



EUROPEAN RESEARCH AREA

Progress Report 2018

Country Profile **AUSTRIA**

EUROPEAN COMMISSION

Directorate-General for Research and Innovation
Directorate A — Policy Development and Coordination
Unit A2 — Research and Innovation Strategy

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COUNTRY SNAPSHOT

	Indicator	Performance					Progress since ERA monitoring 2016				
		Name	Reference year	Score	Cluster	Lead/Gap (Δ %)	EU-28	Reference Period	CAGR	Lead/Gap (Δ % pt)	EU-28
Priority 1	Adjusted Research Excellence Indicator (AREI)	2016	54.9	2	22	45.0	2013-16	8.1%	4.9	3.2%	
	GBARD as share of GDP	2017	0.77%	1	23	0.63%	2014-17	-1.0%	0.7	-1.7%	
	EIS Summary Innovation Index (SII)	2017	0.579	2	15	0.504	2015-17	2.0%	0.1	1.9%	
Priority 2	A - GBARD to transnati coop (EUR/researcher)	2016	6,674	1	78	3,739	2014-16	-0.6%	-4.5	3.9%	
	A - Collab papers w/ERA per 1 000 researchers	2016	138	1	96	71	2014-16	3.4%	0.1	3.3%	
	A - Public-to-public partnerships (EUR/researcher)	2016	1,824	1	227	558	2014-16	2.5%	1.9	0.7%	
	B - Roadmap for ESFRI projects	National roadmap implemented in 2014, ESFRI projects identified									
	B - Participation in ESFRI Projects and Landmarks (combined)	2018	33%	2	-6	35%	2016-18	43.0%	28.0	15.0%	
	B - Participation in developing ESFRI Projects	2018	28%	2	-5	29%	2016-18	:	:	18.6%	
B - Participation in operational ESFRI Landmarks	2018	35%	2	-6	37%	2016-18	12.9%	1.6	11.3%		
Priority 3	EURAXESS job ads per 1 000 researchers	2016	63.8	2	52	42.1	2014-16	-4.0%	1.0	-5.0%	
	Open, transparent, merit-based hiring process	2016	71%	2	8	65%	2012-16	16.6%	9.1	7.5%	
	Share of doctoral students from EU countries	2016	17.7%	1	148	7.1%	2013-16	1.8%	-2.1	3.9%	
Priority 4	Share of women among Grade A in HES	2016	23%	3	-4	24%	2014-16	5.7%	4.7	1.0%	
	Gender dimension in research content	2014-17 ^(R)	1.02	3	-3	1.05	2011-14 to 2014-17 ^(R)	1.3%	-1.2	2.5%	
	Share of female PhD graduates	2016	42%	4	-12	48%	2013-16	-1.1%	-1.5	0.4%	
Priority 5	A - Firms coop with univ, gov, res inst	2014	24.6%	1	64	15.0%	<i>Not computed</i>				
	A - Firms coop with univ	2014	<i>Not computed</i>				2012-14	2.1%	1.4	0.7%	
	A - Firms coop with gov, res inst	2014	<i>Not computed</i>				2012-14	-2.5%	-6.6	4.0%	
	A - Share of public R&D funded privately	2015	6.4%	3	-9	7.0%	2013-15	2.6%	3.8	-1.2%	
	A - Public-private collab papers per capita	2017	82.3	2	101	40.9	2014-17	3.1%	2.7	0.4%	
	B - Share of papers in Open Access (Total)	2016	51.8%	2	5	49.3%	<i>Not computed</i>				
	B - Share of papers in Open Access (Gold)	2016	34.9%	1	15	30.2%	<i>Not computed</i>				
	B - Share of papers in Open Access (Green)	2016	29.0%	2	-11	32.5%	<i>Not computed</i>				
	B - Share life science papers with OA dataset(s)	2017	2.8%	2	11	2.6%	2013-17	2.7%	0.1	2.6%	
Priority 6	Collab papers w/non-ERA per 1 000 researchers	2016	62	2	14	54	2014-16	5.0%	0.6	4.4%	
	Share of doctoral students from outside EU	2016	10.6%	3	-24	13.9%	2013-16	-1.2%	-5.0	3.8%	
	Share med & high tech product export	2017	58%	2	2	57%	2015-17	0.4%	0.0	0.4%	
	Share Knowledge intensive service export	2016	43%	3	-38	69%	2014-16	-1.6%	-2.2	0.6%	

