



European  
Commission

# ERA Country Report 2023

## Poland

Independent  
**Expert**  
Report

Research and  
Innovation

## **ERA Country Report 2023: Poland**

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# **ERA Country Report 2023 Poland**

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# ERA COUNTRY REPORT 2023: POLAND

## Key takeaways:

- Poland is currently committed to 11 ERA Actions under the ERA Policy Agenda. Poland is an Emerging Innovator according to European Innovation Scoreboard 2023.
- Poland's greatest progress towards ERA priorities has been observed in open science, research infrastructures, and knowledge valorisation, whereas challenges remain in public expenditure on research, the number of STEM graduates, and academic freedom.
- The country has developed national initiatives on specific areas of the ERA Policy Agenda. Under ERA Priority 1, Poland has focused on the promotion of open access, the implementation of HEI assessments and on building strong research infrastructures. In relation to ERA Priority 2, the country aims to enhance sectoral activities related to the green and digital transition. Lastly, one of the main objectives of Poland is to support research excellence by funding and participation in initiatives, promoted by ERA Priority 3.

## 1. National context

### 1.1. Overview of the ERA policy agenda implementation

According to the **European Innovation Scoreboard (EIS)** Poland is classified as an **Emerging Innovator**.<sup>1</sup> Still, the EIS score for Poland has increased considerably since 2016. In terms of the ERA Policy Agenda, the country is committed to a total of 11 ERA Actions presented under ERA Priorities 1, 2 and 3.

According to the **European Semester Report of 2023**,<sup>2</sup> **Poland's Recovery and Resilience Plan (RRP)**<sup>3</sup> is key to addressing structural challenges by strengthening the collaboration between researchers and businesses to improve innovation. The RRP supports the implementation of the main strategy for R&I in the country, the **Polish Research and Innovation Policy**.<sup>4</sup> It is the main policy related to the ERA Policy Agenda in the country, and aims to encourage private and public institutions to promote innovation and research to adapt to the challenges related to the green and digital transition. Additionally, it embraces the importance of new technology and knowledge transfer to promote national and international development.

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<sup>1</sup> European Commission, Directorate-General for Research and Innovation (2023), European Innovation Scoreboard 2023 – Country profile Poland. [https://ec.europa.eu/assets/rtd/eis/2023/ec\\_rtd\\_eis-country-profile-pl.pdf](https://ec.europa.eu/assets/rtd/eis/2023/ec_rtd_eis-country-profile-pl.pdf).

<sup>2</sup> European Semester Report 2023. [https://economy-finance.ec.europa.eu/system/files/2023-06/ip245\\_en.pdf](https://economy-finance.ec.europa.eu/system/files/2023-06/ip245_en.pdf)

<sup>3</sup> Poland Recovery and Resilience Plan. [https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility/country-pages/polands-recovery-and-resilience-plan\\_en](https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility/country-pages/polands-recovery-and-resilience-plan_en)

<sup>4</sup> Research and Innovation Policy. <https://www.gov.pl/web/ncbr-en/polish-research--innovation-policy>

## 1.2. Policy context

The key institutions responsible for developing and implementing R&I policies in Poland are two ministries. **Ministry of Funds and Regional Policy** distributes funding for regional development and businesses. It is responsible for the **European Funds for a Modern Economy**, introduced in 2021.<sup>5</sup> These funds include support for research, development and innovation projects aimed at increasing the competitiveness of the Polish economy. Additionally, most sectoral ministries are also undertaking R&I activities, with main institutions including: the Chancellery of the Prime Minister, Ministry of Health, and Ministry of Agriculture and Rural Development. Moreover, the **Ministry of Science and Higher Education**<sup>6</sup>, established in December 2023<sup>7</sup>, is responsible for the legal framework, supervising research in the higher education sector and funding R&I in Poland.

Two most important institutions providing funds for researchers are the **National Centre for Research and Development (NCBiR)**<sup>8</sup> and the **National Science Centre (NCN)**.<sup>9</sup> The main institutions distributing funds for various private (including enterprises) and public entities are the **National Fund for Environmental Protection and Water Management**,<sup>10</sup> the **Medical Research Agency**<sup>11</sup> and the **Polish Agency for Enterprise Development**.<sup>12</sup> There are also non-public institutions supporting science and innovation, and the biggest non-profit organisation of this type is the **Foundation for Polish Science**, both supporting scholar and research teams and innovative enterprises.

In Poland, there are 91 research institutes represented by the **Main Council of Research Institutes**,<sup>13</sup> including **Łukasiewicz Research Network**, which is currently the most important subset of the research institutes, both in terms of impact and budget.<sup>14</sup>

The framework for Polish science and higher education has been established by the new **Law on Higher Education and Science**, where article 2 defines one of the missions as “development of the economy based on innovation”.<sup>15</sup> The most important strategy to define R&I priorities in Poland is the **State Scientific Policy** adopted in 2022.<sup>16</sup> The **Productivity Strategy 2030**,<sup>17</sup> supported by the Ministry of Economic Development and Technology, includes a strand dedicated to increasing the application of technology and knowledge in the

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<sup>5</sup> National Centre for Research and Development, European Funds for a Modern Economy <https://www.gov.pl/web/ncbr/fundusze-europejskie-dla-nowoczesnej-gospodarki> .

<sup>6</sup> <https://www.gov.pl/>

<sup>7</sup> Order n° 657 of the President of the Council of Ministers published on the 29 of December 2023, on the Ministry of Science and Higher Education. <https://monitorpolski.gov.pl/M2023000148301.pdf>. The order divided the former Ministry of Education and Science into the Ministry of Science and Higher Education and the Ministry of National Education.

<sup>8</sup> NCBR. <https://www.gov.pl/web/ncbr-en>

<sup>9</sup> NCN. <https://www.ncn.gov.pl/en>

<sup>10</sup> NFOSIGW. <https://www.gov.pl/web/nfosigw-en>

<sup>11</sup> Medical Research Agency. <https://abm.gov.pl/en/>

<sup>12</sup> Polish Agency for Enterprise Development. <https://en.parp.gov.pl/>

<sup>13</sup> Main Council of Research Institutes, <https://www.rgib.org.pl/index.php/o-rgib/o-rgib>.

<sup>14</sup> Łukasiewicz Research Network, <https://lukasiewicz.gov.pl/en/>

<sup>15</sup> Ministry of Science and Higher Education (2018). The Law on Higher Education and Science. Available at <https://www.gov.pl/web/nauka/konstytucja-dla-nauki-2>.

<sup>16</sup> Ministry of Education and Science (2022), State Scientific Policy, <https://www.gov.pl/web/edukacja-i-nauka/polityka-naukowa-panstwa-przyjeta-przez-rade-ministrow>, accessed 04/10/2023.

<sup>17</sup> Ministry of Economic Development and Technology (2022), The Productivity Strategy 2030, available at <https://www.gov.pl/web/rozwoj-technologia/strategia-produktywnosci-2031> .

economy by stimulating private investment in R&I, improving the organisation of higher education and research centres, further defining national technology policies, promoting social innovation, and supporting the cooperation between research and business.

Other policies relevant to Poland's R&I sector include: i) the **Polish Hydrogen Strategy 2021-2030**,<sup>18</sup> introduced in 2021 and supported by the Ministry of Climate and Environment, which defines goals and actions for the development of national competencies and technologies for a low-emission economy; and ii) the **Policy of Artificial Intelligence Development in Poland**,<sup>19</sup> introduced in 2020 and supported by the Chancellery of the Prime Minister, which defines actions and objectives for the development of artificial intelligence in Poland.

## 2. Assessment of the Implementation of the ERA Policy Agenda and ERA Priorities

Chapter 2 has two objectives: 1) It qualitatively assesses the state-of-play of the implementation of the ERA actions that Poland has committed to. The qualitative information stems from the OECD STIP survey 2023 and supplementary national data sources, referenced where relevant; 2) It quantitatively assesses the country's progress towards achieving the ERA priorities as set out on the Pact for Research and Innovation in Europe. The presented quantitative information is mainly based on the ERA Scoreboard and ERA Dashboard indicators<sup>20</sup> and covers longer-term trends since 2010. Additionally, general indicators for the overall R&I system are outlined in Table 1. More detailed information on the data and graphs can be found in Annex 1.

Poland has committed to 11 ERA actions. In some cases, the activities implemented are broad and cover multiple actions, whereas others are dedicated to the objectives of one or two actions. Due to the diversity of activities, there is no single strategy dedicated to the implementation of the ERA Policy Agenda. However, the ERA actions are implemented through a range of national policies and initiatives. This report will serve as a baseline for reporting in the future.

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<sup>18</sup> Ministry of Climate and Environment (2021). Polish Hydrogen Strategy ('Polska strategia wodorowa'), available at <https://www.gov.pl/web/klimat/polska-strategia-wodorowa-do-roku-2030>.

<sup>19</sup> Council of Ministries of Poland (2020), Policy of Artificial Intelligence Development on Poland ('Polityka rozwoju AI w Polsce'), available at <https://www.gov.pl/web/govtech/polityka-rozwoju-ai-w-polsce-przyjeta-przez-rade-ministrow--co-dale>.

<sup>20</sup> See <https://european-research-area.ec.europa.eu/era-monitoring-reports>.

**Table 1. General ERA Scoreboard and ERA Dashboard indicators<sup>21</sup>**

Indicator	Most recent EU average	Most Recent Metric
Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP	2.26 (2021)	1.44 (2021)
Government Budget Allocations for R&D (GBARD) as a share of GDP	0.76 (2021)	0.46 (2021)
Researchers (in full-time equivalent) per million inhabitants	4,483.4 (2021)	3,594.8 (2021)
Business Enterprise expenditure on R&D (BERD) as a percentage of GDP	1.49 (2021)	0.9 (2021)

Source: compiled by research team based on the ERA Scoreboard and ERA Dashboard indicators

## 2.1. ERA Priority 1: Deepening a truly functional internal market for knowledge

### 2.1.1. State of play in the implementation of the ERA Actions

In relation to **ERA Action 1: Enable the open sharing of knowledge and the re-use of research outputs, including through the development of the European Open Science Cloud (EOSC)**, the first document on open access was set by the official document of the Ministry of Science and Higher Education “**The directions of the development of open access to publications and research results in Poland**”<sup>22</sup> agreed in 2015. It was followed by other documents, including open access to publications and research data.

In 2018, the **National Science Centre (NCN) adopted Plan S**<sup>23</sup>, which established that research results funded by grants must be open and public. Similarly, the NCN issued an order in 2020 on the open access policy stating that, to be eligible for funding approval, researchers had to publish their investigations in open access repositories.<sup>24</sup> According to the **EOSC Survey 2021**, Poland indicated having a Mandated Organisation to the EOSC Association already appointed and EOSC-relevant policies in planning.

