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Romania

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Report

Research and Innovation

ERA Country Report 2023: Romania

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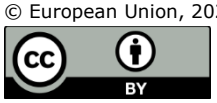

EUROPEAN COMMISSION

ERA Country Report 2023
Romania

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ERA COUNTRY REPORT 2023: ROMANIA

Key takeaways:

- Romania is experiencing progress on the majority of ERA indicators. However, despite the progress, for most indicators the country performs below the EU 27 average.
- On the European Innovation Scoreboard 2023, Romania is classified as an Emerging Innovator, with a performance of 33.1% of the EU average.
- The Research Development and Innovation (R&I) policy and institutional set up, has undergone major changes in the last years in Romania. However, their impact on the RD&U performance is yet to be defined.
- The R&I sector in Romania is challenged by a lack of human resources and skills, brain drain, and insufficient funding. On the other hand, Romania has improved its R&I performance mainly in relation to sector specific innovation, better public-private partnerships, and regional investments in research and development.

1. National context

1.1. Overview of the ERA policy agenda implementation

Romania is qualified as an **Emerging Innovator** on the European Innovation Scoreboard 2023, as Romania's performance is at 33.1% of the EU average.[1] The overall performance experienced an evolution of 1.4 points between 2016 and 2023.[2]

Romania has committed to eight ERA actions across the four ERA Priorities: ERA Actions 1, 3, 4, 8 and 9 under ERA Priority 1, ERA Action 10 under ERA Priority 2, ERA Action 16 under ERA Priority 3 and ERA Action 19 under ERA Priority 4.

The **National Strategy for Research, Innovation, and Smart Specialisation** (NSRI&SS) **2022-2027**[3] and the **National Plan for Research, Development and Innovation 2022-2027**[4] are the main instruments steering Romania's R&I policy. The National Plan presents ten national programmes (with sub programmes) that impact on all public sectors and private entities working in the research and knowledge areas. Both documents also refer to

[1] European Commission (2023), European Innovation Scoreboard 2023 Country profile Romania. https://ec.europa.eu/assets/rtd/eis/2023/ec_rtd_eis-country-profile-ro.pdf
[2] Ibid
[3] NSRI&SS 2022-2027 https://www.mcid.gov.ro/wp-content/uploads/2022/12/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf
[4] Government of Romania (2022a), National Plan for Research, Development and Innovation 2022-2027, available at: https://sgg.gov.ro/1/wp-content/uploads/2022/09/ANEXA-33.pdf

Romanian ERA engagement, define the objectives and describe national measures to achieve them.

Moreover, the **Operational Programme for Smart Growth, Digitisation and Financial Instruments** 2022-2027[5] contributes to Romania's priorities. The programme describes the measures to support research, development and innovation, the cooperation with individual stakeholders, and outlines funding opportunities, including EU funding.

1.2. Policy context

The key R&I actor in Romania is the **Ministry of Research, Innovation and Digitalisation (MRI&D)**[6]. It coordinates the scientific research, experimental and technological development, innovation, and digitalisation policies. In addition, the body oversees several institutions dedicated to sector specific research and innovation and is responsible for monitoring the alignment of the national measures with EU commitments.

Other institutions engaged in the R&I policies are the **Ministry of Education, the Ministry of Investment and European Projects, the Ministry of Entrepreneurship and Tourism, the Romanian Academy**, and private and public organisations working in the area of research and innovation.

The **National Strategy for Research, Innovation, and Intelligent Specialisation 2022-2027** has four main objectives aligned with the ERA priorities: 1) development of the research, development and innovation systems, 2) support of the innovation ecosystems associated with intelligent specialisations, 3) mobilisation for innovation and 4) increase of international and European cooperation in the areas of research, development and innovation.[7]

This strategy is complemented by the **Strategy for the Sustainable Development of Romania 2030**, contributing to the national target on "*Strengthening scientific research, modernizing the technological capacities of industrial sectors; encouraging innovation and significantly increasing the number of employees in research and development and increasing public and private spending on research and development*".[8]

In addition, sector-specific strategies and action plans contain measures related to sector research, development and innovation (i.e., Ministry of Investments and European Projects[9], Ministry of Economy, Ministry of Agriculture and Rural Development, etc).

[5] Ministry of Investment of European Projects (MIEP) (2023), Programul Creștere Inteligentă, Digitalizare și Instrumente Financiare, available at: https://oportunitati-ue.gov.ro/program/programul-crestere-inteligenta-digitalizare-si-instrumente-financiare/

[6] Ministry of Research, Innovation and Digitalisation. https://www.mcid.gov.ro/

[7] National Strategy for R&I and Smart Specialisation. https://clustercollaboration.eu/content/romanian-national-strategy-research-innovation-and-intelligent-specialization

[8] Government of Romania (2018), Romania's Sustainable Development Strategy https://dezvoltaredurabila.gov.ro/web/about/

[9] One example is the Operational Programme for Competitiveness (Programul Operațional Competitivitate, POC), at: https://www.fonduri-ue.ro/images/files/programe/COMPETITIVITATE/POC/2018/CM_POC/Decizii_CM_POC_2016/Rezumat_pentru_cetateni_POC_2014-2020_aferent_2015.pdf

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 Romania has committed to; 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[10] 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. This report will serve as a baseline for reporting in the future.

Table 1. General ERA Scoreboard and ERA Dashboard indicators[11]

Indicator	Most recent EU average	Most Recent Metric
Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP	2.26 (2021)	0.47 (2021)
Government Budget Allocations for R&D (GBARD) as a share of GDP	0.76 (2021)	0.16 (2021)
Researchers (in full-time equivalent) per million inhabitants	4,483.4 (2021)	995.4 (2021)
Business Enterprise expenditure on R&D (BERD) as a percentage of GDP	1,49 (2021)	0.3 (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

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)* is one of the priorities of the **NSRI&IS[12]** under the strategic objective 1.2. *Ensuring the transition to open science and facilitating the advancement of excellence in scientific research*. The strategic documents point towards the causes of deficient performance in this aeras, which is the underdeveloped research infrastructure and low knowledge of open data practices at the level of individual research entities.

[10] See https://european-research-area.ec.europa.eu/era-monitoring-reports.
[11] Further information on the trends can be found in Annex 1
[12] NSRI&SS 2022-2027 https://www.mcid.gov.ro/wp-content/uploads/2022/12/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf

The **NSRI&SS** sets six objectives[13] for the country to enable open access. The strategy envisages the creation of a Council for Open Science and sets financial allocation to support open science. The strategy also stresses the importance of country's integration into the European Cloud for Open Science. In this regard, in 2021 the **first Romanian National Open Science Cloud Initiative** was launched, and a memorandum of understanding was signed, creating a coalition of organisations at national level with the aim of establishing the national cloud for open science.[14]

Romania is committed to implement **ERA Action 3**: *Reform the Assessment System for research, researchers and institutions*. To this end, the **Executive Unit for the Financing of Higher Education, Research, Development and Innovation (UEFISCDI)[15]** organised several events during the reporting period for this country report with Romanian academia under the heading "*assessment of the research, developments, challenges and practices*".

ERA Action 4: *Promote attractive research careers, talent circulation and mobility* is also declared in the strategic documents as a country priority but the lack of research equipment, laboratories for performance, post doc programmes, PhD mobility and lack of regulatory framework (i.e., lack of code of conduct) are main obstacles to attract researchers.[16] In this sense, the **National Plan for Research, Development and Innovation 2022-2027** stipulates several actions to promote attractive research, talent circulation and mobility, including creation of performance monitoring tool for all universities and research units and including external performance evaluation.[17]

Furthermore, Romania is supporting this action through the objective 3.1 in **NSRI&IS** *Support and enhancement of the cooperation between research and the business environment* in the scope of capitalisation of the research results.[18] In particular, the action 8 of the national strategy is dedicated to the development of a mechanism for innovation and research that will link innovation and research to the economic needs.

The **Romanian Roadmap of Research Infrastructures 2017-2025[19]** is the document defining areas for strengthening the research infrastructure related to **ERA Action 8:** *Strengthen sustainability, accessibility and resilience of research infrastructures in the ERA*. It also defines areas for increasing management capacities of research infrastructure and ensuring good functioning of the existing infrastructures. An updated version of the roadmap is currently under preparation.