Note: (:) = missing data, more notes and flags can be found in the Annex.
^(R) = rolling averages (e.g. average scores across 2007–2010, 2008–2011... 2014–2017) have been used to measure performance and growth due to pronounced short-term fluctuations.
Refer to the "Annex: Guide to reading the quantitative results tables (country snapshots)" for guidance in interpreting the data presented above. Further information on the presented indicators is available in the 2018 ERA Monitoring Handbook.

COUNTRY NARRATIVE

Summary

Austria's performances at the Priority level vary markedly from one Priority to another. The country is consistently among the groups of highest performing countries (Cluster 1) for indicators in Priority 2a, whereas for Priority 4 the country's scores positioned it in the groups below (Cluster 3) or well below (Cluster 4) ERA average. On most Priorities, Austria's scores gravitated towards the group of countries just above ERA average (Cluster 2).

Priority 2a (Transnational cooperation) is where Austria obtained its highest performances, well above both ERA average (Cluster 1) and EU-28 scores across all three indicators here. Short-term trends showed no clear pattern on this Priority since the previous ERA monitoring exercise, though Austria's spending on transnational collaboration (the headline indicator for Priority 2a) remained roughly stable as the EU-28 average increased.

For Priority 1 (More effective national research systems), for Priority 3 (An open labour market for researchers) and for Priority 5b (Open access), Austria placed in Cluster 1 on one indicator and Cluster 2 for the other indicators. The country's scores here were above both the ERA average and the EU-28 scores, though generally not by as wide a margin as Austria's lead in Priority 2a. Short-term trends for Austria showed slight growth for Priority 1 and more variation for Priority 3.

In Priority 2b (Make optimal use of public investments in research infrastructures) as well as Priority 5a (Knowledge transfer), Austria's performances generally fell into Cluster 2. The country's scores were mostly above ERA average, and just above or just below EU-28 scores. Short-term changes on these Priorities have generally been modest, slightly above EU-28 trends, with a major exception above EU-28 (Participation in ESFRI projects and landmarks) and one exception below EU-28 (collaboration of the private sector with government bodies and research institutes).

Finally, the least impressive findings were obtained for Priority 6 (International collaboration) and especially Priority 4 (Gender equality and gender mainstreaming in research). In this last Priority, findings positioned the country in Clusters 3 and 4 across indicators. Short-term trends here show modest growth on the headline indicators for both Priority 4 and Priority 6; in the case of the Priority 4 headline, Austria's growth slightly outpaced the EU-28 trend.

To the extent that data was available, below the country profile also analyses progress with the implementation of the ERA National Action Plan. It is noticeable that there were positive developments under priorities 1, 3, 5 and 6.

1. More effective national research systems

Austria's scores placed it in the country groups with performances just above the ERA average (Cluster 2) for Adjusted Research Excellence (AREI – the headline indicator) and the EIS Innovation Summary Index. It placed in Cluster 1 for GBARD as a share of GDP.

Since the last ERA monitoring exercise, Austria experienced average annual increases on the AREI and EIS indicators, whereas it saw average annual decreases on the GBARD as a share of GDP indicator. Growth was particularly pronounced on the AREI at 8.1 % average per annum, above the EU-28 level of 3.2 %.

Austria's strengths include the attractive research system and sufficient human resources (European Commission, 2017a). In 2015, Austria's spending for R&D as a percentage of GDP amounted to 3.07%, which was the second-highest level in the EU (European Commission, 2017b). Despite that, public funding for basic research is relatively low with some increases since 2016. In its national RTI strategy, Austria acknowledges the need to strengthen basic research and its institutions. The goal is to increase it to the level of leading research nations by 2020 (BMVIT and BMWFW, 2011). However, it remains much lower than in other ERA countries that are regarded innovation leaders such as Switzerland, Germany, the Netherlands or Finland (Schuch and Gampfer, 2017). This hinders the growth of research excellence.

