was sampled on.
France	Comue Université Paris-Saclay	Université de La Rochelle	The data from the ETER database for "Comue Université Paris-Saclay" does not match the data available elsewhere for the RPO. In the ETER database "Comue Université Paris-Saclay" has 8.924 students enrolled (per 2017), where in reality the RPO has around 48.000 enrolled students.
Germany	Dresden International University GmbH	Steinbeis-Hochschule Berlin (Priv. H)	According to the country correspondent of Germany, the Dresden International University GmbH appears to be a university that primarily focuses on vocational training (Bachelor- and Master-degrees for people who already have a degree and/or are already working), and it appears to also have no real research focus.
Greece	Hellenic Open University	Aristotle University of Thessaloniki	Hellenic Open University has a very limited website according to the Country Correspondent of Greece. The RPO was thus not found feasible to include the organisation in the sample.
Hungary	Central European University	Corvinus University of Budapest	Per the country correspondent of Hungary, the university, the Central European University, have recently moved to Austria, and only few research centres have stayed in Hungary.
Hungary	Liszt Ferenc Academy of Music	Andrássy Gyula University, Budapest	Per the country correspondent, it is a "classic high level art school and not much if any research is conducted there".
Italy	Università Telematica GUGLIELMO MARCONI	Università degli Studi di NAPOLI "Parthenope"	The Italian sample originally contained two *online universities*, this many of such organisations is representative of neither Italy nor the EU as a whole, and this online university was thus exchanged for a *none-online university*.
Latvia	University of Liepaja	Riga Technical University	University of Liepaja is a small regional institution, which per the country

Country	Original Unsuitable RPO	Final RPO	Reason for the RPO to be deemed unsuitable
			correspondent is going to lose its status as RPO in the near future, as the national rules for RPO classification is in the process of being changed.
Romania	Henri Coanda Air Force Academy	"Ovidius" University of Constanta	The number of relevant documents on the website of Henri Coanda Air Force Academy is very limited, and it was thus not found feasible to include the organisation in the sample, according to the country correspondent of Romania.
Spain	Isabel I de Castilla	Universidad Católica San Antonio de Murcia	The Spanish sample originally contained two *online universities*, this many of such organisations is representative of neither Spain nor the EU as a whole, and this online university was thus exchanged for a *none-online university*.

Table 44: RPOs included in the study

Country	Institution Names	English Names
Austria	Medizinische Universität Wien, Universität für Musik und darstellende Kunst Wien, Universität für Weiterbildung Krems, Universität Wien	Medical University of Vienna, University of Music and Performing Arts in Vienna, Danube University Krems, University of Vienna
Belgium	Universiteit Antwerpen, Universiteit Hasselt, Transnationale Universiteit Limburg, Universiteit Gent	University of Antwerp, Hasselt University, Transnational University Limburg, Ghent University
Bulgaria	Пловдивски университет "Паисий Хилендарски", Национална художествена академия, Русенски университет "Ангел Кънчев", Международно висше бизнес училище	Paisii Hilendarski University of Plovdiv, National Academy of Art, Angel Kanchev University of Ruse, International Business School
Croatia	Sveučilište Sjever, Koprivnica, Sveučilište u Zadru, Sveučilište u Dubrovniku, Sveučilište u Zagrebu	University North, Koprivnica, University of Zadar, University of Dubrovnik, University of Zagreb
Czech Republic	Veterinární a farmaceutická univerzita Brno, Vysoké učení technické v Brně, Vysoká škola finanční a správní, o.p.s., Masarykova univerzita	University of Veterinary and Pharmaceutical Sciences, Brno, Brno University of Technology, University of Finance and Administration, Masaryk University