[13] NSRI&IS objectives: 1) improve accessibility of data, data reutilisation and data visibility; 2) improve science through elimination of duplications and fraud reduction; 3) digitalisation of knowledge; 4) increase transparency of funds for research; 5) improve competitiveness, innovation and cooperation in science; 6) active participation of Romanian researchers in the EU research space (ERA).
[14] Ministry of Education and ReseArch (2020), Memorandum. https://sgg.gov.ro/1/wp-content/uploads/2020/05/MEMO-3.pdf
[15] UEFISCDI (2023). https://www.chistera.eu/uefiscdi
[16] Government of Romania (2022), National Plan of Research, Development and Innovation 2022-2027, available at: https://sgg.gov.ro/1/wp-content/uploads/2022/09/ANEXA-33.pdf
[17] Government of Romania (2022a), National Plan for Research, Development and Innovation 2022-2027, available at: https://sgg.gov.ro/1/wp-content/uploads/2022/09/ANEXA-33.pdf
[18] NSRI&SS 2022-2027 https://www.mcid.gov.ro/wp-content/uploads/2022/12/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf
[19] Ministry of National Education and Scientific Research (2016), Romania ERA roadmap, available at: https://era.gv.at/public/documents/2901/Romanian_ERA_Roadmap.pdf

In addition, the **NSRI&SS** (objective 1.3, action 3) promotes expansion of existing research infrastructures by creating centres of excellence for scientific research.[20] In terms of strengthening research infrastructures, the 2018 ERA country report and the **European Semester Report 2023**[21] confirmed that additional investments increased the quality of research infrastructures in Romania, and foresee that the **Romanian Roadmap of Research Infrastructures 2017-2025** programme will contribute to sustain the changes.

By committing to **ERA Action 9:** *Promote a positive environment and level playing field for international cooperation based on reciprocity*, the is aiming at improving its performance to promote attractive research careers, talent circulation and mobility as all related indicators showed a decreasing trend.[22]

2.1.2. Progress towards achieving ERA Priorities

With regard to **Sub-priority 1.1:** *Open science*, Romania lies below the EU-27 average both in 2009 and 2019 averages in terms of ***open access publications (with DOI) as a proportion of the total number of DOI-publications.*** The share of publications accounted for 25.12% compared to 39.18% at the EU-27 level as illustrated by Figure 5 in Annex 1.

In relation to **Sub-priority 1.2:** *Research Infrastructure*, the ***share of national public R&D expenditure allocated to European research infrastructures in 2022*** is higher in Romania, with a value of 3.87%, than in the EU average[23] that presents a 1.82% in such year. In relation to the indicator ***number of European research infrastructures in which a country participated***, Romania ranks among the lowest with a value of 6 in 2021, far below the EU-27 average (Figure 6 in Annex 1).

Sub-priority 1.3: *Gender equality, equal opportunities for all and inclusiveness*. In relation to the ***share of women in grade A positions in HEIs*****,** Romania displays values constantly above the EU-27 average for the period 2010-2018, showing an increasing trend with a value of 40.59% in 2018 compared to 27.24 % in the EU-27 (Figure 7 in Annex 1).

Regarding the ***proportion of women among doctoral graduates in STEM field,*** the EU-27 experienced stagnation while Spain showed a slight increase from 41.29% in 2013 to 43.96% in 2020, constantly above the EU-27 average. Romania experienced a decline in the ***proportion of papers with mixed gender authorships*** in 2012, remaining below the EU-27 average. Nonetheless, it was followed by an increasing trend in alignment with the EU-27 average (Figure 9 in Annex 1). For the ***proportion of women in authorships of the 10% most cited publications*** (Figure 10 in Annex 1) Romania displays an increasing trend surpassing constantly EU-27 values with a share of 46.1% in 2018. However, as illustrated by Figure 11 in Annex 1, Romain is below the EU-27 average in the ***Women in Digital Index*** in 2022 with a value of 35.81.

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[20] Government of Romania (2022), National Strategy of Research and Innovation, and Smart Specialisation 2022-2027, available at: https://www.mcid.gov.ro/wp-content/uploads/2022/12/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf

[21] https://economy-finance.ec.europa.eu/system/files/2023-05/RO_SWD_2023_623_en.pdf

[22] Government of Romania (2021), SFC2021 Programme supported from the ERDF (Investment for jobs and growth goal), ESF+, the Cohesion Fund, the JTF and the EMFAF - Article 21(3), available at: https://mfe.gov.ro/wp-content/uploads/2023/01/9cf5726fa7062a9b0ca4fc8443ff0bf9.pdf

[23] 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.

For **Sub-priority 1.4:** *Careers and mobility of researchers and research assessment and reward system*, the ***share of foreign doctorate students as a percentage of all doctorate students*** has remained far below the EU-27 average despite the slight increase from 2013 to 2020 (Figure 12 in Annex 1). The number of ***new doctorate graduates (25-34) per 1,000 inhabitants*** (Figure 13 in Annex 1) in Romania has experienced a decreasing trend in the 2013-2019 period, below the EU-27 trend.

The indicator ***job-to-job mobility of Human Resources in Science and Technology (HRST)*** refers to the transition of employees from one job to another within a year. There is noticeable advancement in both the EU-27 and Romania between 2015 and 2019, although a decrease was experienced in 2020 at both levels.

In relation to **Sub-priority 1.5:** *Knowledge valorisation*, the ***share of public-private co-publications per million population*** (Figure 15 in Annex 1) has experienced overall increase both at the EU-27 level as well as in Romania. However, Romania increasing trend remains below the EU-27 average with a value of 53.90 in 2021. *The* ***number of PCT patent applications by million GDP*** (Figure 16 in Annex 1) has suffered overall stagnation, with Romania displaying values below the EU-27 average. The ***share of innovating forms collaborating with HEI/PRO out of all innovative firms*** has increased at the EU-27 level while in Romania it experienced an increase from 2010 to 2016 followed by a decreasing trend. Additionally, Romania has remained constantly below the EU average.

Sub-priority 1.6: *Scientific Leadership* is measured through the ***share of publications among the 10% most cited***, which has experienced an increasing trend in Romania compared to the slight decrease at the EU-27 level. In relation to the ***Academic Freedom Index,*** Romania has followed a very similar trend to the EU average, even surpassing it in 2020 with a value of 0.943 (Figure in 19 Annex 1).

In relation to **Sub-priority 1.7:** *Global engagement*, the ***share of international co-publications with non-EU partners in the public sector*** (Figure 20 in Annex 1) has overall increased over the period 2010-2022, especially at the EU-27 level. Despite the increasing trend of Romania, it remains below the EU-27 average. Regarding ***European and international co-patenting in EPO applications*** the trend illustrated in Figure 21 in Annex 1 shows that Romania has experienced overall stagnation far below the EU-27 average.

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

Romania has committed to **ERA Action 10:** *Make EU research and innovation missions and partnerships key contributors to the ERA*. Intensification of cooperation at the European and International level in the R&I area is one of the strategic objectives of the **National Strategy for Research, Innovation,** and **Smart Specialisation (NSRI&SS) 2022-2027 (objective 4)**[24] and the **National Plan for Research, Development and Innovation 2022-2027.**[25]

The country aims at increasing the synergy with European Programmes (Horizon Europe, FEDR, FSE+, etc) and increasing participation in international projects (ERA-NET/ ERA-NET Cofund, JPIs, Eureka, Eurostars, Lead Agency Procedure, etc.). National reports state that Romanian regions are also under-represented in EU partnerships and regional projects, the allocated funding is low and the funds that attracted by the region are not fully absorbed.[26]

2.2.2. Progress towards achieving ERA Priorities

Sub-priority 2.1: *Challenge-based ERA actions* is measured through different indicators. The ***government budget allocation (GBARD) by NABS*** in energy; environment; transport, telecommunications and other infrastructures, is illustrated in Figure 22 in Annex 1. The GBARD of Romania has decreased for the three different categories, remaining below the EU-27 average.

In relation to *the* ***GBARD allocated to European transnational, bilateral, or multilateral, public R&D programmes per FTE researcher in the public sector,*** at the EU level this indicator has been stagnated between 2010-2020. For the case of Romania, it has slightly decrease with fluctuations over the period and values below the EU-27 average.

The indicator ***national public and private investments as suggested in the SET Plan progress report 2021*** shows a slight but steady increase in EU-27 average until 2019 and fell in 2020 probably due to the COVID-19 pandemic. Romania, on the contrary, displays fluctuations over the period with a peak of EUR 48.63 million in 2015. Finally, in the case of the share of ***OECD patents on environment technologies*** the EU-27 average have slightly decreased during the past decade (Figure 25 in Annex 1). Romania has also decreased but has experienced fluctuations with ups and downs.

Sub-priority 2.2: *Synergies with education and the European Skills Agenda* is measured through the ***share of researchers receiving transferable skills training***. Figure 26 in Annex 1 shows that Romania has increased from 46.6% in 2016 to 89.4% in 2019, surpassing the EU-27 average. **Sub-priority 2.3:** *Synergies with sectorial policies and industrial policy, in order to boost innovation ecosystems* is analysed through the ***direct***

[24] Government of Romania (2022), National Strategy for Research, Innovation, and Smart Specialisation (NSRI&SS) 2022-2027, available at: https://www.mcid.gov.ro/wp-content/uploads/2022/12/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf
[25] Government of Romania (2022a), National Plan for Research, Development and Innovation 2022-2027, available at: https://sgg.gov.ro/1/wp-content/uploads/2022/09/ANEXA-33.pdf
[26] Government of Romania (2022), National Research, Innovation and Smart Specialisation Strategy 2022-2027, available at: https://www.mcid.gov.ro/wp-content/uploads/2022/12/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf

***government support plus indirect government support through R&D tax incentives as a percentage of GDP*.** This indicator has slightly decreased over the period 2010-2020 in Romania, below the EU-27 average values (Figure 27 in Annex 1).