At the same time, Austria actively participates in European funding programmes for R&D. Until 2015, approximately 140 ERC grants were awarded to researchers at Austrian organisations (OECD, 2016).

Austrian Science Fund (FWF) is one of a few European research funding organisations that have an agreement with partner organisations in Germany and Switzerland that allow the portability of grants. The D-A-CH programme allows a leading research performer to transfer a grant to a partner country during the implementation of the research (European Commission, 2018b).

Austrian smart specialisation strategy helped to gradually improve the coordination between federal and regional levels (Schuch and Testa, 2018). All of its federal states and an increasing number of regions have R&I strategies that are prepared according to smart specialisation model. The main issue remains that evaluation and monitoring systems vary across regions. Having said that, most of the regions are already developing and testing their methodologies for evaluation and monitoring.

One of the main objectives proposed in Austrian NAP under Priority 1 is to further develop the evaluation culture in Austrian R&D. It is a long-term goal of Austria and it has achieved substantial progress in developing evaluation culture in R&D. In this regard, Austria has commissioned several studies in 2017 which were finalised in 2018 and will feed evidence into the development of the new R&I Strategy 2030. Among them is the newly published OECD review of the Austrian R&I system as well as an extensive evaluation of the implementation by FFG of major European research funding programmes such as Horizon 2020, EUREKA, COSME, EEN as well the ERA policy in Austria. These evaluations will inform Austria's positioning in the future ERA and Horizon Europe.

Additionally, Austria has progressed in enhancing demand-side stimulation of innovation, in particular by means of innovation-friendly public procurement (IÖB). First of all, the IÖB online platform (www.innovationspartnerschaft.at) was created as a support tool for providers and consumers of innovative solutions in mid-2016. Second, Austria advances international dialogue, including through participation in the Mutual Learning Exercise (MLE) of the EC on "Innovation Procurement", and inclusion of the IÖB initiatives in the OPSI database of the OECD. It also developed a set of IÖB performance indicators.

2. Optimal transnational co-operation and competition

a. Transnational cooperation

As previously mentioned, Austria fell into the group of highest performing countries (Cluster 1) across all three indicators for this priority. Its lead over the EU-28 scores was also pronounced, especially in public-to-public partnerships, where the country's score was more than three times that of the 28 Member States overall.

Despite these strong performances, Austria's GBARD allocated to transnational collaboration was relatively stable since the last ERA monitoring exercise as performance across the EU-28 improved on that indicator. For public-to-public partnerships, the slight growth of Austria gave it a slight edge over EU-28 growth. For co-publications with foreign partners within ERA, Austria's growth was slight, basically keeping pace with changes at the EU-28 level.

Even though Austria's investment into transnational cooperation has not increased significantly, it remains high. It is an active participant in these transnational activities that include 7 JPIs, 2 Article 185 initiatives, numerous ERA-NETs and other initiatives (European Commission, 2017c). The participation in these activities involve some ministries and related agencies such as the Federal Ministry of Education, Science and Research (BMBWF)); the Federal Ministry for Transport, Innovation and Technology (BMVIT); the Federal Ministry for Digital and Economic Affairs; and the Federal Ministry of Sustainability and Tourism (BMNT). Investment in transnational cooperation activities is decided by each ministry and is based on their strategic or financial priorities. The distribution of the funds can be either competitive or direct.

Austria has achieved some progress in the implementation of its NAP under sub priority 2a. The pilot project planned in the NAP – "Demographic change" – was launched. The results of the project were published in 2017 and provided evaluations of some of the funded projects.

b. Make optimal use of public investments in research infrastructures

Austria obtained participation scores in ESFRI Projects and Landmarks that were slightly below the EU-28 benchmark, but just above the ERA averages (placing the country in Cluster 2 for these indicators).