Furthermore, the **Poznan Supercomputing and Networking Centre of Poland**<sup>25</sup> adopted in 2015 the **National Data Storage (NDS)**, a global infrastructure to interchange big data and artificial intelligence information. At a national level, **PLGrid National Cloud Infrastructure for EOSC** offers Polish researchers the services of computer companies and aim to simplify the exchange and storage of data.<sup>26</sup>

In relation to **ERA Action 3: Reform the Assessment System for research, researchers and institutions**, the evaluation of higher education entities and research institutes is based on the

<sup>21</sup> Further information on the trends can be found in Annex 1

<sup>22</sup> National Science Centre (2023). Directions of the development of open access <https://www.gov.pl/web/edukacja-i-nauka/dokumenty-na-temat-otwartego-dostepu>, accessed 3/10/2023

<sup>23</sup> European Science Foundation, Plan S. available at: <https://www.coalition-s.org/addendum-to-the-coalition-s-guidance-on-the-implementation-of-plan-s/principles-and-implementation/>

<sup>24</sup> Open Access Policy at NCN, Order No 38/2020 of the Director of the National Science Centre. 2020. [https://ncn.gov.pl/sites/default/files/pliki/zarzadzenia-dyrektora/zarzadzenieDyr-38\\_2020\\_ang.pdf#page=2](https://ncn.gov.pl/sites/default/files/pliki/zarzadzenia-dyrektora/zarzadzenieDyr-38_2020_ang.pdf#page=2)

<sup>25</sup> National Data Storage: delivery of the long-term storage system elements. <https://www.psnk.pl/>

<sup>26</sup> <https://eosc.eu/wp-content/uploads/2023/10/Cyfronet-in-EOSC-1.pdf>



**Law on Higher Education and Science** adopted in 2018<sup>27</sup> and the **Regulation of the Ministry of Science and Higher Education** adopted in 2022.<sup>28</sup> The evaluation of scientific activity is carried out every four years by a Science Evaluation Committee for each scientific discipline within the higher education entity. The results of the evaluation, in the form of a category (from A+ to C) for a discipline and institution, are publicly available. The category impacts the rights of the higher education institution to conduct studies and award diplomas (e.g. at least category B+ is required for doctoral education) and the institution's budget to some degree.

Evaluation is a subject of constant discussion in the scientific environment. Due to controversies regarding the criteria of evaluation and assessment of the academic impact of scientific publications, the Ministry was considering changes in the evaluation rules based on feedback from higher education representatives,<sup>29</sup> yet these plans were altered, shifting governance and political priorities. Polish higher education and research institutions are also signatories of the **Coalition for Advancing Research Assessment (CoARA)**.<sup>30</sup>

In relation to **ERA Action 4: Promote attractive research careers, talent circulation and mobility** activities have been undertaken. The **National Agency of Academic Exchange (Narodowa Agencja Wymiany Akademickiej)** is responsible for promoting Polish science and education abroad, such as by representing Poland at international conferences or hosting workshops, training, and meetings with Polish universities present.<sup>31</sup> It also supports returns to Poland of Polish researchers working abroad.<sup>32</sup> This Action is also supported by the activities of the **National Centre for Research and Development (Narodowe Centrum Badań i Rozwoju)**, and the **National Science Centre (Narodowe Centrum Nauki)**. Polish higher education institutions are also implementing the **Charter and Code of Conduct for the Recruitment of Researchers**.<sup>33</sup> The Foundation for Polish Science (a non-profit organisations) is also supporting researchers' careers by offering various funding opportunities.<sup>34</sup>

International grant programmes for researchers covering various topics in the area of science and health are offered by research funding agencies, such as M-ERA.NET3, TRANSCAN-3 ERA NET or ERA4Health by NCBiR<sup>35</sup> or ERA-NET, CHIST-ERA, NORFACE.<sup>36</sup>

There are limited initiatives in support of **ERA Action 5: Promote gender equality and foster inclusiveness**. The **Strategy for Social Inclusion and Diversity** of the National Erasmus+

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<sup>27</sup> Higher Education Law of 20/07/2018, Laws Diary 2018, position 1668.

<https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20180001668/U/D20181668Lj.pdf>

<sup>28</sup> Journal of Laws of the Republic of Poland from 23 of March 2022, pos. 661. The Regulation of the Ministry of Science and Higher Education related to the evaluation of the quality of scientific activity.

<https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20220000661/O/D20220661.pdf>

<sup>29</sup> Matlacz, A (2023), There will be no legal changes in evaluation of quality of research activity.

<https://www.prawo.pl/student/ewaluacja-jakosci-dzialalnosci-naukowej-uczelnii-institutow,521831.html>

<sup>30</sup> Coalition for Advancing Research Assessment CoARA, available at <https://coara.eu/about/>

<sup>31</sup> National Agency for Academic Exchange, Promotion and fairs. <https://nawa.gov.pl/promocja-i-targi>

<sup>32</sup> Polish Returns programme, <https://nawa.gov.pl/naukowcy/polskie-powroty>.

<sup>33</sup> Euraxess. <https://www.euraxess.pl/poland/information-assistance/european-charter-researchers-and-code-conduct-recruitment-researchers>

<sup>34</sup> Foundation for Polish Science. Actual programmes. [https://www.fnp.org.pl/kategoria\\_szkolenia/aktywne/](https://www.fnp.org.pl/kategoria_szkolenia/aktywne/).

<sup>35</sup> National Centre for Research and Development, Calls schedule, available at <https://www.gov.pl/web/ncbr/harmonogram-konkursow--2023>

<sup>36</sup> National Science Centre, international programmes, information available at <https://www.ncn.gov.pl/en/wspolpraca-zagraniczna/wspolpraca-wielostronna>

Agency aims at ensuring equal rights to participate in Erasmus+ programmes.<sup>37</sup> The strategy uses a broad definition of social exclusion based on various criteria, including disability, cultural differences, gender, age, religion, and sexual orientation, and targets both employees and beneficiaries. Additionally, some research calls include gender-balance criteria, such as the 'Collaboration of Humanities and Social Sciences in Europe' international research project aimed at the theme of social and cultural dynamics in the digital age.<sup>38</sup>

Although there is no national-level strategy related to this action, the Ministry of Science and Education has recently developed a new dataset called **RADON**<sup>39</sup> that collects data on HEIs and Science to address intersectionality and process the information in these areas. RADON provides open access to the statistics in the academic and research environments, allowing to observe the evolution of the country through disaggregating the data in terms of sex, gender and inclusivity among others.

**ERA Action 7: Upgrade EU guidance for a better knowledge valorisation** aims to address the various needs of the R&I landscapes in the context of management of intellectual property in knowledge transfer activities. The main national initiative is the **Lukasiewicz Research Network**, that is one of the largest research platforms in Europe focused on science and its connection with business.<sup>40</sup> Its objective is to propose solutions for the development of digitalisation and other current challenges. Additionally, in order to establish an efficient method of evaluation ensuring consistence and coherence within the assessment of the research academic environment, the Research Service Office of the University of Warsaw presented specific criteria to evaluate<sup>41</sup> the research system of Poland in the context of the **Evaluation 2021 Regulation**.<sup>42</sup>

In this context multiple activities are organised by national ministries<sup>43</sup> and agencies.<sup>44</sup> For example, the Innovation Coach (IC) instrument provides advice and mentoring for entrepreneurs as potential beneficiaries of the European Funds for Modern Economy 2021-2027<sup>45</sup> programme. The Polish Agency for Enterprise Development offers grants for business R&I aimed at increasing the entrepreneurialism and internationalisation of the SME and research sectors.<sup>46</sup> The National Centre for Research and Development is offering funds with knowledge valorisation requirement, such as Eurostars-3, where the results should be implemented within two years.<sup>47</sup>

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<sup>37</sup> Strategy for Social Inclusion and Diversity, <https://erasmusplus.org.pl/wlaczanie-i-roznorodnosc>.

<sup>38</sup> National Science Centre, international research project CHANSE (Collaboration of Humanities and Social Sciences in Europe), [https://www.ncn.gov.pl/wspolpraca-zagraniczna/wspolpraca-wielostronna/chans\\_e](https://www.ncn.gov.pl/wspolpraca-zagraniczna/wspolpraca-wielostronna/chans_e).

<sup>39</sup> Radon dataset. <https://radon.nauka.gov.pl/o-systemie/o-projekcie>

<sup>40</sup> Lukasiewicz Research Network. <https://lukasiewicz.gov.pl/en/get-to-know-us/>

<sup>41</sup> Criterion II covers the financial effects of research and development. It established a guide to analyse the progress and commercialisation of the research projects in terms of financial results. Similarly, criterion III looked at the definition of the consequences of scientific activities, on the economic and social polish environment. Criterion III aims to cover the significance and importance of the projects at the local, regional and global levels.

<sup>42</sup>For further details, please see "How will research units be evaluated? Evaluation regulation. Evaluation 2021. University of Warsaw". <http://bob.uw.edu.pl/ewaluacja-2021-jak-oceniane-beda-jednostki-naukowe-prezentujemy-rozporzadzenie-ws-ewaluacji/>.

<sup>43</sup> Ministry of Funds and Regional Policy, Ministry of Education and Science.

<sup>44</sup> Agency for Enterprise Development. The Foundation For Polish Science.

<sup>45</sup> Detailed Description of Priorities of the Programme European Funds for Modern Economy (FENG) (2023). [https://www.nowoczesnagospodarka.gov.pl/media/123364/SZOP\\_FENG\\_03\\_10\\_2023.pdf](https://www.nowoczesnagospodarka.gov.pl/media/123364/SZOP_FENG_03_10_2023.pdf)

<sup>46</sup> Examples: 1) project SMART2, with the objective of developing and strengthening of research and innovation capabilities of enterprises by product innovation, digital and sustainable development.

<sup>47</sup> National Centre for Research and Development, Programmes, <https://www.gov.pl/web/ncbr/platforma-konkursowa/#/ncbr?sort=announcementDate,desc&currentPage=0&limit=10>

In relation to the **ERA Action 8: Strengthen research infrastructures**, the **State Scientific Policy**, accepted by the Council of Ministers of Poland in 2022,<sup>48</sup> underlines that research infrastructure is a significant factor for research excellence and undertaking breakthrough research programmes. Poland is participating in the works of **European Strategy Forum on Research Infrastructures (ESFRI)**. The first **Polish Roadmap for Research Infrastructure (PRRI)** was already published in 2011. In the most recent update, the PRRI is described as a tool that research institutes and laboratories may use for further development and help the Ministry to define investment policy. It maps 70 entities (institutes, research centres, laboratories), chosen through a transparent process carried out in accordance with ESFRI standards, divided into six thematic areas.

#### 2.1.2. Progress towards achieving ERA Priorities

Under **Sub-priority 1.1: Open science**, the indicator **share of publications available in open access** in Poland increased in the last years and was slightly higher than the EU-27 average. In 2009, the percentage corresponding to Polish publications was 35% against the 35.5% in the EU-27. In 2019 the appropriate percentage in Poland increased to 41%, while the European value increased to 39.5% (Figure 5 in Annex 1).

The **share of national public R&D expenditure allocated to European research infrastructures in 2022** in relation to **Sub-priority 1.2: Research infrastructures**, is really similar in Poland and the EU,<sup>49</sup> as the registered values are 1.85% and 1.82% respectively. Furthermore, the indicator measuring the progress is the **number of European research infrastructures in which Poland participated**. In 2021 Poland participated in 19 European research infrastructures, which was above the average for the EU (16) (Figure 6 in Annex 1).

In terms of **Sub-priority 1.3: Gender equality, equal opportunities for all and inclusiveness**, several indicators are used for measuring the progress and highlight that the situation of Poland is mixed. The **share of women in grade A positions in HEIs** (Figure 7 in Annex 1) was 25% in 2018 and was marginally below the EU-27 average (26%), whereas the **proportion (%) of women among doctoral graduates by narrow fields of Science, Technology, Engineering and Mathematics (STEM)** in Poland equalled to 50% (2020), above the EU-27 average (37%, Figure 8 in Annex 1).

The **proportion of papers with mixed-gender authorship** was 55% in 2020 in Poland, below the average for the EU-27 (63%, Figure 9 in Annex 1), whereas the **proportion of women in authorships of the top 10% of most cited publications** was 38% (2018) in Poland, above the EU-27 average (32%, Figure 10 in Annex 1). The **Women in Digital Index in 2022** achieved 47% in Poland, lower than the EU-27 average (53%, Figure 11 in Annex 1).