Finally, **Sub-priority 2.4:** *An active citizen and societal engagement in R&I in all its dimensions*. The indicator **trust in science** shows that 42.6% of the Romanian population strongly trusted science compared to the 43.2% for the EU-27 (Figure 28 in Annex 1). The **number of publications on "social innovation" or "social entrepreneurship" per million population** has experienced slight increase in Romania over the period 2010-2021, but lower than the EU-27 average.

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

At strategic level Romania is committed to contribute to this ERA Priority through **ERA Action 16:** *Improve EU-wide access to excellence*. The **NSRI&IS**[27] states that the country will improve EU-wide access to excellence by putting in place a national funding mechanism. This is also covered on the fourth **National Plan for Research and Innovation**,[28] that focuses on performance, offer high-performing equipment to research units that prove excellence, and the development of topic research excellence centre based on partnerships amongst research entities.

2.3.2. Progress towards achieving ERA Priorities

In relation to the **Sub-priority 3.1:** *More investments and reforms in countries and regions with lower R&I performance*, the available indicator measures the ***increase in total R&D expenditure expressed as a percentage of GDP***. Romania has experienced increasing trend over the 2011-2021 period except for 2016. However, it remains constantly below the EU-27 average.

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

2.4.1. State of play in the implementation of the ERA Actions

In relation to the overarching goal of this priority, the government of Romania every year approves in the State Budget Law, which includes the budget allocated to R&I activities. The R&I budget allocation remains vulnerable to ad-hoc changes, lacks instruments funding based on rigorous performance evaluations, and pressure from stakeholders.[29]

[27] NSRI&SS 2022-2027 https://www.mcid.gov.ro/wp-content/uploads/2022/12/strategia-na-ional-de-cercetare-inovare-i-specializare-inteligent-2022-2027.pdf
[28] Government of Romania (2022), Planul Național de Cercetare, Dezvoltare și Inovare 2022-2027, available at: https://sgg.gov.ro/1/wp-content/uploads/2022/09/ANEXA-33.pdf
[29] Chioncel, M., (2019), Analysis of the factors that obstruct the diffusion of innovation, including digitization, Cod MySMIS 127557, SIPOCA 592, available at: https://www.poc.research.gov.ro/uploads/2021-2027/conditie-favorizanta/bariere-diseminare-inovare.pdf

Towards the enhancement of **ERA Action 19:** *Establish an ERA monitoring system* the **National Institute of Statistics (INSSE)**[30] of Romania aims to provide access to the national performance on a variety of areas, while committing to transparency, relevance and autonomy. In regard to the ERA Policy Agenda, after gathering the data on specific fields, the Institute publishes the Research, Development and Innovation Statistics.

2.4.2. Progress towards achieving ERA Priorities

In relation to the **Sub-priority 4.1:** *Coordination of R&I investments*, *the* ***share of public R&D expenditures financed by the private sector*** has remained stagnant both in Romania as well as at the EU-27 level. Nonetheless, Romania displays values constantly above the EU-27 average for the period 2010-2020 (Figure 31 in Annex 1).

3. Country-specific drivers and barriers

The main drivers of the Romania R&I sector stem from improving public-private partnerships, increasing the involvement of regions and increasing the information technology performance. **Public-private partnerships are improving in Romania**. As introduced in the European Semester Report 2023,[31] they cooperate to the fulfilment of joint projects at national and international scopes, such as the European Digital Identity Wallet testing. The **Romanian regions are more active in the area of R&I as a result of EU Cohesion Policy**. The EC 2023 assessment report finds that *Romanian has a better recognition of the role of regions in the national R&I system.*[32]

Among the main issues that obstruct progress in the field of research and innovation is a **lack of human resources and skills in the society**. This is due to the demographic decline and the high level of emigration. In this sense, the brain drain is also significant as about 760 thousand highly educated Romanians live abroad.[33]

The **education system** is still unsuccessful to provide relevant skills, and high-level professionals tend to leave the country.[34] Moreover, the **regulatory framework** is instable creating an insecure situation for the private sector hindering advancements of on R&I.

Another key challenge relates to the **overly fragmented public R&I system**, which, *inter alia* and due to distributed responsibilities, leads to a missing common evaluation mechanism.[35] The R&I sector evaluations are based on administrative reports and less connected to impact indicators[36], and a systemic evaluation of the implementation of measures as part of national strategic and regulatory documents is absent.

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[30] INSSE https://insse.ro/cms/en/content/general-presentation
[31] https://economy-finance.ec.europa.eu/system/files/2023-05/RO_SWD_2023_623_en.pdf
[32] European Commission (2023), Country Review of the Romanian Research and Innovation System Final report, available at: https://ec.europa.eu/research-and-innovation/sites/default/files/rio/report/PSF-RO-Final-Report_03.06.2022.pdf
[33] https://www.oecd.org/south-east-europe/programme/Labour-Migration-report.pdf
[34] Chioncel, M., (2019), Analysis of the factors that obstruct the diffusion of innovation, including digitization, Cod MySMIS 127557, SIPOCA 592, available at: https://www.poc.research.gov.ro/uploads/2021-2027/conditie-favorizanta/bariere-diseminare-inovare.pdf
[35] https://economy-finance.ec.europa.eu/system/files/2023-05/RO_SWD_2023_623_en.pdf
[36] Ibid

Furthermore, the **Romanian R&I sector is underfunded**. The budget allocation is subject to constant changes accompanied by a lack of cooperation within the R&I actors.[37] Finally, **significant delays in launching many instruments and 'red tape'** contribute to the need for improving the R&I sector.[38]

4. Final remarks

During the last years, Romania has improved in the R&I context and has demonstrated its progress towards the ERA Priorities. The country has committed to eight ERA Actions that have been underpinned by the **National Strategy for Research, Innovation and Smart Specialisation 2022-2027**[39].

Even though Romania has improved in most aspects in the national context, its slow progress keeps its performance below the EU-27 average. When looking at ERA Priority 1, Romania experienced some challenges in open science, in promoting attractive research careers, talent circulation and mobility. In this context, the lack of investment in R&I plays a role.

While in relation to ERA Priority 2 positive trends can be observed in most indicators, the country is still below the EU-27 average. The data for Romania in both ERA Priority 3 and ERA Priority 4 has remained stagnated over time, but is nevertheless slightly above the EU-average.

It is advised that Romania puts a focus on the long-term R&I context and on the sufficient allocation of funds. The European Semester Report 2023 confirms that the recently implemented initiatives, as the Romanian Roadmap of Research Infrastructures 2017-2025 programme, will contribute to sustain the changes in future periods.

[37] European Commission (2023), Country Review of the Romanian Research and Innovation System Final report, available at: https://ec.europa.eu/research-and-innovation/sites/default/files/rio/report/PSF-RO-Final-Report_03.06.2022.pdf
[38] Ibid
[39] National Strategy for R&I and Smart Specialisation. https://clustercollaboration.eu/content/romanian-national-strategy-research-innovation-and-intelligent-specialization

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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 Report. In addition, the research aimed to use the latest data available for each indicator, the most recent data for some of them dates from several years ago.