Increases in rates of participation in ESFRI Projects and Landmarks combined have been clear for Austria over the 2016 to 2018 period, with its annual growth rate at 43 %, well above the EU-28 trend of 15 %. As of 2018, Austria participated in 28 % of developing ESFRI Projects, markedly up from the null participation rate recorded in 2016.

Note that large countries are generally advantaged on this priority, since the indicators are not normalised to account for differences in the size of countries.

As of 2017, Austria participated in 11 ESFRI infrastructures (BMWF, 2017). The participation in ESFRI is especially beneficial to Austria as relatively small country in improving its research infrastructures (OECD, 2016). The Federal Ministry of Education, Science and Research (BMBWF) is responsible for the participation in ESFRI infrastructures in Austria.

In 2016, the government adopted a package of support measures for 2017-2021. These funds are expected to further support research infrastructures. Universities are also encouraged to strengthen their collaboration on research infrastructures, which would consolidate investments and ensure a wider use of RIs.

3. An open labour market for researchers

Austria scored on the higher side of the scale for this suite of indicators. It placed in Cluster 1 with 18 % of its doctoral students from other EU countries. This share was notably above the figure of 7 % for the EU-28. For the other two indicators, Austria's scores positioned it among the countries just above the ERA average (Cluster 2).

Considering short-term changes on this Priority's indicators, the noteworthy trend was sharp increases on Austrian researchers' perception that academic hiring processes are open, transparent and merit-based. With average annual growth on the order of almost 17 %, increases for Austria increased its lead relative to the EU-28, which grew by only 7.5 % over the same timeframe.

Austria's NAP under Priority 3 aimed to create a culture of welcome for researchers. Some progress was achieved by further developing Red-White-Red card, which is expected to attract more top-level researchers. Additionally, the number of posts advertised on EURAXESS Jobs for scientific personnel also increased from 1050 in 2014 to 1611 in 2017 (OeAD, 2017). Another aspect referred in the Austrian NAP was the implementation of career model at non-university research institutions, namely Austrian Academy of Sciences (OeAW) and Institute of Science and Technology Austria (IST-Austria), which both organisations have developed and are implementing.

4. Gender equality and gender mainstreaming in research

Generally, Austria lags behind the EU-28 score and the EU-28 growth for these indicators. Its performance was particularly weak on the share of female PhD graduates (42 %), where it positioned in Cluster 4. Nevertheless, it should be kept in mind that all ERA countries have achieved scores between 40 % and 60 % on this indicator, and have therefore almost realised, realised or gone beyond gender parity at for this career stage.

Austria's growth outpaced that of the EU-28 for its share of women among Grade A positions in higher education systems, the headline indicator for this Priority. With an annual average increase of 5.7 %, it is 4.7 percentage points above the EU-28 trend growth rate. On the other two indicators of Priority 4, Austria's short-term growth was slightly below that of the EU-28, by less than 2 percentage points; Austria therefore fell a little further behind.

Austria is one of only a few countries where higher education institutions, namely universities, have to implement structured gender equality plans (EIGE, 2016). However, EIGE (2016) reports

that HEIs do not generally perform evaluation targeting specifically implementation of gender equality plans.

Another positive practice is identified in Austrian RFO Austrian Science Fund (FWF) where internal training on gender mainstreaming is practiced (Science Europe, 2017). This process already started in 2009 but a further step to improve procedures was taken in 2015. A training session on diversity in the context of research funding was formulated where FWF staff and board members can learn more about the topic and its theoretical background.

One of the main targets in the Austrian NAP regarding Priority 4 was to increase the share of women in all areas and at all hierarchy levels where they are under-represented. It was reported that the share of females amongst university professors increased by 1.1. percentage points from 22.6% to 23.7% in the winter semester of 2015 (BMWFW, 2017). However, there is lack of evidence to support that there has been substantial progress achieved in this area.