Similarly, various indicators regarding **Sub-priority 1.4: Researchers' careers and mobility and research assessment and reward systems**, are taken into account where Poland was either below or equal to EU-27 average values. The **share of foreign doctorate students as a percentage of all doctorate students in Poland** was 8% in 2020, below the EU

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<sup>48</sup> Ministry of Education and Science (2022), State Scientific Policy ('Polityka naukowa państwa'), available at <https://www.gov.pl/web/edukacja-i-nauka/polityka-naukowa-panstwa-przyjeta-przez-rade-ministrow>.

<sup>49</sup> The EU average for this indicator is calculated considering the contributions of the 15 EU Member States for which data is available, which includes: Belgium, Bulgaria, Spain, France, Greece, Hungary, Italy, Latvia, Malta, The Netherlands, Poland, Portugal, Romania, Slovenia and Slovakia. In addition, the data is also available for two Associated Countries: Iceland and Norway.

average of 24%. This percentage in Poland increased in 2020 after several years of stable, very low levels (Figure 12 in Annex 1).

The **number of new doctorate graduates per 1,000 inhabitants aged 25-34**, achieved a value close to 0.2, which was below the EU-27 average (Figure 13 in Annex 1). Finally, the indicator of **job-to-job mobility of Human Resources in Science and Technology** equalled 7 in Poland (2020), on the same level as the EU-27 average (Figure 14 in Annex 1).

Four indicators are used to measure the progress **Sub-priority 1.5: Knowledge valorisation**. Poland was below the EU average for all the indicators within this sub-priority. The **share of public-private co-publications per million inhabitants in Poland** was 80 in 2021, and the average for the EU-27 was over 130 (Figure 15 in Annex 1). The **number of PCT patent applications divided by GDP in million Euros** was 0.0014 in Poland (2015), whereas the average for the EU-27 achieved 0.0024 (Figure 16 in Annex 1). **Business enterprise researchers as % of national researchers** achieved 50% in Poland, below the EU-27 average of 56% (Figure 17 in Annex 1), whereas the value of **business enterprise researchers in full-time equivalent per thousand employees in the industry** was 5 in Poland, and 7 in the EU-27 (Figure 18 in Annex 1). The final indicator, **share of innovating firms collaborating with higher education institutions or public/private research institutions**, was 11% in Poland (2020), one percentage point below the EU-27 average (Figure 19 in Annex 1).

Regarding **Sub-priority 1.6: Scientific leadership**, the **number of scientific publications among the top-10% most cited publications worldwide as a percentage of all publications** was 5% in Poland in 2020, slightly increasing since 2010 (Figure 20 in Annex 1). The EU-27 average for this indicator was 11%. The European average for the **Academic Freedom Index (AFI)** remained stagnant during the period. Poland was over the EU-27 average until 2019, when the values for the country started to decrease (Figure 21 in Annex 1).

**Sub-priority 1.7: Global engagement** is measured by the indicator **international co-publications with non-EU partners per 1,000 researchers in the public sector**. The value for the indicator in Poland consistently increased since 2010 and achieved a value of 591 in 2022, below the EU-27 average of 1278 (Figure 22 in Annex 1). Figure 23 in Annex 1 shows **the European and international co-patenting in EPO applications at national and EU level**, that is constantly below the EU-27 average and remains quite stagnant from 2010 to 2013.

## 2.2. ERA Priority 2: Taking up together the challenges posed by the twin green and digital transition and increasing society's participation in the ERA

### 2.2.1. State of play in the implementation of the ERA Actions

In relation to **ERA Action 10: Make EU research and innovation missions and partnerships key contributors to the ERA**, Poland participates in a variety of programmes under Horizon Europe. Polish entities from industry, higher education, research institutes, NGO's and other are partners in European Partnerships. The country was engaged in 75 partnership under

Horizon 2020,<sup>50</sup> such as the **Key Digital Technologies Joint Undertaking**<sup>51</sup> or **ERA4Health**<sup>52</sup>.

The country also takes part in the **Partnership Knowledge Hub**, and various partnerships steering groups.<sup>53</sup> The promotion and dissemination of this joint activities is mainly carried out by the **National Contact Point** of the National Centre for R&D,<sup>54</sup> and the **Industrial Contact Points** managed by the Łukasiewicz Network.<sup>55</sup> Similarly, with the aim of improving the connection with EU stakeholders, the **Brussels office of National Centre for Research and Development** was established.<sup>56</sup>

In addition, R&I sectoral strategies have also been implemented at a national level. Some examples are the **Polish Nuclear Energy Programme**,<sup>57</sup> **2030 Strategy for Sustainable Development of Rural Areas, Agriculture and Fisheries**,<sup>58</sup> **Multi-year Programme for the Development of the use of Geothermal Resources in Poland**,<sup>59</sup> and **Energy Policy of Poland until 2040**.<sup>60</sup> Although not explicitly referring to Horizon Europe, these initiatives cover similar topics key for the research and innovation sphere. For example, the **National Raw Materials Policy 2050**<sup>61</sup> mentions that the list of strategic raw materials has helped with targeting investment and R&I towards the areas of greatest need under EU programmes, such as Horizon 2020.<sup>62</sup>

Towards the implementation of **ERA Action 11: An ERA for green transformation**, the main programming document is the **National Energy and Climate Plan 2021-2030 (NECP)**.<sup>63</sup> It sets climate and energy targets for 2030 along five dimensions: energy safety, internal energy market, energy effectiveness, decreasing emissions, research, innovation, and competitiveness. The most important strategic programmes for green transformation include “**Hydrostrateg**” (innovations for water management and inland waterway transport”),

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<sup>50</sup> Poland Country Fiche, Horizon 2020. [https://projects.research-and-innovation.ec.europa.eu/sites/default/files/bmr-2022/ec\\_rtd\\_bmr-2022-poland-country-fiche.pdf](https://projects.research-and-innovation.ec.europa.eu/sites/default/files/bmr-2022/ec_rtd_bmr-2022-poland-country-fiche.pdf)

<sup>51</sup> Key Digital Technologies Joint Undertaking. [https://european-union.europa.eu/institutions-law-budget/institutions-and-bodies/search-all-eu-institutions-and-bodies/key-digital-technologies-joint-undertaking\\_en](https://european-union.europa.eu/institutions-law-budget/institutions-and-bodies/search-all-eu-institutions-and-bodies/key-digital-technologies-joint-undertaking_en)

<sup>52</sup> ERA4Health. <https://www.gov.pl/web/ncbr/era4health-konkurs-NanoTecMec-2025>

<sup>53</sup> Partnership Knowledge Hub. Europe. <https://www.era-learn.eu/documents/opinion-of-the-partnership-knowledge-hub-on-the-european-ki0923427enn.pdf#:~:text=The%20Partnership%20Knowledge%20Hub%20%28PKH%29%20is%20a%20Horizon,the%20Specific%20Programme%20implementing%20Horizon%20Europe%20Specific%20Programme>.

<sup>54</sup> National Contact Point. National Centre for research and development. <https://www.gov.pl/web/ncbr-en/national-contact-point>

<sup>55</sup> Industrial contact point. LRN. <https://bpkhoryzont.pl/en/>

<sup>56</sup> Brussels Office for the Centre for R&D. <https://www.gov.pl/web/ncbr-en/ncbr-office-in-brussels>

<sup>57</sup> Council of Ministries (2020), Polish Nuclear Energy Programme. <https://www.gov.pl/web/polski-atom/program-polskiej-energetyki-jadrowej>

<sup>58</sup> Council of Ministries (2020), Strategy for Sustainable Development of Rural Agriculture and Fisheries <https://www.gov.pl/web/rolnictwo/strategia-zrownowazonego-rozwoju-wsi-rolnictwa-i-rybactwa-2030>

<sup>59</sup> Ministry of Climate and Environment (2021), Multi-year Program for the Development of the use of Geothermal Resources in Poland. <https://www.gov.pl/web/klimat/mapa-drogowa-rozwoju-geotermii-w-polsce>

<sup>60</sup> Ministry of Climate and Environment (2021), Energy Policy of Poland until 2040, <https://www.gov.pl/web/ia/polityka-energetyczna-polski-do-2040-r-pep2040>

<sup>61</sup> Ministry of Climate and Environment (2022), National Raw Materials Policy. <https://www.gov.pl/web/klimat/polityka-surowcowa-panstwa---dokument>

<sup>62</sup> National Raw Materials (2022) <https://www.gov.pl/web/klimat/polityka-surowcowa-panstwa---dokument>

<sup>63</sup> National Energy and Climate Plan. <https://www.gov.pl/web/klimat/krajowy-plan-na-rzecz-energii-i-klimatu>

“**Biostrateg**” (research on natural environment, agriculture and forestry) and “**New Technologies in the field of Energy**”.<sup>64</sup>

With regard to **ERA Action 12: Accelerate the green/digital transition of Europe's key industrial ecosystems**, the most important strategy document is the **Energy Policy of Poland until 2040**, which focuses primarily on a just and inclusive energy transition towards a zero-emissions system based on innovation, sustainable economic growth, increased efficiency and competition<sup>65</sup>. It sets the framework for the energy transformation in the country, prioritising energy security alongside competitiveness, energy efficiency, sustainability, and other topics.

Additionally, the most fundamental activities within this action are: a) “**Hydrogen Storage Programme**”; b) **Hydrogen Valleys** under the Polish Hydrogen strategy up to 2030; c) **High Temperature Gas-cooled Reactor** – research programme in cooperation with Japan; d) **Gospostrateg** programme supporting investments in wind and solar energy.<sup>66</sup>

Advancement towards the digital transition is exemplified by ‘**ARTIQ**’ call, which provides co-financing of basic and industrial research, development or pre-implementation work, and the establishment of special purpose vehicles and supports the creation of three Centres of Excellence in the field of artificial intelligence.<sup>67</sup>

In relation to **ERA Action 14: Bring Science closer to citizens**, the 3<sup>rd</sup> criterium of the evaluation of scientific activity of higher education institutions refers directly to the social impact of research activities. The last evaluation of research activities was performed in 2021/2022 and a number of activities related to the societal interactions were included. Ministry of Science introduced the programme “**Science for Society**”<sup>68</sup> supporting higher education institutions in public dissemination of research results (inactive since March 2022). Moreover, the **National Science Centre** is participating in the Science Europe communication working group.<sup>69</sup> The **State Scientific Policy** acknowledges low social trust in research and limited awareness on the importance of innovation as one of the key challenges in the area of bringing science closer to citizens.<sup>70</sup>

#### 2.2.2. Progress towards achieving ERA Priorities

With regard to progress towards **Sub-priority 2.1: Challenge-based ERA actions**, five indicators are used. **Government budget allocations for R&D (GBARD)** by *energy and environment* in Poland were below the EU-27 average over the period. However, the country's data on the *transport, telecommunications and others* was above the European level until 2018, when it dropped significantly (Figure 24 in Annex 1). **R&I investments (transnational cooperation) as GBARD (EUR) allocated to Europe-wide transnational, bilateral or multilateral, public R&D programmes per FTE researcher in the public sector** in Poland achieved the value of 350 in 2020, far below the EU-27 average of 1,900

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<sup>64</sup> Centre for R&D, Strategic programmes, <https://www.gov.pl/web/ncbr/programy-strategiczne>.

<sup>65</sup> Ministry of Climate and Environment (2021), Energy Policy of Poland until 2040. <https://www.gov.pl/web/ia/polityka-energetyczna-polski-do-2040-r-pep2040>

<sup>66</sup> National Centre for Research and Development, <https://www.gov.pl/web/ncbr/gospostrateg>.