General Indicators

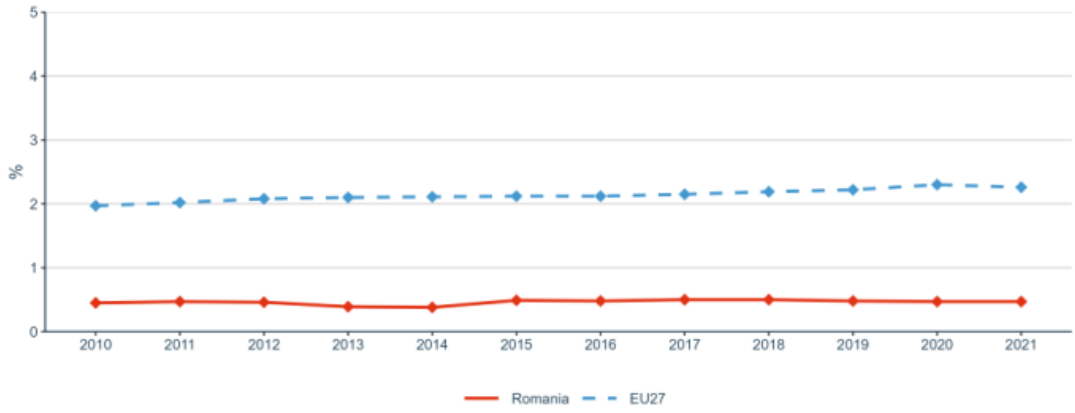

Figure 1: Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP

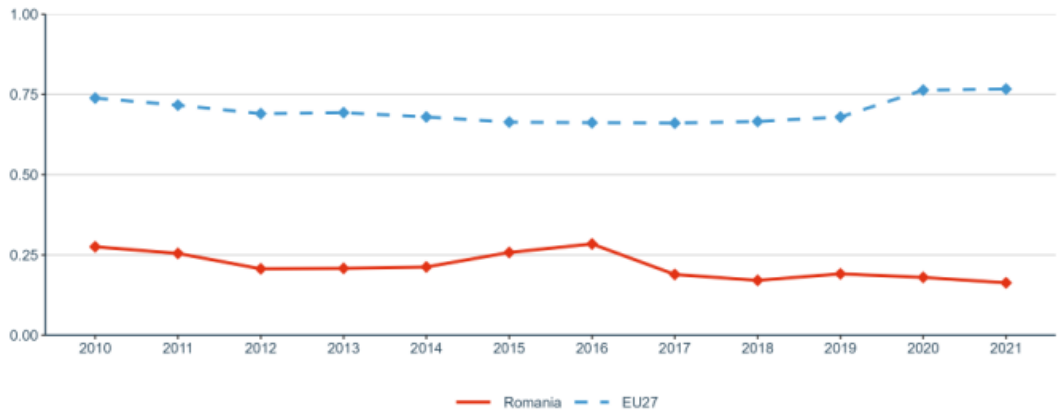

Figure 2: Government Budget Allocations for R&D (GBARD) as share of GDP

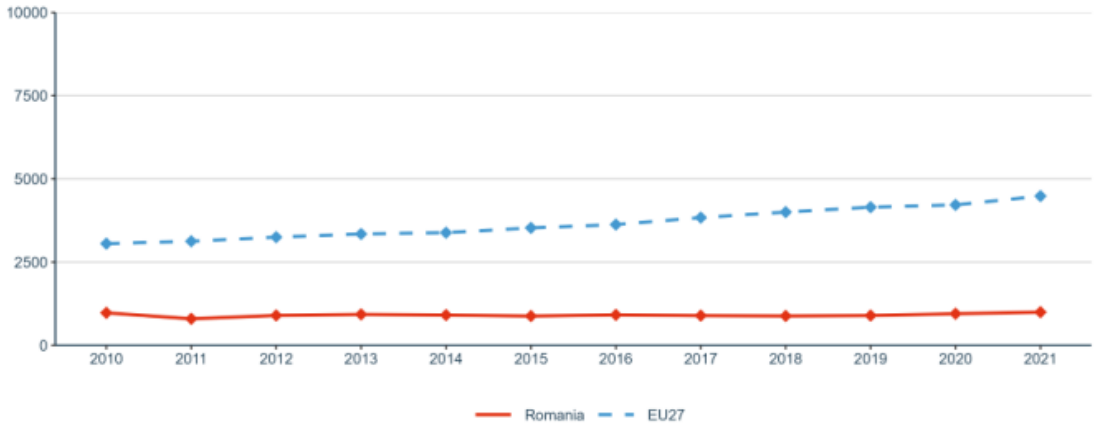

Figure 3: Researchers (in full-time equivalent) per million inhabitants

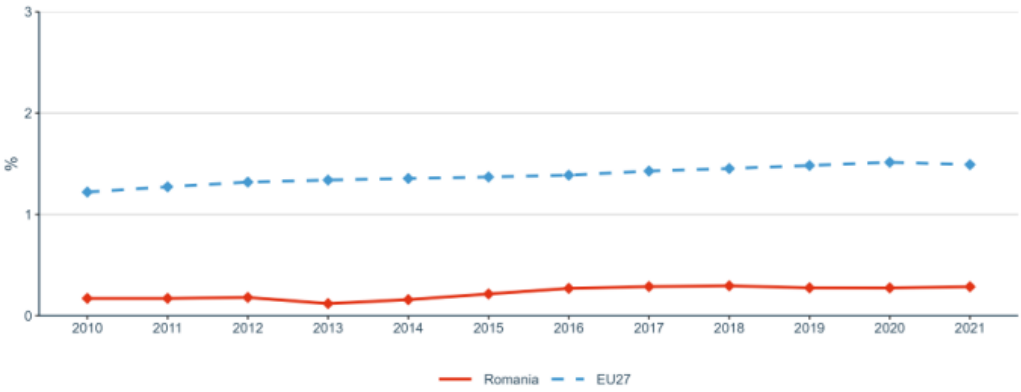

Figure 4: Business Enterprise expenditure on R&D (BERD) as a percentage of GDP

Priority 1: Deepening a truly functioning internal market for knowledge

Sub-priority 1.1: Open Science

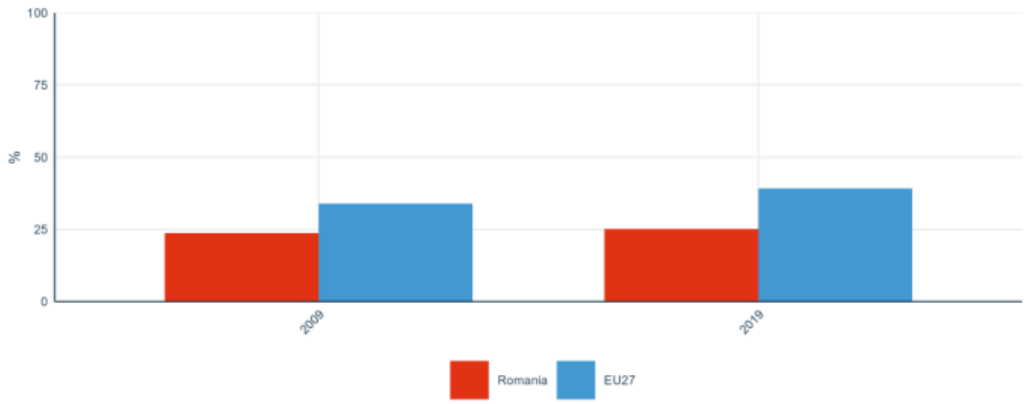

Figure 5: Share of publications available in open access

Sub-priority 1.2: Research infrastructures

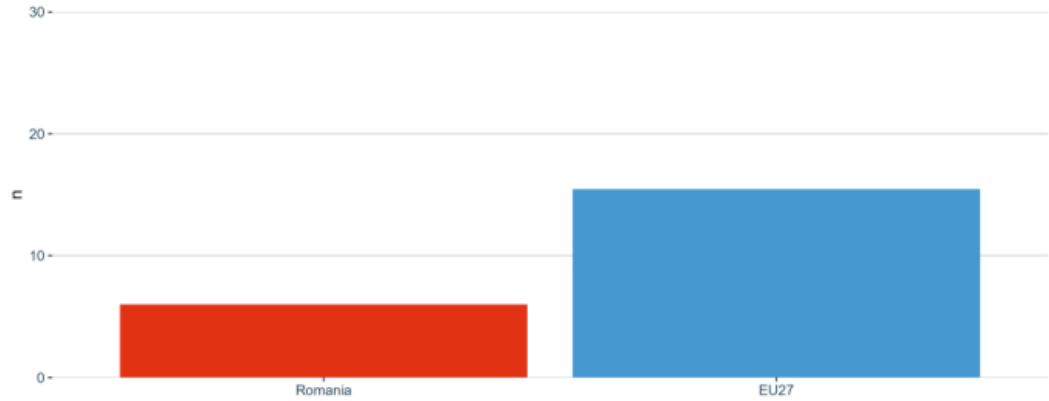

Figure 6: Number of European research infrastructures in which a Member State or an Associated Country participated (financially contributes to operations) in 2021