Country	Institution Names	English Names
Denmark	Københavns Universitet, Aarhus Universitet, Handelshøjskolen i Kobenhavn, Danmarks Tekniske Universitet	University of Copenhagen, Aarhus University, Copenhagen Business School, Technical University of Denmark
Estonia	Tallinna Ülikool, Tallinna Tehnikaülikool, Eesti Maaülikool, Estonian Business School	Tallinn University, Tallinn University of Technology, Estonian University of Life Sciences, Estonian Business School
Finland	Helsingin yliopisto, Kuvataideakatemia, Lapin yliopisto, Turun yliopisto	University of Helsinki, Finnish Academy of Fine Arts, University of Lapland, University of Turku
France	Université de La Rochelle, Université de Montpellier, Université d'Angers, Université de Rennes 1, Université de Lille, Université de la Nouvelle-Calédonie	University of La Rochelle, University of Montpellier, University of Angers, University of Rennes 1, Lille University, University of New Caledonia
Germany	Universität Duisburg-Essen, Bauhaus-Universität Weimar, Technische Universität München, Steinbeis-Hochschule Berlin (Priv. H), Universität Bayreuth, Universität Bremen	University of Duisburg-Essen, Bauhaus-Universität Weimar, Technical University of Munich, Steinbeis University Berlin, University of Bayreuth, University of Bremen
Greece	Χαροκόπειο Πανεπιστήμιο, Πανεπιστήμιο Θεσσαλίας, Οικονομικό Πανεπιστήμιο Αθηνών, Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης	Harokopio University, University Of Thessaly, Athens University of Economics and Business, Aristotle University of Thessaloniki
Hungary	Pázmány Péter Katolikus Egyetem (PPKE), Andrássy Gyula Budapesti Német Nyelvű Egyetem, Budapesti Corvinus Egyetem (BCE), Pécsi Tudományegyetem (PTE)	Pázmány Péter Catholic University, Andrássy Gyula University, Budapest, Corvinus University of Budapest, University of Pécs
Ireland	University of Limerick, National University of Ireland, Galway, University College Dublin, Maynooth University	University of Limerick, National University of Ireland, Galway, University College Dublin, Maynooth University
Italy	Università della CALABRIA, Università degli Studi di NAPOLI "Parthenope", Università degli Studi di MACERATA, Università Telematica PEGASO, Università degli Studi di ROMA "La Sapienza", Università degli Studi di FIRENZE	University of Calabria, University of Naples "Parthenope", University of Macerata, Online University "Pegaso", Sapienza University of Rome, University of Florence
Latvia	Latvijas Lauksaimniecibas universitate, Rigas Tehniska universitate, Rigas Stradina universitate, Latvijas Universitate	Latvia University of Agriculture, Riga Technical University, Riga Stradinš University, University of Latvia
Lithuania	Mykolo Romerio universitetas, Viešoji istaiga LCC Tarptautinis universitetas, Aleksandro Stulginskio universitetas, ISM Vadybos ir ekonomikos universitetas, UAB	Mykolas Romeris University, LCC International university, Aleksandras Stulginskis University, ISM University of Management and Economics, JSC

Country	Institution Names	English Names
Luxembourg	Université du Luxembourg, LUNEX University	University of Luxembourg, LUNEX University
Malta	University of Malta (L'Universita` ta` Malta), Malta College of Arts, Science & Technology	University of Malta, Malta College of Arts, Science & Technology
Netherlands	Vrije Universiteit Amsterdam, Universiteit voor Humanistiek, Universiteit Leiden, Technische Universiteit Eindhoven	VU University Amsterdam, University of Humanistic Studies, Leiden University, Eindhoven University of Technology
Norway	Universitetet i Oslo, Universitetet i Agder, Norges teknisk-naturvitenskapelige universitet, Universitetet i Tromsø - Norges arktiske universitet	University of Oslo, University of Agder, The Norwegian University of Science and Technology, University of Tromso - Norway's Arctic University
Poland	Uniwersytet Rolniczy im. Hugona Kołłątaja w Krakowie, Krakowska Akademia im. Andrzeja Frycza Modrzewskiego, Uniwersytet Medyczny im. Piastów Śląskich we Wrocławiu, Akademia Wychowania Fizycznego we Wrocławiu, Uniwersytet Pedagogiczny im. Komisji Edukacji Narodowej w Krakowie, Uniwersytet Jagielloński w Krakowie	Hugo Kołłątaj Agricultural University of Cracow, Andrzej Frycz Modrzewski Cracow College, Wrocław Medical University, University School of Physical Education in Wrocław, Pedagogical University in Cracow, Jagiellonian University in Cracow
Portugal	Universidade do Minho, ISCTE - Instituto Universitário de Lisboa, Universidade Aberta, Instituto Superior de Ciências da Saúde Egas Moniz	University of Minho, ISCTE - University Institute of Lisbon, Open University of Portugal, Egas Moniz Higher Institute of Health Sciences
Republic of Cyprus	Πανεπιστήμιο Frederick, Ανοικτό Πανεπιστήμιο Κύπρου, Πανεπιστήμιο Frederick, Πανεπιστήμιο Λευκωσίας, Τεχνολογικό Πανεπιστήμιο Κύπρου	Frederick University, Open University of Cyprus, Frederick University, University of Nicosia, Cyprus University of Technology
Romania	Universitatea de Medicină şi Farmacie „Grigore T. Popa” din Iaşi, Universitatea "Vasile Alecsandri" din Bacău, Universitatea "Ovidius" din Constanţa, Universitatea de Arhitectură şi Urbanism "Ion Mincu" din Bucuresti	"Grigore T. Popa" University of Medicine and Pharmacy Iasi, "Vasile Alecsandri" University of Bacau, "Ovidius" University of Constanta, "Ion Mincu" University of Architecture and Urbanism
Slovakia	Univerzita Pavla Jozefa Šafárika V Košiciach, Trenčianska Univerzita Alexandra Dubčeka V Trenčíne, Univerzita Sv. Cyrila A Metoda V Trnave, Slovenská Zdravotnícka Univerzita V Bratislave	Pavol Jozef Šafárik University in Košice, Alexander Dubček University of Trenčín in Trenčín, University of Ss. Cyril and Methodius in Trnava, Slovak Medical University in Bratislava
Slovenia	Univerza v Ljubljani, Univerza v Mariboru, Univerza na Primorskem, Univerza v Novi Gorici	University of Ljubljana, University of Maribor, University of Primorska, University of Nova Gorica