<sup>67</sup> National Science Centre, ARTIQ call for financing projects, which could increase the potential of research and innovation potential in the area of artificial intelligence, details available at <https://www.ncn.gov.pl/ogloszenia/konkursy/artiq>

<sup>68</sup> <https://scienceinpoland.pl/en>

<sup>69</sup> National Science Center. <https://www.ncn.gov.pl/en>

<sup>70</sup> Ministry of Education and Science (2022), Scientific Policy of the State ('Polityka naukowa państwa'), <https://www.gov.pl/web/edukacja-i-nauka/polityka-naukowa-panstwa-przyjeta-przez-rade-ministrow>

(Figure 25 in Annex 1). The data for **environmentally related government R&D budget as a percentage of total government R&D** are available for Poland only for years 2015-2018. The data for the last available value show that, the share of government R&D budget in Poland was close to 8%, above the 2% EU-27 average (Figure 26 in Annex 1).

The **national public and private investments as suggested in the SET Plan progress report** achieved in Poland the value of 146, after a slight but continuous decrease since 2010. The EU average value was higher and kept growing until 2020 (Figure 27 in Annex 1). Poland had 7 **OECD patents on environmental technologies** in 2018, below the EU average of 13; however, this increased in Poland to 9 in 2019 (Figure 28 in Annex 1).

Progress towards **Sub-priority 2.2: Synergies with education and the European Skills Agenda** is measured by a single indicator: **the share of researchers receiving transferable skills training**. In 2019, Poland had 40% of such researchers, below the EU-27 average of 47% (Figure 29 in Annex 1). This was a considerable decrease from 2016, where Poland had just over 50% of researchers receiving transferable skills training.

Analysing **Sub-priority 2.3: Synergies with sectorial policies and industrial policy, in order to boost innovation ecosystems, direct government support and indirect government support through R&D tax incentives as a percentage of GDP** achieved a value of 0.17% in Poland in 2020, slightly below the EU-27 average (0.19%) (Figure 30 in Annex 1).

Measuring advancement of **Sub-priority 2.4: An active citizen and societal engagement in R&I in all its dimensions** was through two indicators. The **level of trust in science** in Poland (50%) was higher than the EU-27 average (46%) based on the 2021 data (Figure 31 in Annex 1). The **research on social innovation (publications on 'social innovation' or 'social entrepreneurship') per million population** was, on the other hand, lower in Poland than the EU-27 average using 2021 data (Figure 32 in Annex 1).

## 2.3. ERA Priority 3: Amplifying access to research and innovation excellence across the Union

### 2.3.1. State of play in the implementation of the ERA Actions

In relation to the **ERA Action 16: Improve EU-wide access to excellence** significant activities are undertaken aimed at developing high quality research teams, building research infrastructure, and strengthening the research and innovation capabilities of enterprises.

Besides being active under **Horizon 2020 and Horizon Europe**, activities related to research excellence includes projects implemented by the **Foundation for Polish Science** (including International Research Agenda scheme).<sup>71</sup> Other activities are: a) changes in the remuneration schemes of Polish research organisations that will promote excellent research activities; b) reform of the new evaluation pattern, that promotes excellent research using as a metric participation in EU research and innovation programmes; c) implementation by Polish higher education institutions the Human Resources Strategy for Researchers (HRS4R).

Examples of other programmes include: a) **CHANSE** - international research project that provides funding for high-quality international research projects and promotes cooperation

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<sup>71</sup> Foundation for Polish Science, actual programmes, [https://www.fnp.org.pl/kategoria\\_szkolenia/aktywne/](https://www.fnp.org.pl/kategoria_szkolenia/aktywne/)

between scientists and various interest groups,<sup>72</sup> and b) **INNOGLOBO** with objective of developing high-quality research networking between researchers, enhancing communication and scientific cooperation between Polish and foreign research teams, developing new partnerships and strengthening existing ones, and improving the competitive position of Polish and foreign enterprises in the world's markets.<sup>73</sup>

#### 2.3.2. Progress towards achieving ERA Priorities

**Sub-priority 3.1: More investments and reforms in countries and regions with lower R&I performance** is measured through the **increase (in percentage points) of total R&D expenditure expressed as a percentage of GDP**. The value of this indicator for Poland has been similar to the EU-27 average since 2011. In 2021 the increase in Poland was 0.5 percentage points, whereas the EU-27 average noted 0.1pp decrease (Figure 33 in Annex 1).

### 2.4. ERA Priority 4: Advancing concerted research and innovation investments and reforms

#### 2.4.1. Progress towards achieving ERA Priorities

Evolution of **Sub-priority 4.1: Coordination of R&I investments** is assessed through the **share of public R&D expenditures financed by the private sector**. It reached 3% in Poland, below the EU-27 average, which was over 9% in 2020 (Figure 34 in Annex 1).

## 3. Country-specific drivers and barriers

Poland has benefitted from **dynamic economic development in recent years**. GDP growth has been above the EU average for most of the past 20 years. The share of start-up companies in total employer enterprises almost doubled between 2010 and 2019, and the share of employment in high-growth enterprises in the most innovative sectors was also slightly above the EU average.<sup>74</sup> Business R&I investment over the last decade increased significantly, although still maintaining at a low level.<sup>75</sup>

Despite strong GDP growth, **public finances in Poland are under strain**. According to the Commission's forecast, the budget deficit is expected to increase between 2022 and 2023.<sup>76</sup> Economic development is likely to be affected by possible labour shortages due to the decreasing size of the active population and relatively high consumer demand.

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<sup>72</sup> National Science Centre, international research project CHANSE (Collaboration of Humanities and Social Sciences in Europe), available at <https://www.ncn.gov.pl/wspolpraca-zagraniczna/wspolpraca-wielostronna/chanse>

<sup>73</sup> National Centre for Research and Development, INNIGLOBO programme aimed at starting co-operation of Polish research institutions with international partners in various thematic areas, more information available at <https://www.gov.pl/web/ncbr/iii-konkurs-w-ramach-programu-innoglobo>

<sup>74</sup> European Commission (2023). 2023 Country Report – Poland. Accompanying the document Recommendation for a COUNCIL RECOMMENDATION on the 2023 National Reform Programme of Poland and delivering a Council opinion on the 2023 Convergence Programme of Poland. Available at [https://economy-finance.ec.europa.eu/publications/2023-european-semester-country-reports\\_en](https://economy-finance.ec.europa.eu/publications/2023-european-semester-country-reports_en).

<sup>75</sup> European Commission (2023), European Semester 2023, Poland country report, available at [https://economy-finance.ec.europa.eu/publications/2023-european-semester-country-reports\\_en](https://economy-finance.ec.europa.eu/publications/2023-european-semester-country-reports_en).

<sup>76</sup> Ibid



In relation to R&I, there is a **lack of a legal framework to accelerate the processes of robotisation, digitalisation, and innovation in the industry**, and the internal governance of research institutes limits the cooperation between science and industry. As a result, the development and diffusion of innovative technologies and solutions across the Polish economy, particularly among SMEs, remain limited, hindering the green and digital transitions. This could be addressed in the future by the RRP measures A2.1 “Accelerating robotisation and digitalisation and innovation processes” or C2.1 “Scaling up digital applications in the public sphere, the economy and society”.

According to the Community Innovation Survey, **Polish firms reported one of the lowest rates of innovation activities in the EU**.<sup>77</sup> The potential for progress in the area of research and competitiveness of Poland in creating new technologies are further limited by low shares of graduates in STEM subjects and shortages of skills in science and engineering.

**Public research is another barrier to the improvement of the R&I ecosystem.** The quality of the public science base, as measured by the share of scientific publications within the top 10% of most cited publications worldwide, remains still below the EU average. Additionally, science-business linkages remain to be improved.

## 4. Final remarks

Poland has committed to 11 ERA actions and has undertaken several initiatives to achieve the ERA priorities. The analysis of indicators measuring the progress towards achieving ERA objectives shows a relatively stable situation in Poland, indicating that overall progress towards closing the gap with the EU-27 average should be accelerated. The areas where most progress is observed are open science, global engagement, gender equality, and knowledge valorisation. The least progress was seen in relation to scientific leadership and the private and public investment for R&I.

Poland’s efforts to enhance the R&I ecosystem are reflected through various initiatives. For example, the regular evaluation of research and higher education institutions conducted by the Science Evaluation Committee strengthen the pursuit of efficiency and quality of the Polish R&I system. Additionally, there are specific sectoral R&I activities areas. Highlighting the relevance of ERA Priority 2, some initiatives are the Hydrogen Storage Programme, the Nuclear Plant Programme, and other activities focused on green transformation and artificial intelligence. Similarly, internationalisation is key, and therefore, the country is part of funding programmes that promote researcher excellence, open access, and knowledge transferability. In this context, Polish entities are very active in various parts of Horizon Europe, such as European Partnerships for example.

While the development of Poland’s R&I system is still constraint due to public and private budget limitations to fund research, development, and innovation-related activities, the Recovery and Resilience Plans address skill shortages and an improved role of public research in the R&I ecosystem.

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<sup>77</sup> Ibid

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## 6. Annexes

### 6.1. Annex 1: Graphs

The 2023 ERA Scoreboard and ERA Dashboard indicators used in the country report are presented in this annex. Detailed information on the data sources, description of the indicators, time period for which the data is available, and the necessary calculations can be found in the ERA Scoreboard and ERA Dashboard Methodology Reports. The most recent available data for each indicator has been used.