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

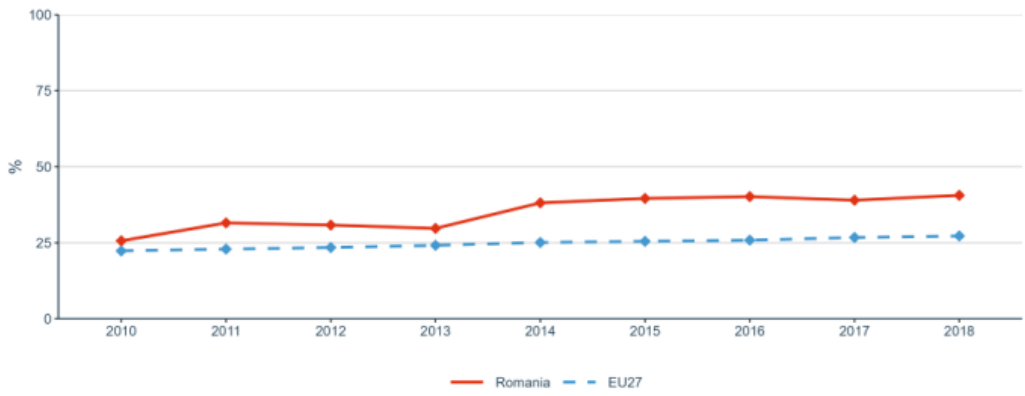

Figure 7: Share of women in grade A positions in HEIs

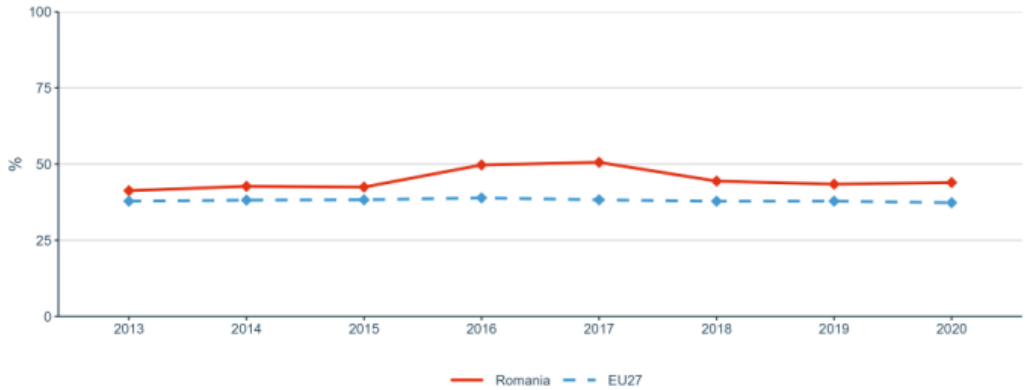

Figure 8: Proportion (%) of women among doctoral graduates by narrow fields of Science, Technology, Engineering and Mathematics (STEM)

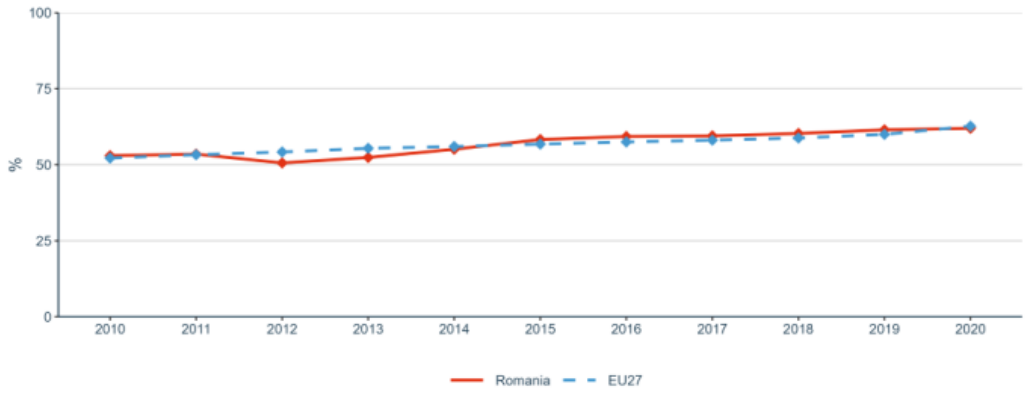

Figure 9: Proportion of papers with mixed gender authorship, 2000–2020

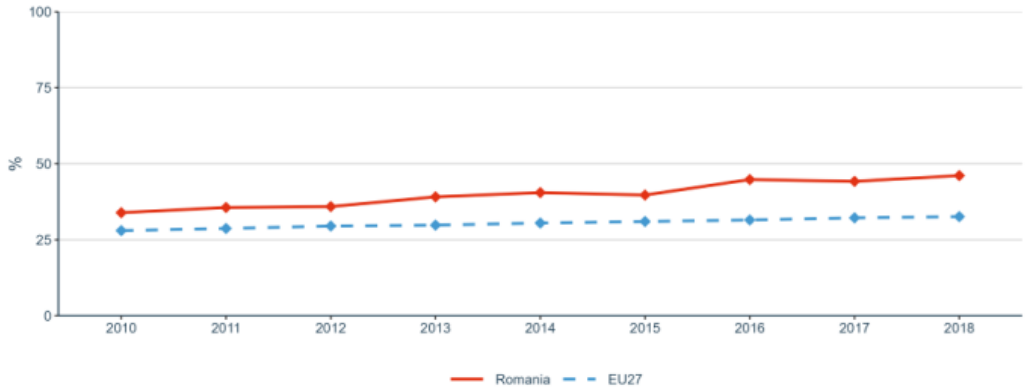

Figure 10: Proportion of women in authorships of the top 10% most cited publications, 2000–2018

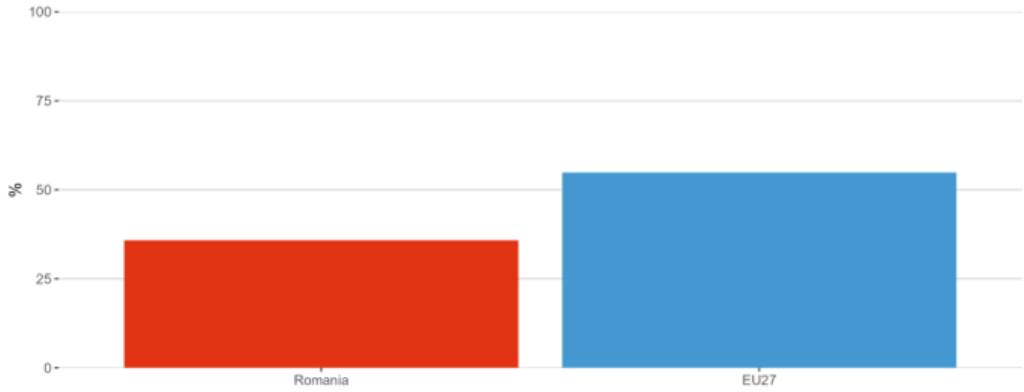

Figure 11: Women in Digital Index in 2022

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

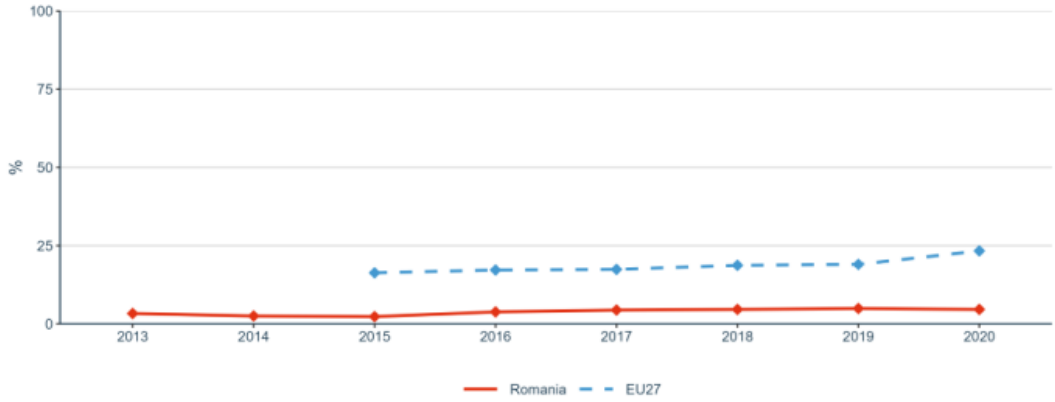

Figure 12: Share of foreign doctorate students as a percentage of all doctorate students