Country	Institution Names	English Names
Spain	Universidad Carlos III de Madrid, Universidad Miguel Hernández de Elche, Universidad de Sevilla, Universidad Nacional de Educación a Distancia, Universitat Autònoma de Barcelona, Universidad Católica San Antonio de Murcia	Carlos III University of Madrid, Miguel Hernández University of Elche, University of Seville, National University of Distance Education, Autonomous University of Barcelona, San Antonio Catholic University of Murcia
Sweden	Högskolan Dalarna, Sveriges lantbruksuniversitet, Uppsala universitet, Linköpings universitet	Dalarna University, Swedish University of Agricultural Sciences, Uppsala University, Linköping University
United Kingdom	London School of Hygiene and Tropical Medicine, Queen Margaret University, The University of Sheffield, The University of Greenwich, Staffordshire University, The Open University	London School of Hygiene and Tropical Medicine, Queen Margaret University, The University of Sheffield, The University of Greenwich, Staffordshire University, The Open University

Appendix C – CCN-RPO study Quality Assurance process

The quality of the country correspondents' (CC) reports for the CCN-RPO study was checked in a two-stage process. This process aimed to ensure high quality in all reports and provided a uniform foundation for the coding process. As mentioned in the report, the CCs were divided into teams for the duration of the study. Within each team a quality assessment was performed, where CCs would read each other's reports and provide feedback. Further, the CCs contacted the HEIs by email to receive their feedback on whether all strategies and policies had been found. Forty-three of the 122 HEIs replied to these emails. Among those HEIs that did reply, no particularly significant documents were added to the study. Finally, each CC would perform any amendments needed before submitting the report.

When all reports were submitted to the study group, the authors of this report commenced the second step of the QA process: checking all reports based on a number of parameters in the areas of technical issues, congruency, and completeness. Technical issues described to what extent the template had been filled out correctly, so the data could be extracted and coded. The study group also checked if all supporting documents had been uploaded and whether the report had been validated through the HEI. Congruency was used to identify any inconsistencies between qualitative descriptions and quantitative reporting, throughout the reports. Finally, completeness checked if responses could be understood by themselves and provided sufficient detail for meaningful understanding and if all questions were answered. Following this process, CCs were contacted again and asked to provide further information where needed and answer any other questions that had come up during the QA process. The percentage of reports in which there where issues mentioned above is shown in Table 45, Table 46 and Table 47 below. As can be read from these tables, the main area identified in the QA process was related to technical issues with regard to the template. Between 20-25% of the reports had one or more issue relating to congruency. This included, for example, cases where country correspondents were asked to take a second look at the evaluation of strategic priority, if the text they had written did not seem to be aligned with their evaluation. Between 7-15 % required attention to completeness. Often country correspondents were asked to provide more detail on a subject or to correct an omission where a text- or check-box had been left blank. After incorporating the comments and suggestions the CCs returned the updated reports. The new version was then uploaded to the study server.

Table 45: Percentage of all reports with one or more technical issues within a QA theme

Technical Issue	Percentage
Is text added within boxes (percentage "no")	28%
Are boxes filled out rather than highlighted (Percentage "no")	37%
Do documents have the correct file name (Percentage "no")	47%
Are documents referenced when they should be (Percentage "no")	25%
Are documents referenced accurately (Percentage "no")	72%
Are documents available/uploaded in correct format (percentage "no")	39%
Did the report get validated through the RPO (Percentage "no")	68%
Has changes been made to the document structure (Percentage "yes")	19%

Table 46: Percentage of all reports with one or more congruency issues within a QA theme

Congruency	Percentage
Do the check-off variables correspond to qualitative judgements (Percentage "no")	19%
Are text questions filled in where they should be /should not be based on previous answers (percentage "no")	26%

Table 47: Percentage of all reports with one or more completeness issues within a QA theme

Completeness	Percentage
Full sentences that can be understood by itself (Percentage "no")	7
Sufficient detail in responses to questions (Percentage "no")	12
All boxes filled out – to the extent expected (Percentage "no")	15

SUPER MoRRI

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