#### General Indicators

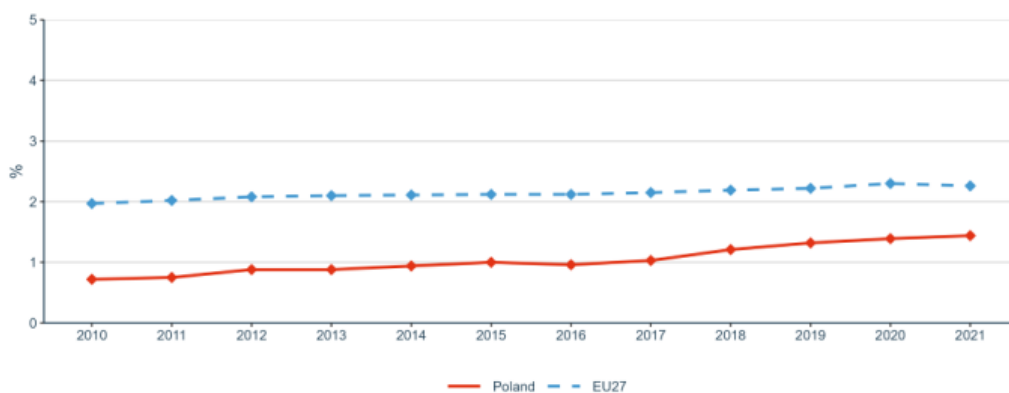


Figure 1: Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP

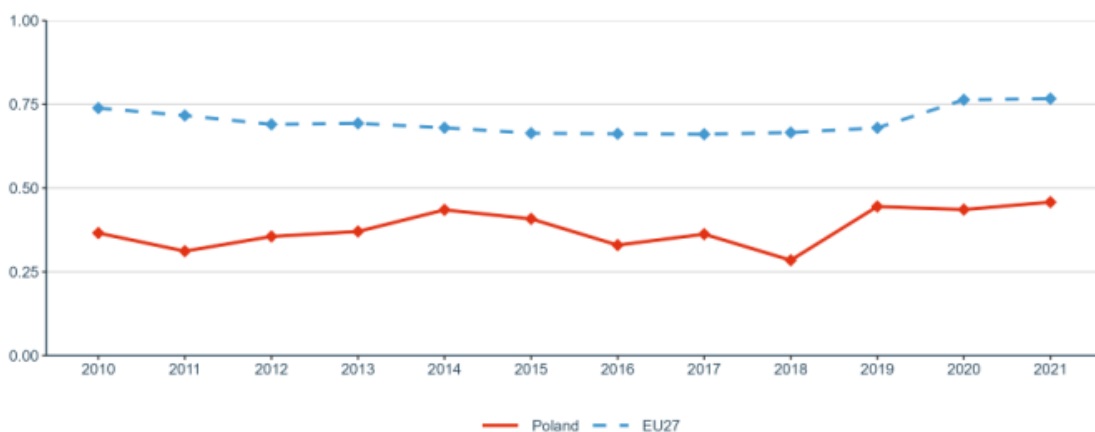


Figure 2: Government Budget Allocations for R&D (GBARD) as share of GDP

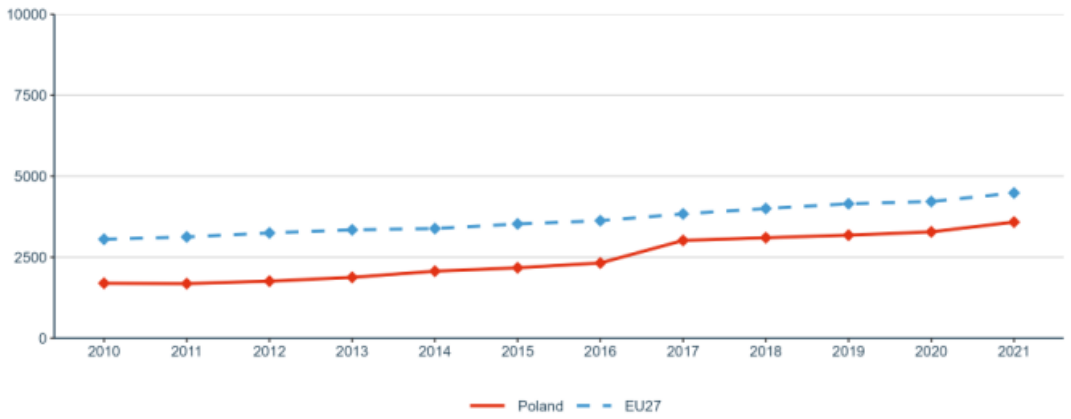


Figure 3: Researchers (in full-time equivalent) per million inhabitants

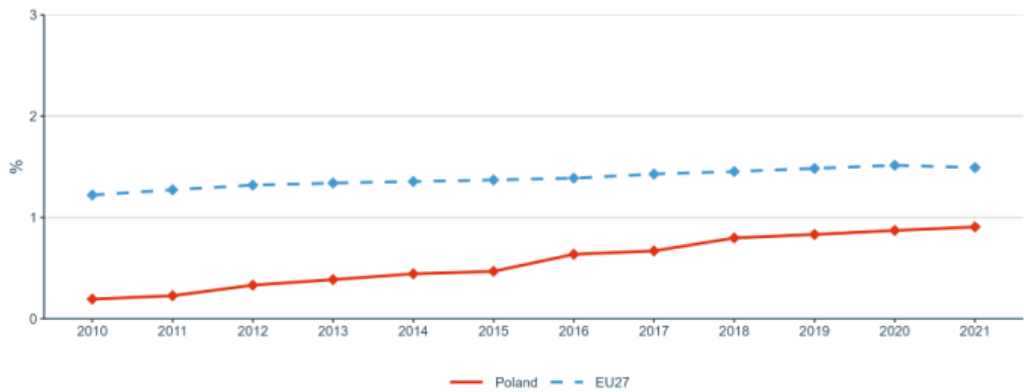


Figure 4: Business Enterprise expenditure on R&D (BERD) as a percentage of GDP

**Priority 1: Deepening a truly functioning internal market for knowledge**

Sub-priority 1.1: Open Science

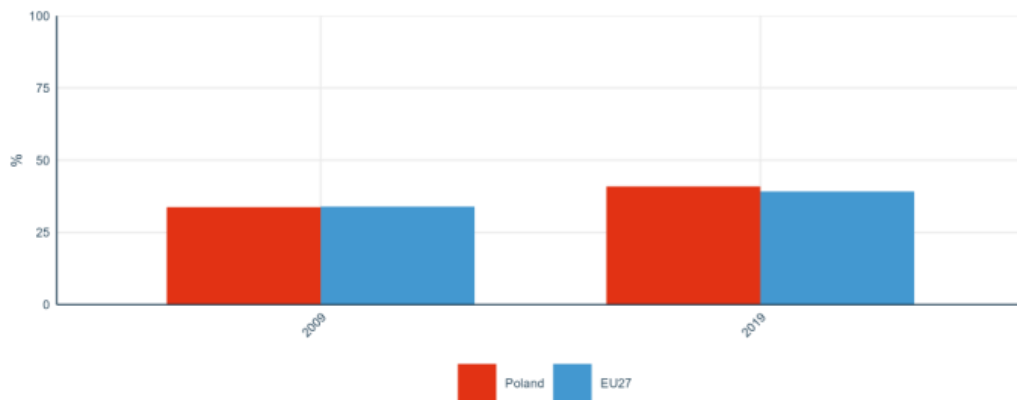


Figure 5: Share of publications available in open access

### Sub-priority 1.2: Research infrastructures

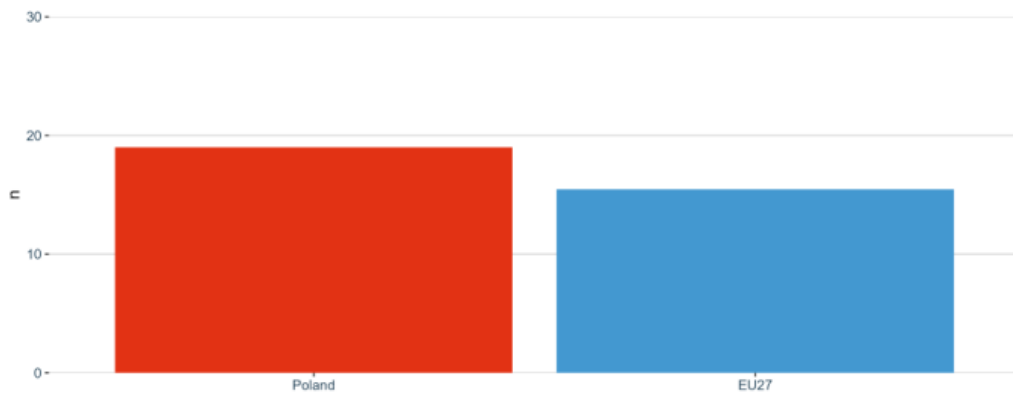


Figure 6: Number of European research infrastructures in which a Member State or an Associated Country participated (financially contributes to operations) in 2021



Sub-priority 1.3: Gender equality, equal opportunities for all and inclusiveness

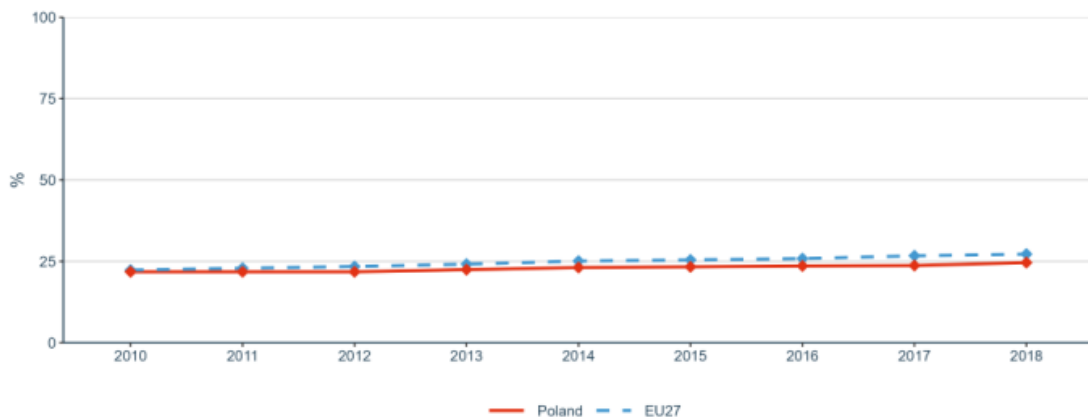


Figure 7: Share of women in grade A positions in HEIs

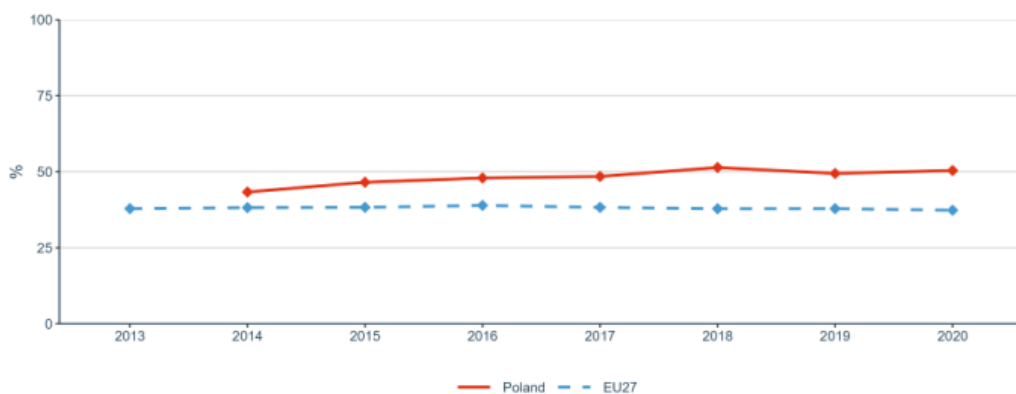


Figure 8: Proportion (%) of women among doctoral graduates by narrow fields of Science, Technology, Engineering and Mathematics (STEM)

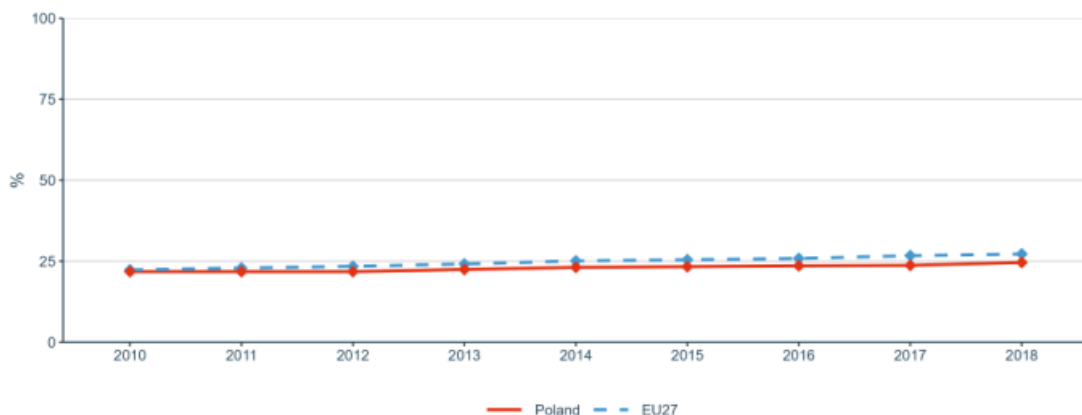


Figure 9: Proportion of papers with mixed gender authorship, 2000–2020

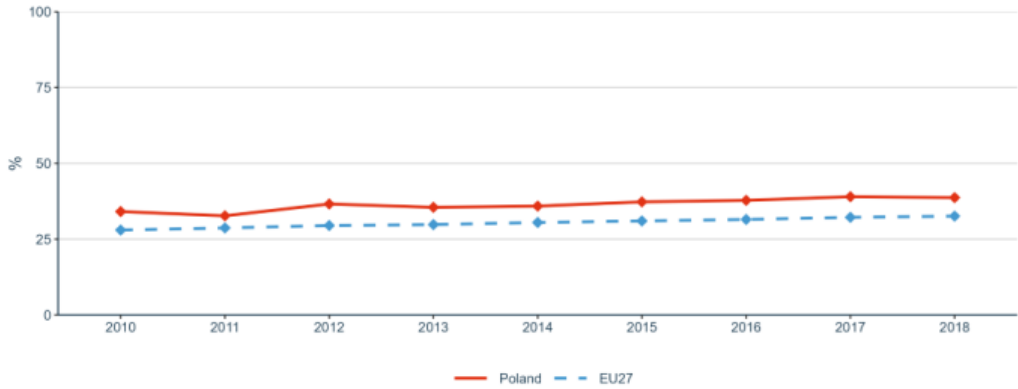


Figure 10: Proportion of women in authorships of the top 10% most cited publications, 2000–2018

