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and Research

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Climate Action, Environment,
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Republic of Austria
Labour and Economy

Austrian Research and Technology Report

2023

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Preface

The Austrian Research and Technology Report 2023 provides an overview of Austria's federally funded research, technology and innovation (RTI). Besides the presentation of recent trends in research policy, covering the status of implementation of the RTI Strategy 2030 and the research-relevant sub-strategies as well as the latest developments in higher education, the report analyses Austria's RTI performance at national and international level based on recent data from international rankings, from the statistical surveys on the funding and implementation of research and experimental development (R&D) and the 2023 global estimate.

This year's report focuses on supporting the green and digital transformation in research and economy. The major societal challenges – especially in the areas of climate protection and use of resources – show the significance and importance of basic and application-oriented research in overcoming crises.

Investments in science and research are a basic prerequisite for a country's ability to innovate and for securing long-term competitiveness. In addition to open-topic research funding, which is particularly important for the area of basic research as well as entrepreneurial research, there is an increased focus on a new generation of policy measures. Central features are an expanded understanding of innovation and the formulation of concrete goals for transformation in order to bundle the efforts of different social actors. This goes beyond technological change and includes changes in regulatory frameworks, markets and everyday practices. The EU also provides support for this: with the Recovery and Resilience Facility, the core element of NextGenerationEU, important research and infrastructure projects are accelerated. Transformative and mission oriented innovation policy strengthens the focus and directionality of RTI policy and is a way to increase the immediate effectiveness of research and development activities. The aim is to mobilise resources, actors and institutions to stimulate innovation around a concrete societal challenge for which no timely solution can be found and implemented without a coordinated joint effort.

According to estimates by Statistics Austria, a strong increase in total expenditure on research and development of about 8% to a total of €15.5 billion is expected again in 2023. R&D expenditure is thus expected to reach 3.22% of nominal gross domestic product (GDP). This positive development can be attributed primarily to the 6.6% increase in R&D spending by the Federal Government compared to 2022. The public sector will spend an estimated total of €5.1 billion in 2023, or about 33% of R&D funding.

Austrian companies are expected to finance about half (€7.8 billion) of the R&D expenditures in Austria in 2023. The research premium in 2023 is estimated by the Federal Ministry of Finance at approximately €1.1 billion and is attributed to R&D expenditure of business enterprises. In addition, the projected 17% (approx. €2.6 billion) in 2023 that will be financed from abroad are mainly foreign companies with subsidiaries performing R&D in Austria. Fortunately, an upward trend in R&D expenditure in the business enterprise sector is consolidating again after the crisis-related decline in 2020.

The R&D intensity is an internationally established input indicator for depicting a country's performance. Internationally, Austria's R&D rate in 2021 ranks third in the EU behind Sweden and Belgium, and seventh in a global comparison. Together with Sweden, Belgium and Germany, Austria is one of the four countries that meet the European target of a research intensity of 3%.

One core chapter of this report is devoted to the monitoring of the now eleven central research and research funding institutions, which must be

accomplished annually in the Austrian Research and Technology Report in accordance with the Research Financing Act. The chapter provides an overall systemic picture of the institutions with all their diversity and has been further developed compared to the previous year. For the first time, the new competence centre "GeoSphere Austria", Austria's integrated federal institute for geology, geophysics, climatology and meteorology, is included in the monitoring as the eleventh central RTI institution in accordance with the Research Financing Act. Overall, it can be seen that most institutions are growing; participation in the EU Framework Programmes increased significantly across all research institutions in 2022. The RTI Pact is an integrative element in the Austrian RTI landscape that creates a stable and reliable framework for RTI actors.

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Executive Summary

The Austrian Research and Technology Report is the status report on federally funded research, technology and innovation in Austria and is prepared on behalf of the Federal Ministry of Education, Science and Research (BMBWF) in agreement with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and the Federal Ministry of Labour and Economy (BMAW).

The present report is marked by complex change at different levels, driven on the one hand by multiple crises that not only change the innovation behaviour of companies and scientific actors, but also bring about changed framework conditions. The twin transition is omnipresent. In this report, the focus is on the green transformation in research and the economy.

RTI Strategy 2030 and RTI Pact to strengthen Austria as an RTI location

The core task of the **RTI Strategy 2030** ("FTI-Strategie 2030") is to position Austria as a leading research, technology and innovation country by 2030 and to address the following goals in this context:

- Become an international innovation leader and strengthen Austria as an RTI location
- Focus on effectiveness and excellence
- Focus on knowledge, talents and skills

The goals of the RTI Strategy 2030 are operationalised through three-year RTI Pacts. After the first RTI Pact for 2021–2023, the Federal Government adopted the second **RTI Pact 2024–2026** ("FTI-Pakt 2024–2026") in December 2022. The focus is on the following priority areas:

- Accelerate the sustainable transformation of the economy
- Increase trust in science and democracy
- Encourage excellence in research
- Promote top young talent
- Accelerate research to achieve the climate targets
- Expand cooperation between science and business
- Encourage technological sovereignty and openness

To achieve these goals, the Federal Government is providing a budget of €5,048.673 million for the years 2024–2026. This budget is intended to sustainably strengthen research funding and non-university research in the area of responsibility of the BMBWF, BMK and BMAW, with an increase of approximately 31% compared to the first RTI Pact.