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

a. Knowledge transfer

Austria's performances are the most dispersed for the indicators included in this priority, although they still come out as relatively strong on balance. Austria took a position among Cluster 1 on the headline indicator, the rate at which its firms cooperated with universities, higher education institutions, or research institutes (whether governmental, public or private). The 25 % collaboration rate observed here is notably above the EU-28 score of 15 %. At the same time, a comparatively smaller share of public R&D is funded privately in the country with a score (6.4 %) nearly on par with the EU-28 score (7.0 %). This score placed Austria in Cluster 3 for the share of its public R&D that is privately financed.

Short-term growth rates of Austria have been slightly above the EU-28 trend for this priority, with one exception. Austrian firms decreased their collaborations with governmental, public or private research institutes by an average annual rate of 2.5 % between 2012 and 2014. This contrasts with an EU-28 trend of 4.0 % growth for this indicator.

In recent years, the number of initiatives fostering collaboration between academia and business has been growing. There are new knowledge transfer centres, regional and thematic, that provide support exploitation of research results. Through these centres, entrepreneurship is highly supported. Other initiatives include competence centres for excellent technologies (COMET), Christian Doppler (CD) Laboratories, cooperation and innovation networks (COIN-Net), and Laura Bassi centres. The promotion of business-academia cooperation is also one of the core activities of Austrian Research Promotion Agency (FFG).

Austria's NAP did not differentiate its objectives into sub priorities under Priority 5. From the available data, some progress is seen in Priority 5a. Austria is making further efforts to promote the efficient and rapid utilisation of academic research results by innovative companies, whether in science transfer centres, the CD laboratories or research centres. It is expected to be achieved through the expansion of the CD laboratory and research centres. Additionally, IP strategy was adopted by the Council of Ministers on 14 February 2017 and the implementation of the measures is commencing.

b. Open access

The country's Austrian Science Fund (FWF) established instruments to cover costs of OA publishing. Peer-reviewed articles that acknowledge support from that body tend to be published in some OA modality to a high degree (74 % share of FWF-funded papers fell into the Total OA category, data not shown).

At the whole country level, Austria generally positioned itself in the group of countries just above the ERA average (Cluster 2) for its shares of papers available in OA (greenand overall), as well as for the share of life sciences papers with OA datasets. The country's scores were generally slightly above the EU-28 scores, except for share of Green OA papers (at 29 % for Austria compared to 33 % for the EU-28). It held a clearer lead for Gold OA papers (35 % compared to 30 % for the

EU-28 taken together, with a score that also placed the country well above the ERA average (Cluster 1).

The Austrian Science Fund (FWF) published guidelines for open access for publicly funded research. Additionally, the FWF, the University of Vienna, and the Technical University of Vienna contribute to the funding of arXiv.org platform managed by Cornell University (OECD, 2016). It provides open access to more than a million of publications in different fields such as computer science, mathematics, statistics, physics among others.

Regarding the implementation of the NAP, a clear accomplishment is that all Austrian universities participate in the project 'Austria Transition to Open Access', which seeks to support the transition from closed to open access in scientific publications.

6. International cooperation

Austria offered a mid-range performance on international cooperation indicators, placing either in the groups of countries just above (Cluster 2) or just below (Cluster 3) the ERA average. Across all priorities, the country's two largest gaps to EU-28 score were in Priority 6. For its share of knowledge-intensive service exports, the country's score of 43 % compared to an EU-28 score of 69 %. Among the doctoral students at Austrian universities, 11 % were from countries outside the EU, compared to the EU-28 score of 14 %.

What is more, for those two indicators where the Austrian research system is comparatively weak, slight average annual decreases have been recorded in recent periods, with Austria falling slightly behind the European level in terms of growth. For the share of doctoral students from outside the EU, Austria's decrease of 1.2 % compares to a 3.8 % growth rate for the EU-28. For the share of knowledge-intensive service exports, 1.6 % average annual declines for Austria contrast with 0.6 % annual growth for the EU-28.