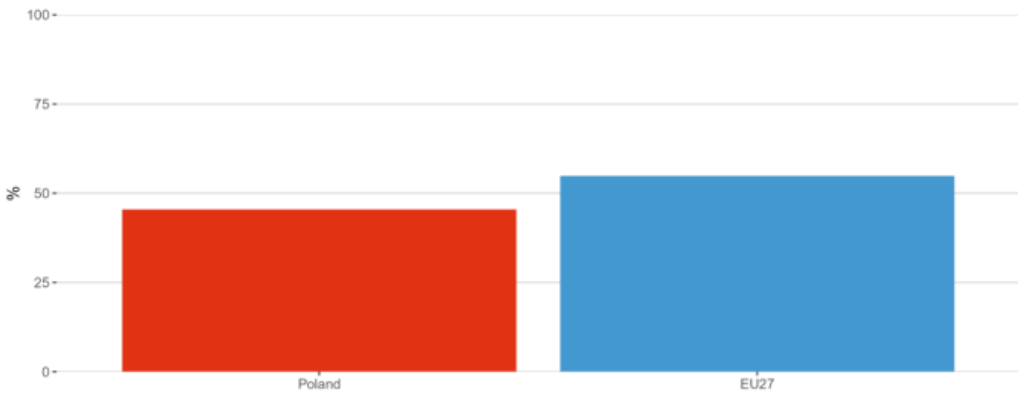


Figure 11: Women in Digital Index in 2022

Sub-priority 1.4: Researchers' careers and mobility and research assessment and reward systems

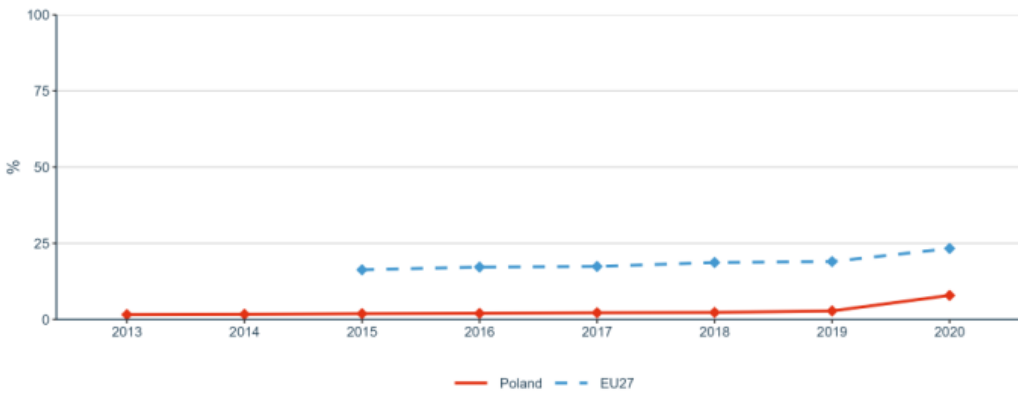


Figure 12: Share of foreign doctorate students as a percentage of all doctorate students

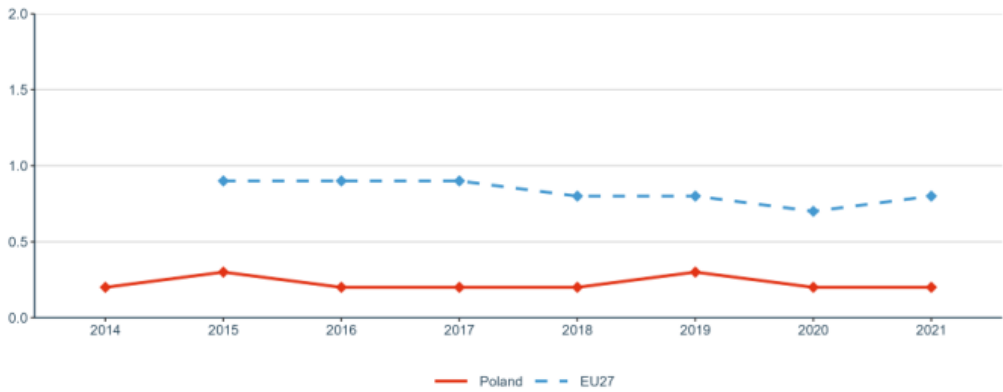


Figure 13: New doctorate graduates per 1,000 inhabitants aged 25-34

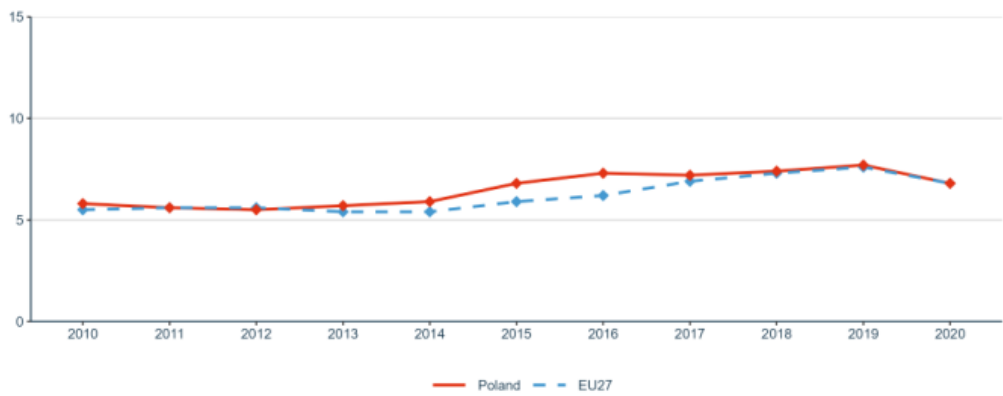


Figure 14: Job-to-job mobility of Human Resources in Science and Technology

### Sub-priority 1.5: Knowledge valorisation

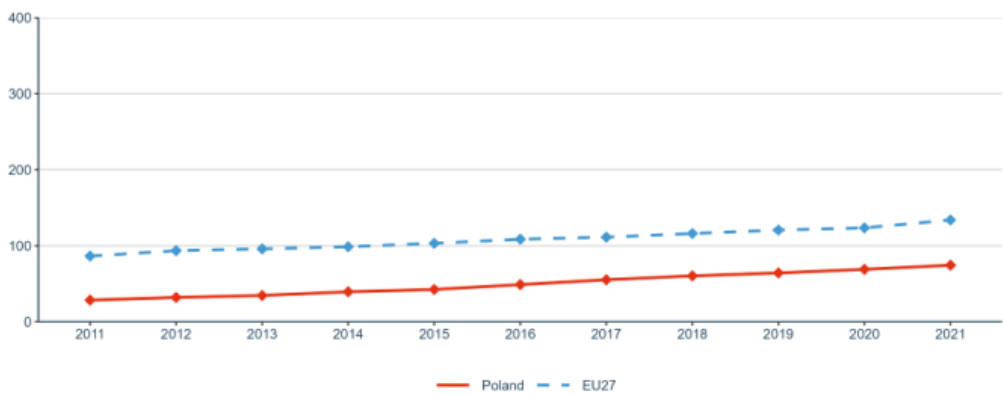


Figure 15: Share of public-private co-publications per 1 mio. inhabitants

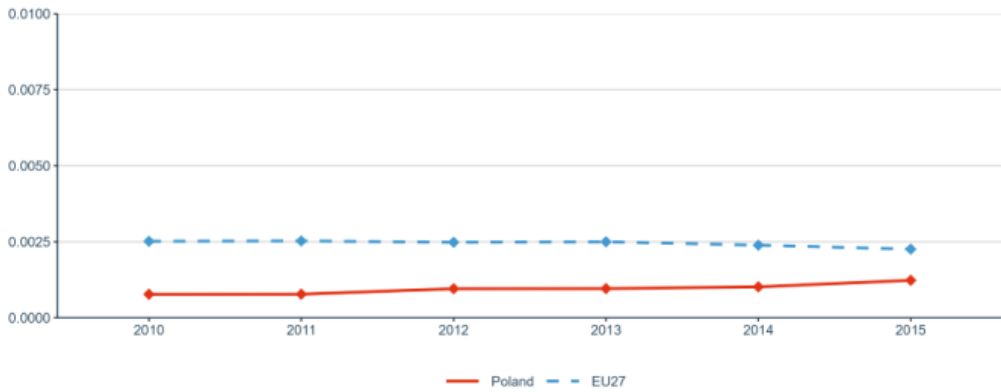


Figure 16: Number of PCT patent applications divided by GDP in million Euros

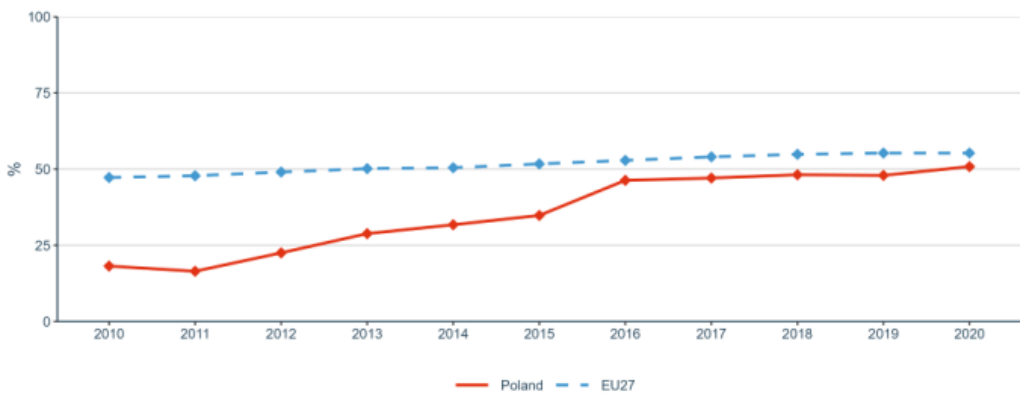


Figure 17: Business enterprise researchers as % of national researchers

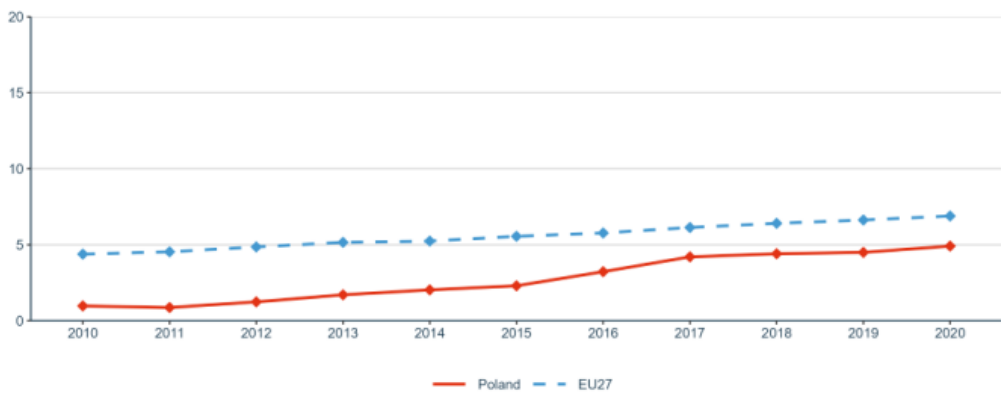


Figure 18: Business enterprise researchers in full-time equivalent per thousand employees in industry