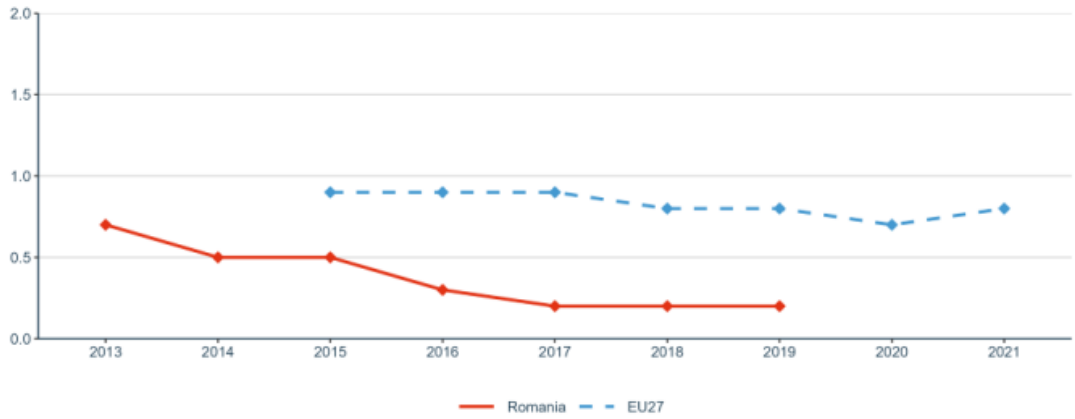

Figure 13: New doctorate graduates per 1,000 inhabitants aged 25-34

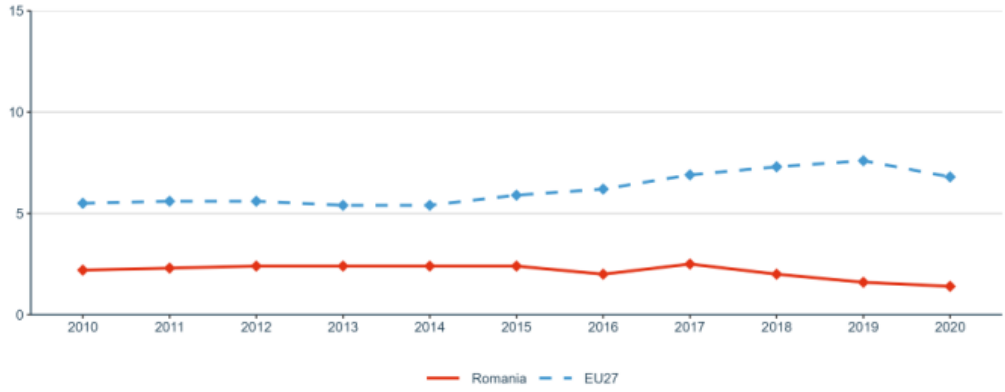

Figure 14: Job-to-job mobility of Human Resources in Science and Technology

Sub-priority 1.5: Knowledge valorisation

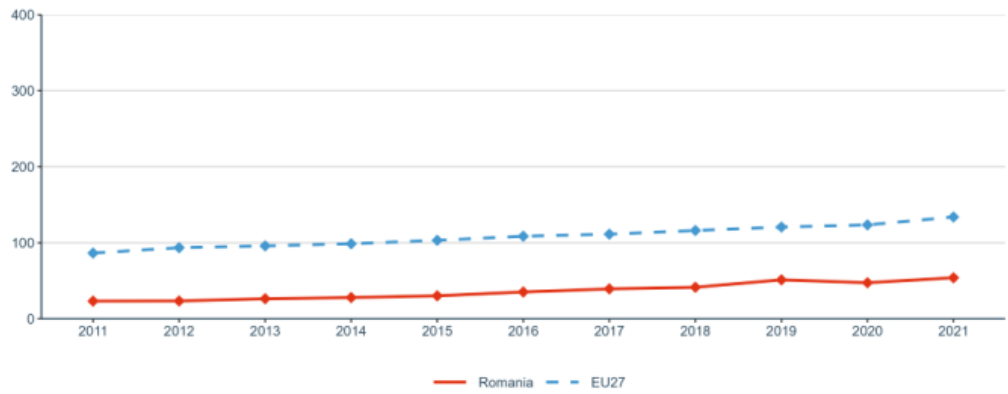

Figure 15: Share of public-private co-publications

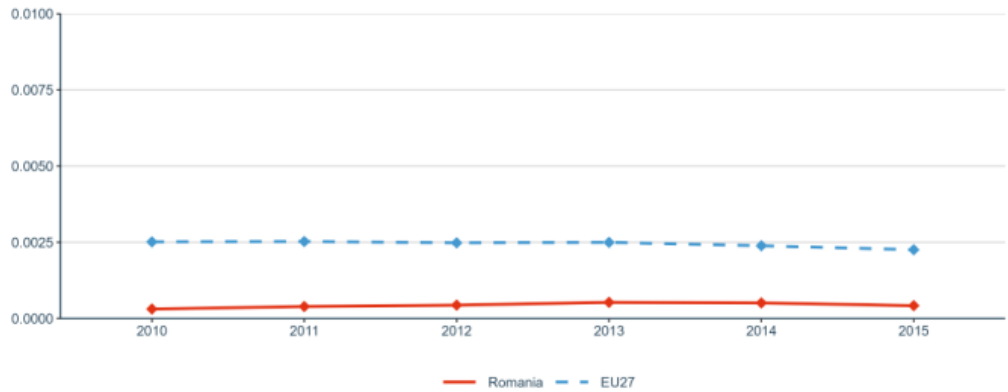

Figure 16: Number of PCT patent applications divided by GDP in million Euros

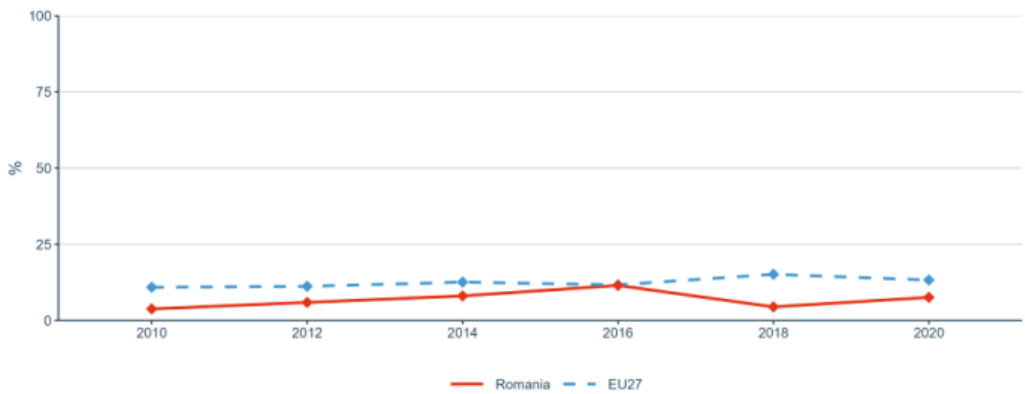

Figure 17: Share of innovating firms collaborating with higher education institutions or public/private research institutions

Sub-priority 1.6: Scientific leadership

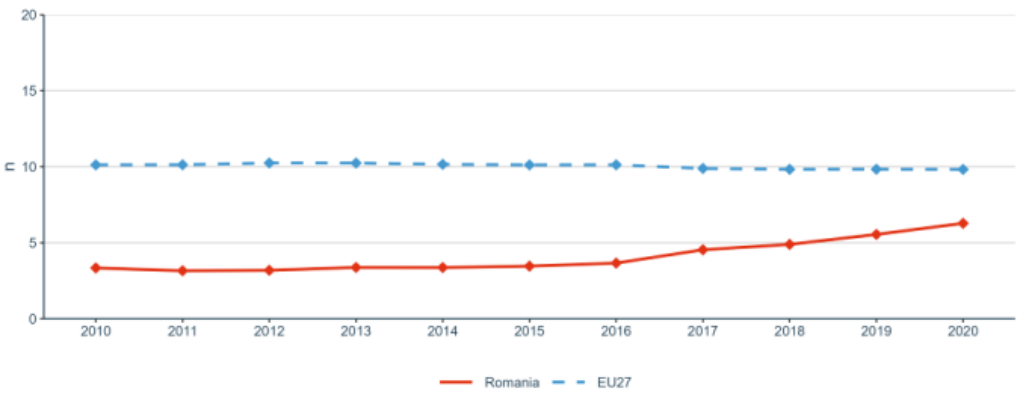

Figure 18: Number of scientific publications among the top-10% most cited publications worldwide as a percentage of all publications

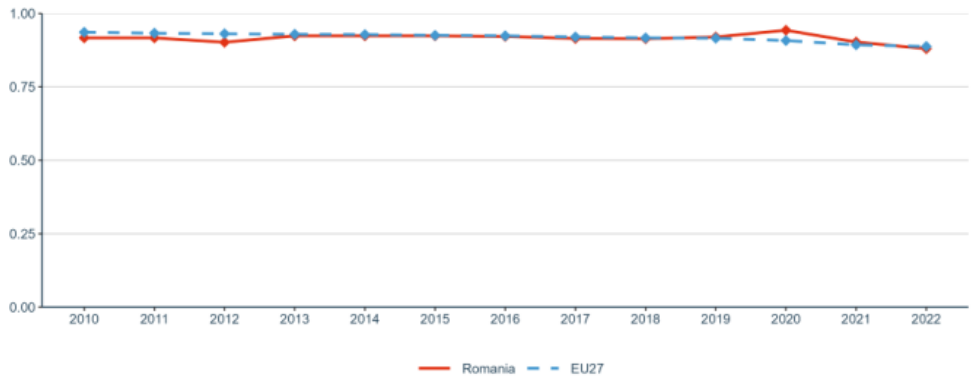

Figure 19: Academic Freedom Index (AFi)