Additionally, Austrian Research Promotion Agency (FFG) is running a dedicated programme "Beyond Europe" to support internationalisation of R&I projects. It is open to businesses, research performing organisations and other organisations that seek to create and extend collaborations with partners outside Europe (FFG). This programme is expected to contribute to the strategic objective of the Federal Government and relevant Ministries to encourage international cooperation as well as being able to respond to cooperation requests in a targeted manner.

In order to support internationalisation of R&I, Austrian Federal Ministry of Education, Science and Research (BMBWF) has signed agreements with selected targeted countries. Even though there is a strong focus on neighbouring countries and Eastern and South-eastern Europe, bilateral agreements are also concluded with countries outside of ERA such as Argentina, China, India, the Russian Federation and South Africa. New agreements with Brazil and South Korea are under preparation (BMBWF). The practical value of these agreements includes regular calls for bilateral research projects. Additionally, there are two Offices of Science and Technology Austria located in the US and China. Despite the efforts to internationalise Austrian system of R&I, more attention is concentrated on European cooperation, as corroborated by interviewees.

Austria's NAP under Priority 6 aimed to formulate Austrian Strategy for International Cooperation, to stimulate networking within Austria and increase activities with third countries. Some progress was achieved for all of these objectives. Formulation of an Austrian Strategy for International Cooperation is implemented through the preparation of annual action plans up to 2020.

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ANNEX: METHODOLOGICAL NOTES

	Indicator	Data availability	Flag								
			Name	Exception to ref. year	Exception to ref. period	Break in time series	Definition differs	Estimated	Provisional	Potential outlier	Confidential
Priority 1	Adjusted Research Excellence Indicator (AREI)	Available									
	GBARD as share of GDP	Available				2009-15			2017		
	EIS Summary Innovation Index (SII)	Available									
Priority 2	A - GBARD to transnatl coop (EUR/researcher)	Available						2008, 2010, 2012, 2014		2016	
	A - Collab papers w/ERA per 1 000 researchers	Available						2012, 2014		2016	
	A - Public-to-public partnerships (EUR/researcher)	Available						2012, 2014		2016	
	B - Roadmap for ESFRI projects										
	B - Participation in ESFRI projects and landmarks (combined)	Available									
	<i>B - Participation in developing ESFRI projects</i>	Available									
Priority 3	EURAXESS job ads per 1 000 researchers	Available						2012, 2014		2016	
	Open, transparent, merit-based hiring process	Available									
	Share of doctoral students from EU countries	Available									
Priority 4	Share of women among Grade A in HES	Available	2015	2014-15							
	Gender dimension in research content	Available									
	Share of female PhD graduates	Available									
Priority 5	A - Firms coop with univ, gov, res inst	Available									
	A - Firms coop with univ	Available									
	A - Firms coop with gov, res inst	Available				2012					
	A - Share of public R&D funded privately	Available						2008, 2010, 2012, 2014			
	A - Public-private collab papers per capita	Available									
	B - Share of papers in Open Access (Total)	Available									
	<i>B - Share of papers in Open Access (Gold)</i>	Available									
	<i>B - Share of papers in Open Access (Green)</i>	Available									
B - Share life science papers with OA dataset(s)	Available										
Priority 6	Collab papers w/non-ERA per 1 000 researchers	Available						2008, 2010, 2012, 2014		2016	
	Share of doctoral students from outside EU	Available									
	Share med & high tech product export	Available									
	Share Knowledge intensive service export	Available									

ANNEX: GUIDE TO READING THE QUANTITATIVE RESULTS TABLES (COUNTRY SNAPSHOTS)

Each profile table shows the given country's performance score and growth for all indicators used in this study. Given that specific targets were not established for each of the 24 ERA Monitoring Mechanism (EMM) indicators for each country, it is impossible to report on a country's level of compliance in achieving the ERA priorities, or the ERA policies/actions, that each of these indicators intends to measure ⁽¹⁾. Instead, the level of performance in the country snapshots is compared to the EU-28 (lead/gap analysis) and ERA averages (performance clusters). These references might represent unrealistic targets for some countries, especially the smaller ones. However, care was taken to use normalised indicators (except for Priority 2b), usually by incorporating the size of a country's population or economy in the denominator of an indicator. Additionally, the EU-28 and ERA averages might in some cases be lower than the level of performance which would be optimal towards achieving the ERA; for instance, gender equality might not have been reached in all relevant aspects at the EU- and/or ERA-wide level. That said, the main goal of these comparative analyses is to help situate countries relative to the core of the EU and ERA, so as to inform decisions on the most appropriate targets and on how to achieve them.