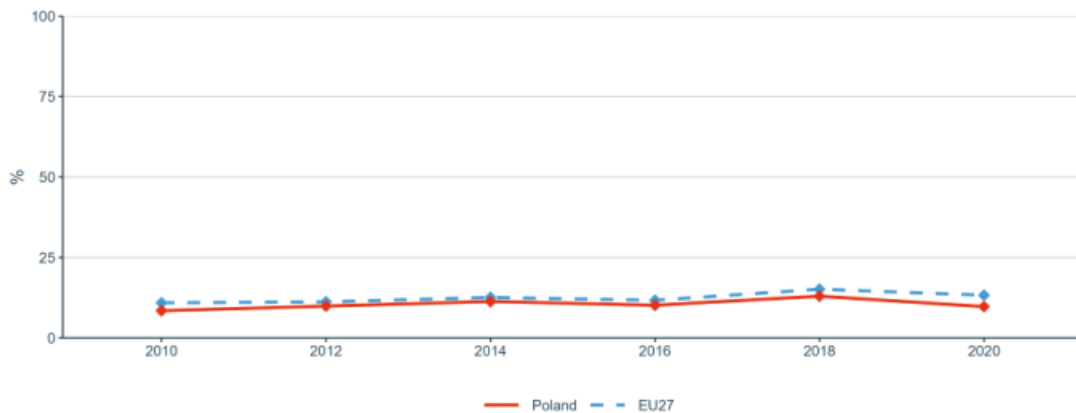


Figure 19: Share of innovating firms collaborating with higher education institutions or public/private research institutions

### Sub-priority 1.6: Scientific leadership

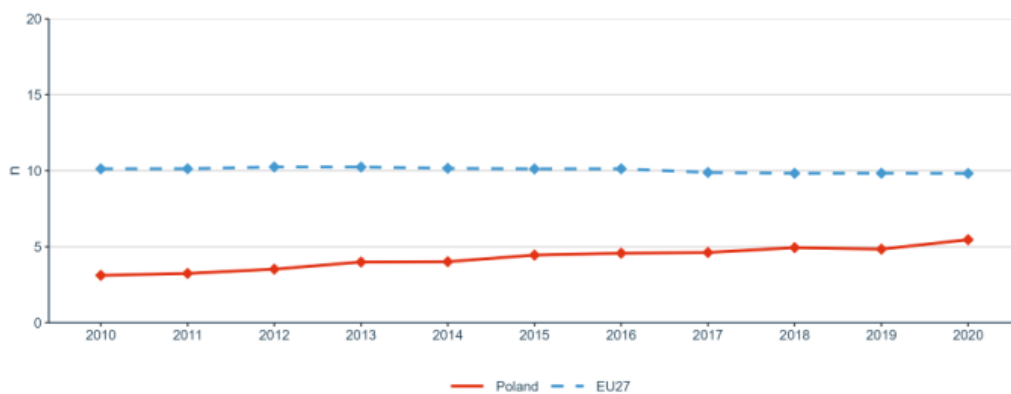


Figure 20: Number of scientific publications among the top-10% most cited publications worldwide as a percentage of all publications

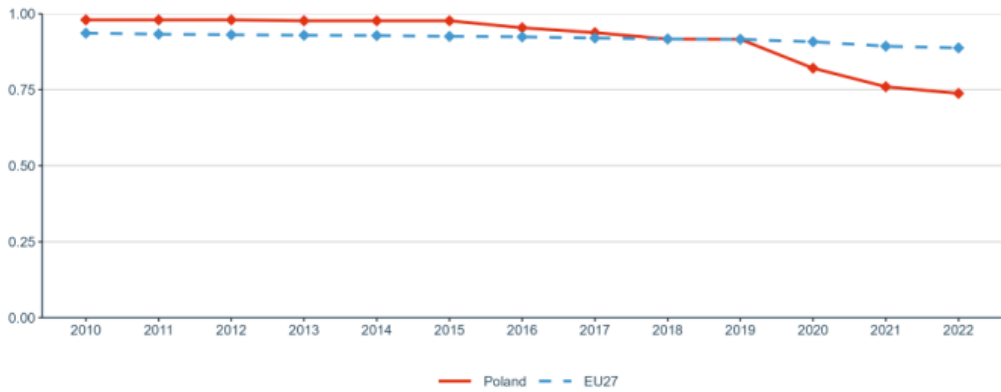


Figure 21: Academic Freedom Index (AFI)

Sub-priority 1.7: Global engagement

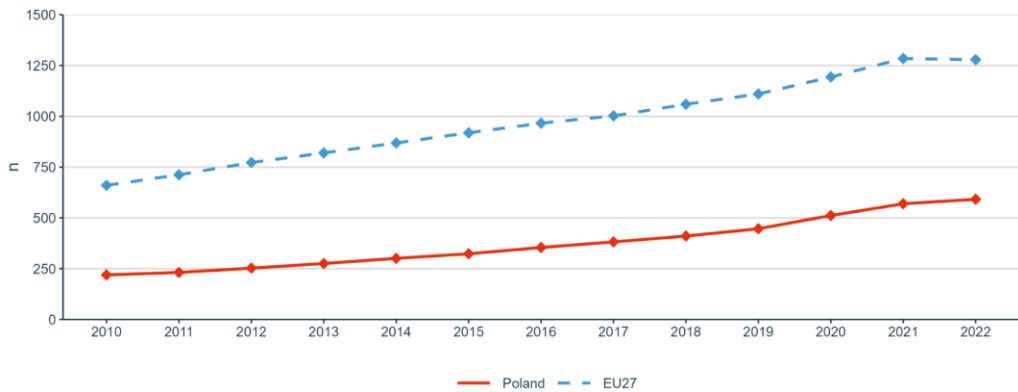


Figure 22: International co-publications with non-EU partners per 1,000 researchers in the public sector

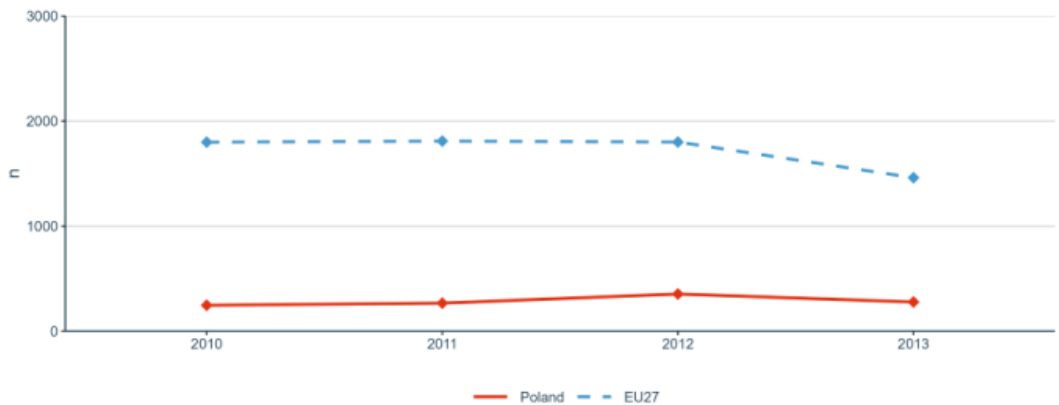


Figure 23: European and international co-patenting in EPO applications at national and EU level

**Priority 2: Taking up together the challenges posed by the twin green and digital transition, and increasing society’s participation in the ERA**

**Sub-priority 2.1: Challenge-based ERA actions**

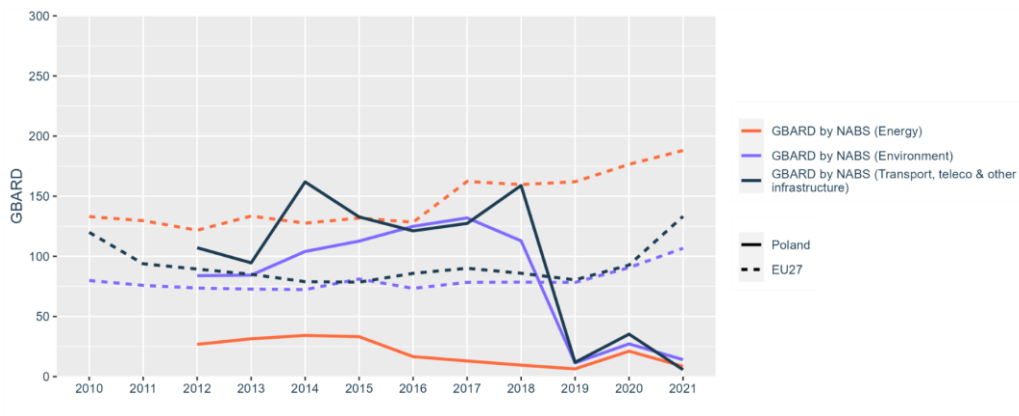


Figure 24: Government budget allocations for R&D (GBARD) by NABS

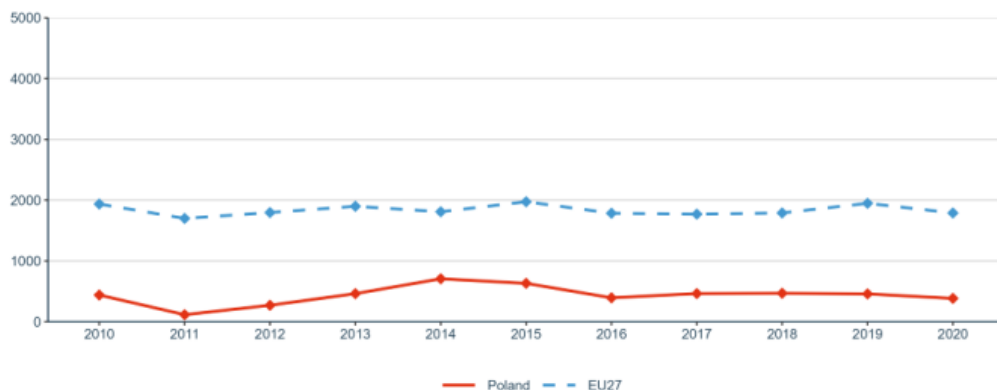


Figure 25: R&I investments (transnational cooperation): GBARD (EUR) allocated to Europewide transnational, bilateral or multilateral, public R&D programmes per FTE researcher in the public sector

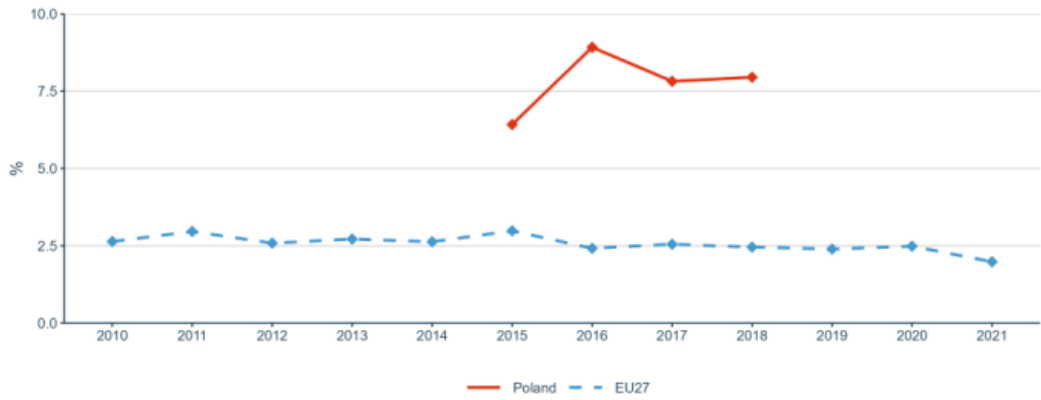


Figure 26: Environmentally related government R&D budget as percentage of total government R&D