Sub-priority 1.7: Global engagement

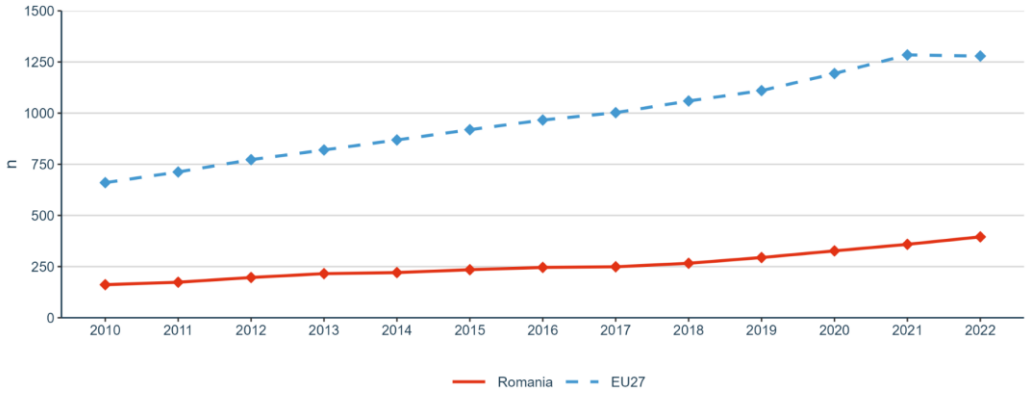

Figure 20: International co-publications with non-EU partners per 1,000 researchers in the public sector

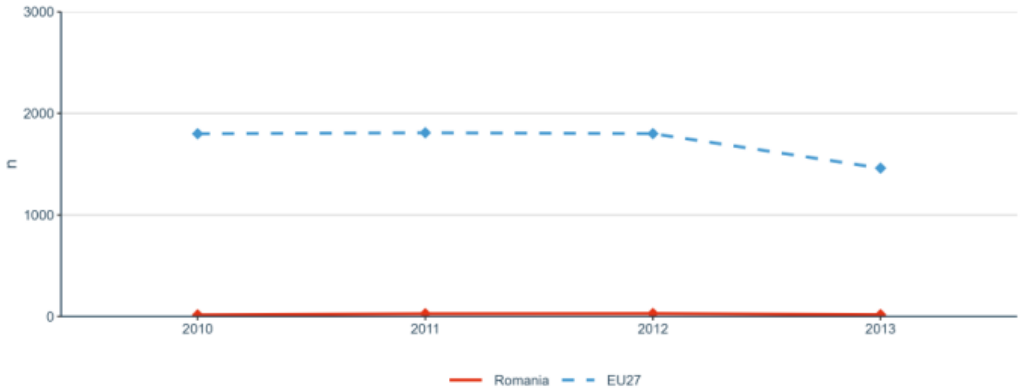

Figure 21: European and international co-patenting in EPO applications at national and EU level

Priority 2: Taking up together the green transition and digital transition, and increasing society´s participation in the ERA.

Sub-priority 2.1: Challenge-based ERA actions

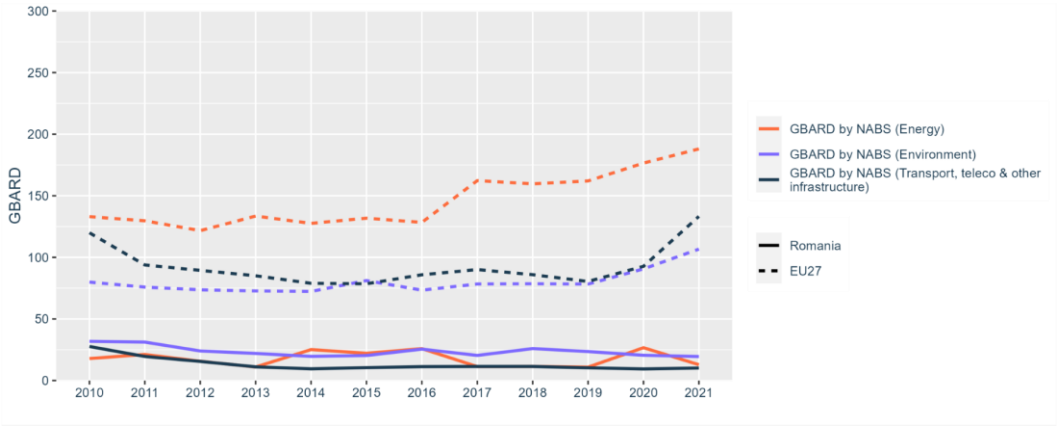

Figure 22: Government budget allocations for R&D (GBARD) by NABS

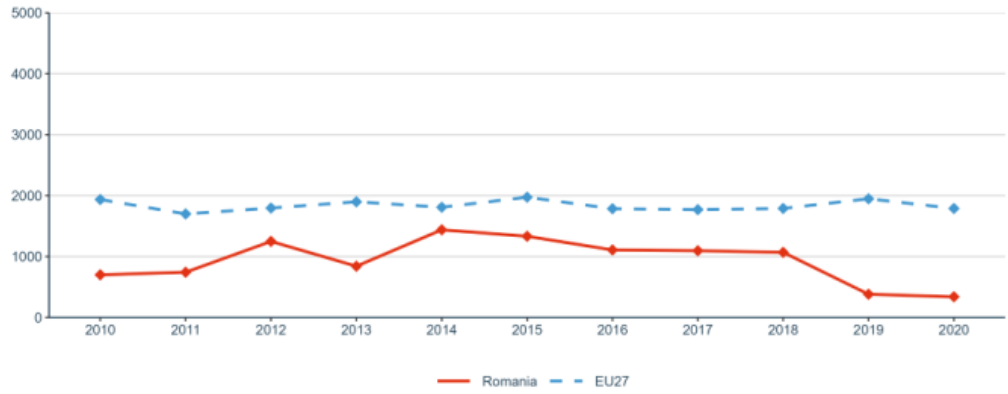

Figure 23: R&I investments (transnational cooperation): GBARD (EUR) allocated to Europewide transnational, bilateral or multilateral, public R&D programmes per FTE researcher in the public sector

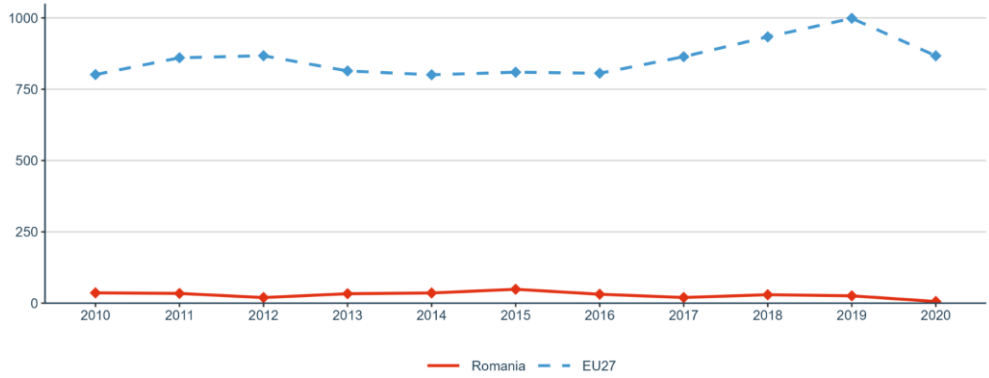

Figure 24: National public and private investments as suggested in the SET Plan progress report 2021