In addition to a measurement of performance in 2017 (or the most recent reference year for which sufficient data were available at the time of producing this report ⁽²⁾), the profile table also reports on recent changes in national performance, computed as a Compound Annual Growth Rate (CAGR). The CAGR aims to assess progress made since the ERA Progress Report 2016. Accordingly, it compares the latest available year in the 2016 report to the latest available year in this report. Growth since the last monitoring exercise is also compared to the EU-28 (lead/gap analysis) to inform individual countries on the extent to which their gap with the EU-28 level of performance is closing or widening. This information is intended to help individual countries better assess the extent to which new actions are required to achieve their respective targets.

The profile table is divided in two parts: performance and growth. For performance, the reference year for each indicator is noted. If the reported year for a given country and indicator is different from the reference year, the performance score in the snapshot is highlighted using a grey font in italics. The specific year which is reported appears in the column "exception to ref. year" of the appendix table at the end of the country profile. The appendix table also lists the years for which a flag is applied to the data. The performance section of the snapshot table also provides the EU-28 scores across indicators upon which the country lead/gap, in percent difference to the EU-28 score, is computed. Furthermore, the performance clusters from the main report have also been presented here; recall that countries more than one standard deviation above the unweighted ERA average (i.e. average across member states and associated countries for which data is available for each indicator) are in Cluster 1, the strongest cluster; those at or above the unweighted ERA average but within one standard deviation are in Cluster 2; those below the unweighted average but within one standard deviation are in Cluster 3; those more than one standard deviation below the ERA unweighted average are in Cluster 4, the weakest cluster.

For growth, the reference period used in computing the Compound Annual Growth Rate (CAGR) is also presented, alongside the actual CAGR. Again, exceptions to the reference period are highlighted by using a grey font in italics to display the actual CAGRs of the corresponding country and EU-28. Information on the specific years used in these cases are again available in the appendix tables. The lead/gap analysis for growth shows the percentage point difference between the country's CAGR and the CAGR of the EU-28 average. The CAGR measures growth relative to the latest available year in the *2016 ERA Progress Report*. Since there were retrospective corrections to the scores of countries on some indicators, growth was computed based on the updated time series. Trend lines over the longest available period for a given indicator are provided to inform on longer-term patterns of progress towards realising the ERA. Empty lines in the trend indicate either that data was missing for that year, or that the country's score was zero. For one indicator where short-term fluctuations were

¹ A more in-depth assessment of progress of implementation of ERA policies was rather achieved in the text of country profiles (not the snapshot tables) accounting for quantitative (where available) and qualitative (especially) elements in relation to the objectives, baselines, targets, timelines and milestones established by individual countries in their National Action Plans (NAP).

² Refer to the 2018 ERA Monitoring Handbook for the extraction dates of the presented data.

particularly pronounced (gender dimension in research content in priority 4), rolling averages (e.g. average scores across 2007–2010, 2008–2011... 2014–2017) have been used to measure performance and growth. In such cases, the CAGR measures the year-by-year percent change in the rolling average of an indicator between the starting and ending periods (e.g. between 2011–2014 and 2014–2017). These cases are highlighted by the addition of the superscript (R) to the reference year (performance) and period (growth) of the concerned indicators.

The lead/gap analyses, both for performance and for growth, have been colour-coded to help visually elucidate patterns in the findings. The colour scheme for the country profiles ranges from dark blue (weakest scores) to dark orange (strongest scores), as was applied in the main report. There is however, a key difference to note. In the main report, the colouring compared the results of different countries along a single indicator, in these country profile tables the colouring compares the results of one country along several indicators, to highlight its relative strengths and weaknesses across indicators. More specifically, in each profile, blue always indicates that a country is below the EU-28 average, and orange always indicates that it is above, but the shade of blue and orange (dark or light) is relative to the country's own performance across indicators, rather than relative to the performance of other countries.