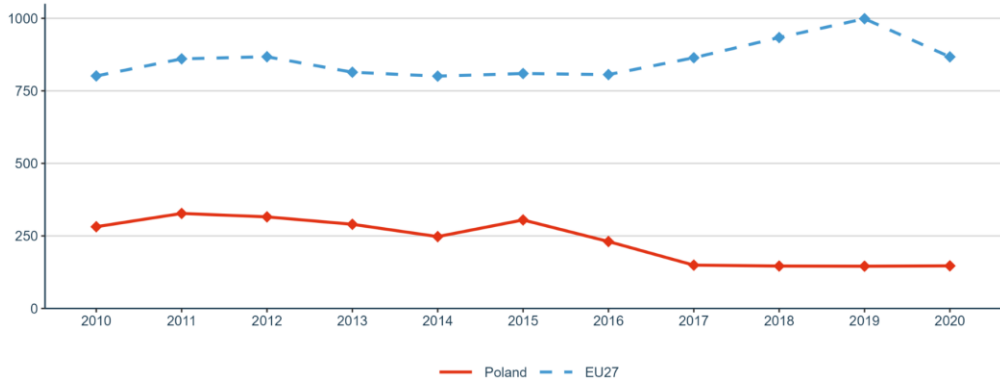


Figure 27: National public and private investments as suggested in the SET Plan progress report 2021

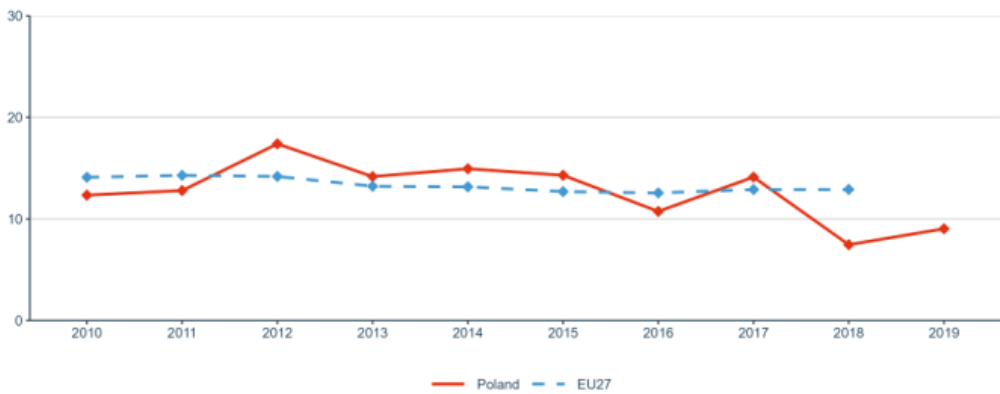


Figure 28: OECD Patents on environment technologies



Sub-priority 2.2: Synergies with education and the European Skills Agenda

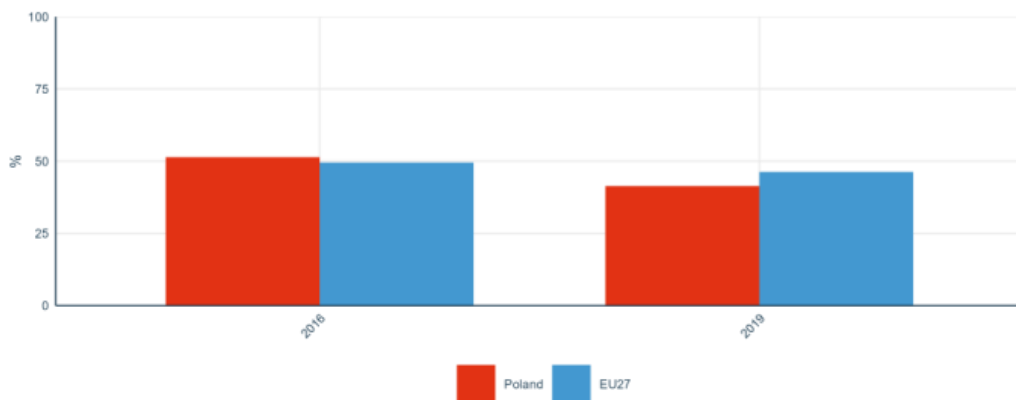


Figure 29: Share of researchers receiving transferable skills training

Sub-priority 2.3: Synergies with sectorial policies and industrial policy, in order to boost innovation ecosystems

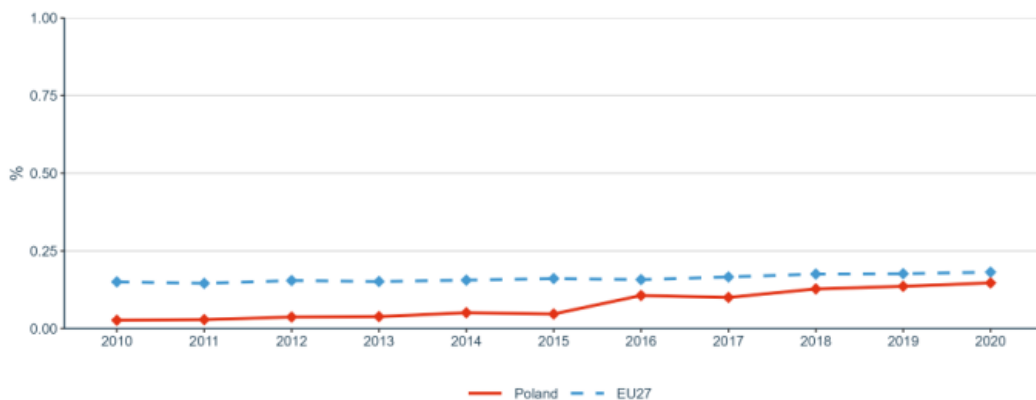


Figure 30: Direct government support and Indirect government support through R&D tax incentives as a percentage of GDP

Sub-priority 2.4: An active citizen and societal engagement in R&I in all its dimensions

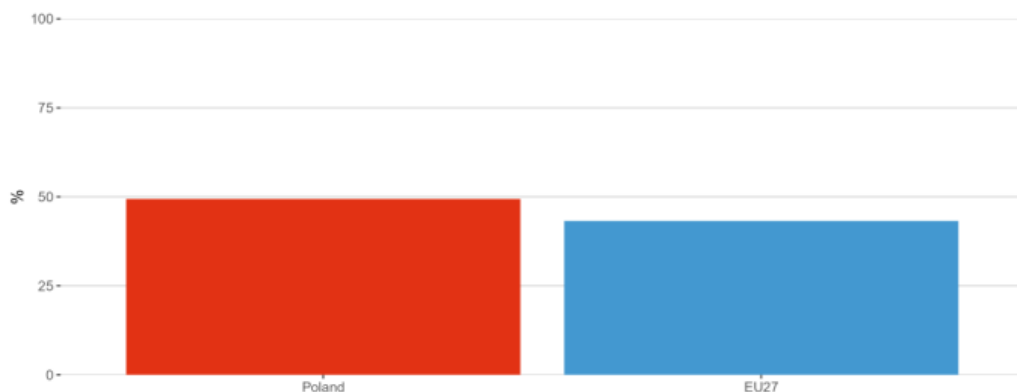


Figure 10: Trust in science in 2021

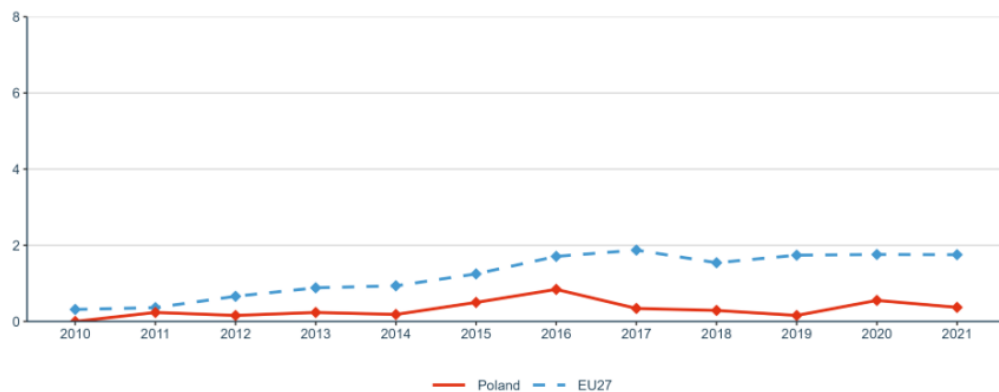


Figure 11: Research on social innovation (publications on 'social innovation' or 'social entrepreneurship') per million population

### Priority 3: Amplifying access to research and innovation excellence across the Union

#### Sub-priority 3.1: More investments and reforms in countries and regions with lower R&I performance

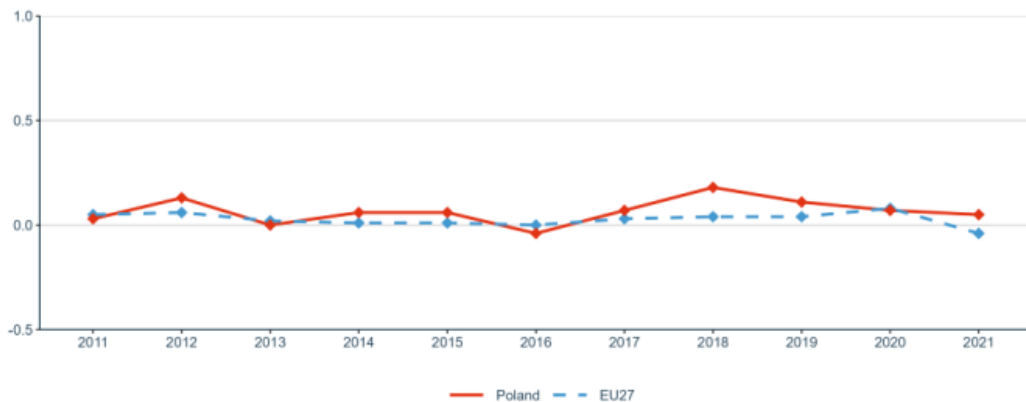


Figure 12: Increase (in percentage points) of total R&D expenditure expressed as a percentage of GDP

### Priority 4: Advancing concerted research and innovation investments and reforms.

#### Sub-priority 4.1: Coordination of R&I investments

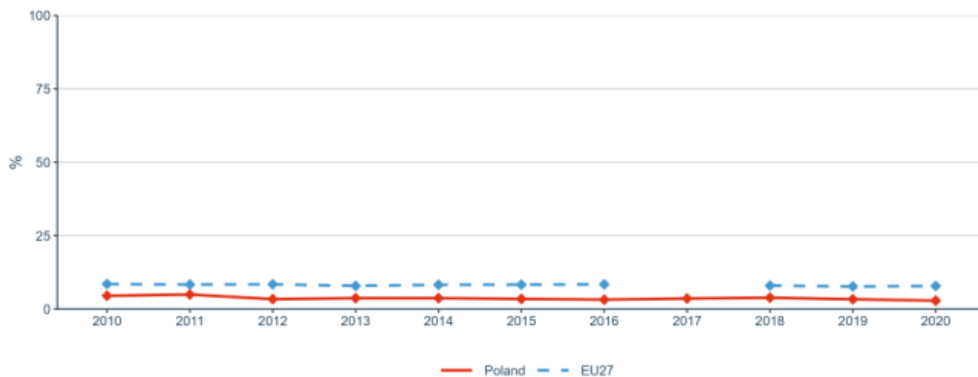


Figure 13: Share of public R&D expenditures financed by the private sector

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ERA Monitoring 2023: ERA Country Report Poland.

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