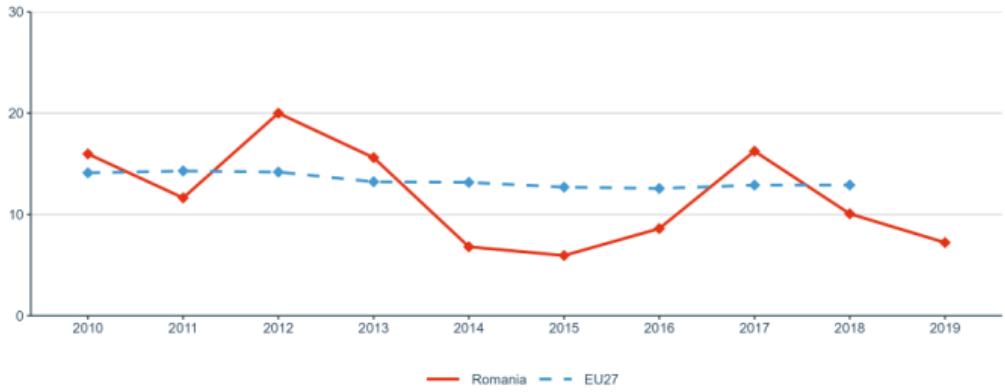

Figure 25: OECD Patents on environment technologies

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

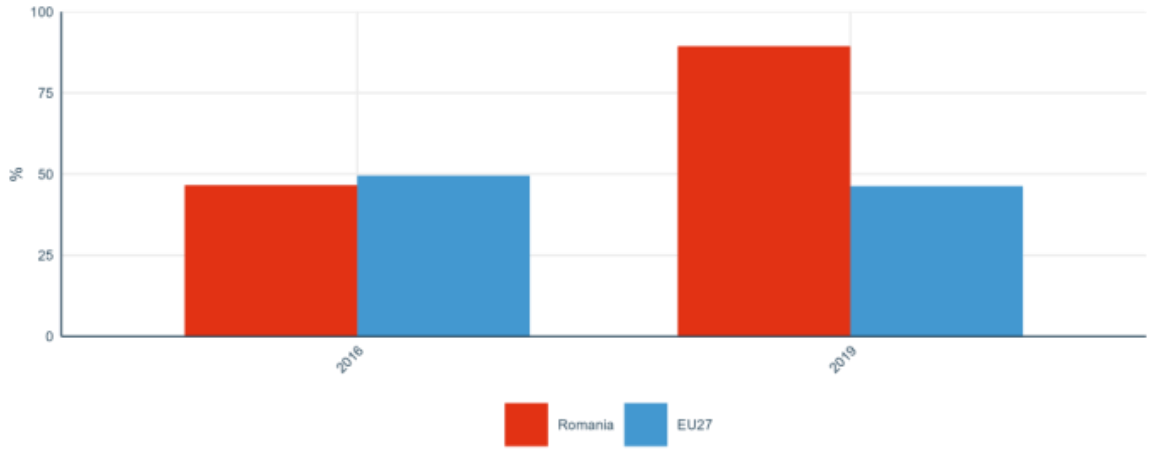

Figure 26: Share of researchers receiving transferable skills training

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

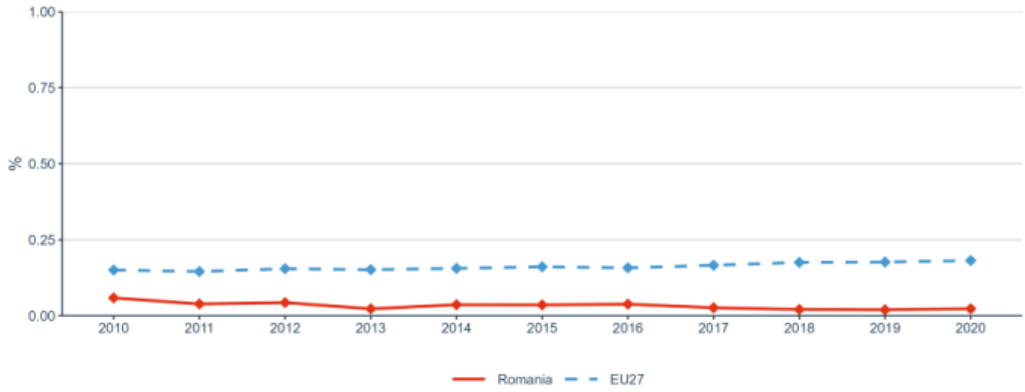

Figure 27: Direct government support and Indirect government support through R&D tax incentives as a percentage of GDP

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

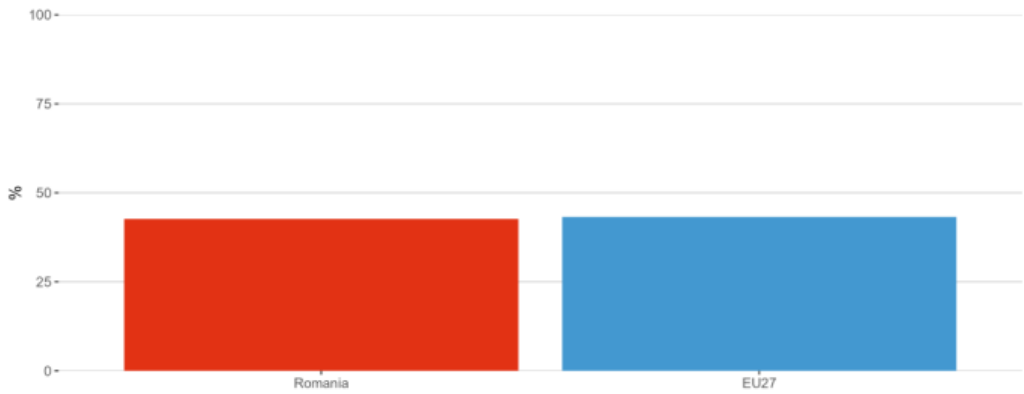

Figure 28: Trust in science in 2021

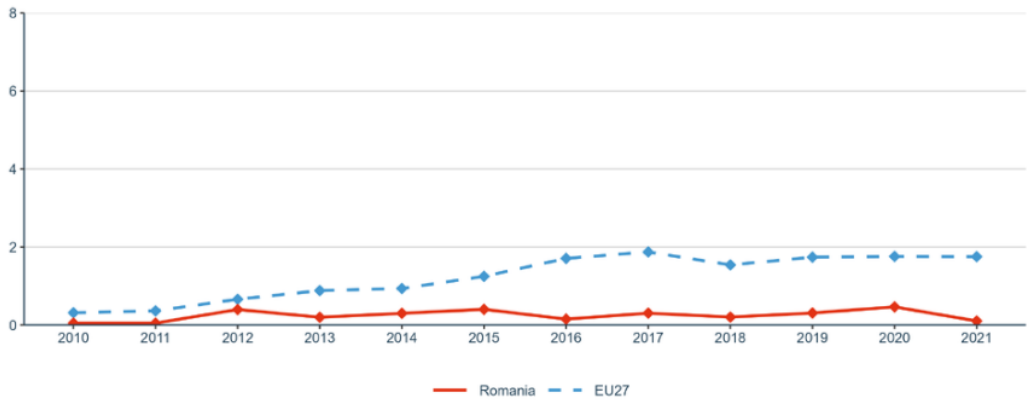

Figure 29: Research on social innovation (publications on 'social innovation' or 'social entrepreneurship') per million population

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

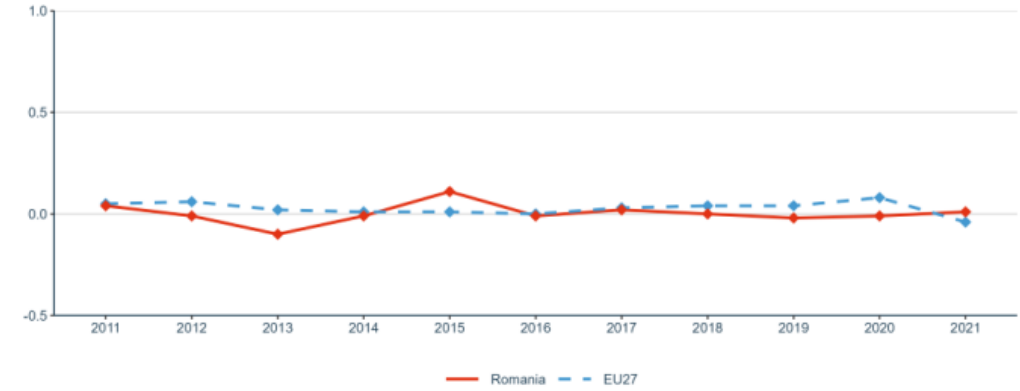

Figure 30: Increase (in percentage points) of total R&D expenditure expressed as a percentage of GDP

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

Sub-priority 4.1: Coordination of R&I investments

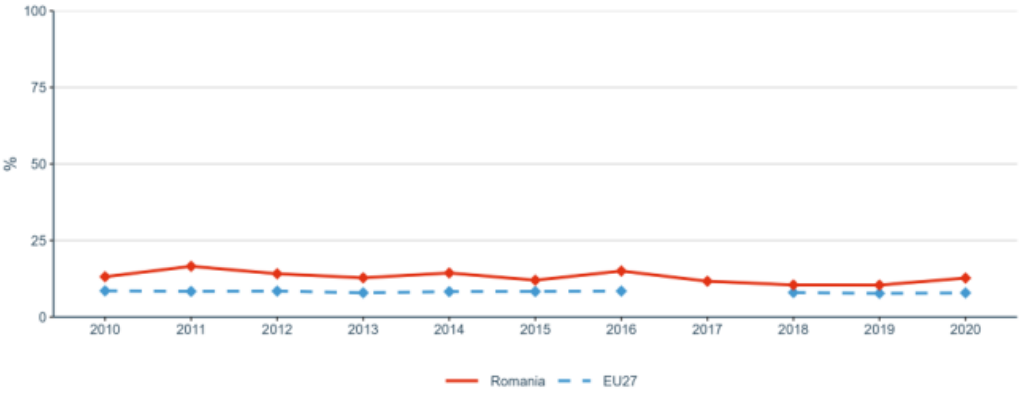

Figure 31: Share of public R&D expenditures financed by the private sector

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Research and Innovation policy