Indicators in bold are the Headline indicators that were selected as being the most relevant in monitoring progress in achieving the ERA by the European Research Area and Innovation Committee (ERAC). Within each priority, the Headline is followed by the two complementary EMM indicators identified by ERAC. Lack of data is identified by using a symbol (:) within the table cells.

Due to changes and discontinuities in data collection, some indicators have been updated, modified or replaced. A first modification was introduced for the complementary EMM indicators of Priority 2b (Make optimal use of public investments in research infrastructures). Here, findings are now provided on a combined indicator that better illustrates how level of engagement in ESFRI developing Projects and Landmarks are connected rather than independent.

For the headline indicator of Priority 5a, the underlying data coming from Eurostat was for the first time aggregated in a manner that made it possible to present a single metric (in terms of performance) merging both of its underlying dimensions ⁽³⁾; that is the share of product and/or process innovative firms cooperating with 1) universities or higher education institutions, or 2) with government, public or private research institutes. For growth, these two dimensions still had to be kept separated in this edition.

The indicators on the share of a country's peer-reviewed scientific papers that are available in Open Access (i.e. Total, Gold and Green OA) in Priority 5b have all been impacted by a revised definition of what constitute Green Open Access papers (see Section 3.5.5 of the Main Report for a description of this change). The indicator on the inclusion of OA policies in RIO policy repositories was discontinued since the new reporting guidelines for RIO policy reports no longer ask the experts to report on OA specifically. It has been replaced by a qualitative assessment of the NAPs and other information sources. A new indicator was also added to Priority 5b to fill a data gap in the 2016 ERA Progress Report; no data was available in 2016 for the share of research performing organisations (RPOs) making their research data available in OA. The share of research performing organisations (RPOs) making their research data available in OA has been replaced by the share of life sciences papers to which a country contributed and that have at least one open dataset in Figshare.

Due to discontinued data, the indicator on "Licence and patent revenues from abroad as a share of GDP" in Priority 6 has been replaced by two new indicators: knowledge intensive services exports as percentage of total services exports and exports of medium and high technology products as a share of total product exports; this modification coincides with a similar replacement in the 2018 European Innovation Scoreboard (EIS). Changes in the data for some countries also led to changes in EU28 aggregate scores the following two indicators: the share of doctoral candidates with a citizenship of another EU Member State (Priority 3) and non-EU doctorate students as a share of all doctorate students (Priority 6). Additional modifications in the approach used in computing EU-28 aggregate scores (e.g. imputation of missing data) led to some changes in the GBARD (EUR) allocated to

³ The new aggregation provided by Eurostat enabled this change by removing duplicated count of firms falling in both types of partnerships.

Country profile: Austria

Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE researcher in the public sector (Priority 2a).

Finally, the composite indicators combining findings from headline and complementary indicators within and across ERA priorities have not be computed in the 2018 ERA monitoring exercise. The rationale for these changes is detailed in the 2018 ERA Monitoring Handbook.

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The 2018 ERA Progress Report assesses the current state of the European Research Area (ERA) and the progress made on ERA implementation in 2016-2018. It is the second time in a row that progress has been measured at country level using the ERA monitoring mechanism.

Based on the overall evolution of the headline indicators, progress on ERA implementation continues, albeit at a slower pace than before. This trend calls for a renewed commitment to (i) further strengthening shared efforts at all levels; (ii) reforming national research and innovation systems; and (iii) realising a well-functioning ERA. The Commission has anticipated this need by proposing a number of programmes for the next financing period 2021-2027: these include regional funds, a European reform delivery tool, and the EU's next research and innovation framework programme — Horizon Europe, which includes a dedicated pillar to help strengthen the ERA.

Research & Innovation policy