Monitoring in accordance with the Research Financing Act (FoFinaG)

The implementation of the RTI Pacts is accompanied by the fact that the **central research and research funding institutions are subject to monitoring as part of the annual Austrian Research and Technology Report**. As in previous years, this monitoring is a central component of the report and is presented specifically in Chapter 3. The focus is on the profile, the development of key figures, as well as the development of various indicators compared to the previous year, including the consideration of target values, if available. The identification of new instruments and measures complements the systemic picture, and a brief outlook provides the strategic orientation.

Higher education strategies with a complementary effect to the RTI Strategy 2030

With its comprehensive systemic approach, the **Austrian Higher Education Plan 2030** ("Hochschulplan 2030") is a novelty in Austrian higher education policy. As an umbrella strategy, the Higher Education Plan has a systemic claim and pursues a coherent development of the four higher education sectors, encompassing all 77 Austrian universities. For the further development of public universities, the overall **Austrian National Development Plan for Public Universities 2025–2030** ("Gesamtösterreichischer Universitätsentwicklungsplan 2025–2030") also applies. New and modern education and teaching concepts, excellence in research, strengthening STEM, interdisciplinary, interuniversity and transnational cooperation, the valorisation of research results for the economy and society, e.g. through spin-offs, diversity and permeability, as well as the development and expansion of research infrastructures are among the important fields of action, in addition to the need to digitally and sustainably orient universities in the future.

Excellence Initiative (excellent=Austria)

The Excellence Initiative ("Exzellenzinitiative") which is designed to run for ten years comprises three funding tracks:

- Clusters of Excellence (strengthening outstanding research areas by means of collaboration across institutions, disciplines and national borders)

- Emerging Fields (identifying and supporting high-potential, forward-looking research topics).
- FWF Distinguished Professor (recruiting and appointing renowned researchers)

excellent=austria was launched with the first round of calls for proposals for the "Clusters of Excellence" at the end of 2021, with funding commitments announced in March 2023. The research teams will have €135 million at their disposal for the next five years, 60% of which will be funded by the FWF and 40% provided by the participating research institutions. After five years, there will be an interim evaluation followed by the possibility of an extension for another five years.

Climate and Transformation Initiative

The measures of the Climate and Transformation Initiative ("Klima- und Transformationsoffensive") support Austrian industry in its transformation to a sustainable, renewable energy-based and digitalised economy. It is aimed at technology-developing leading companies as well as SMEs and start-ups. An additional budget totalling €5.7 billion is available for the thematic priorities until 2030.

Austrian Micro Data Center AMDC

On 1 July 2022, the Austrian Micro Data Center AMDC was launched at Statistics Austria; thus, as anchored in the RTI Pact, a forward-looking research infrastructure was created in the form of the virtual safe centre. In compliance with the highest quality and security standards, it is now also possible in Austria to combine register and statistical micro data in order to answer research questions.

Research intensity in 2023 according to global estimate: 3.22%

According to data from the Statistics Austria global estimate of April 2023, the research intensity is 3.20% in 2022 and will in 2023 be higher than ever before at 3.22%. **Austria thus continues to have one of the highest research intensities among OECD countries.** Since the outbreak of COVID-19 and the resulting recession, the share of R&D financed by the business enterprise sector has declined; this decline is compensated by **increased government spending.**

One reason for the relative decline in business-enterprise funded R&D is the multiple crises facing Austria and other economies in the 2020s. Crises such as the recession caused by COVID-19, climate change and the Russian war of aggression on Ukraine increase uncertainty, which tends to lead companies trying to reduce risk by cutting R&D spending. At the same time, a paradigm shift can be observed: concepts such as technology sovereignty and resilience are increasingly determining RTI policy. The above-mentioned crises are not the only reason for new concepts; there is also a growing mistrust between the EU, the USA and China.

There are initiatives at both EU and Austrian level to meet the challenges of the current decade. For example, strengthening the resilience of the internal market, reducing strategic dependencies and accelerating the green and digital transition are the main focus of the European Commission's industrial strategy.

Austria's performance in research and development

Austria was able to **improve its position in the RTI indicators patent intensity, R&D expenditure and venture capital expenditure**. The share of R&D employees in the labour force could be increased, although international reference countries such as Sweden have recently shown a disproportionate increase. In the **science indicator ERC grants, the goal formulated in the RTI Strategy 2030 of being among the top 10 nations was once again achieved with third place**. In the Times Higher Education World University Ranking, universities from Austria achieved better rankings. However, there is a need to catch up in terms of the proportion of women in research. In the global innovation rankings, Austria was able to

maintain its position (EIS) or improve it slightly (GII, by one rank).

A mixed picture emerges in the area of digitalisation. Although Austria was able to maintain its position from the previous year in the DESI, the index value deteriorated, and Austria is also below the EU average in the connectivity sub-index. Regarding the indicators in the areas of **artificial intelligence, the Internet of Things and quantum technology, Austria is above the EU average** in each. Austria is the leader in **scientific publications in the field of quantum research and the share of companies that use the Internet of Things**.

Austria and the European research, technology and innovation policy

The European Union provides a central framework that extends beyond research, technology and innovation policy. The Recovery and Resilience Facility, the key element of NextGenerationEU, drives important research and infrastructure projects, including Quantum Austria or the Important Projects of Common European Interest (IPCEI). **Horizon Europe plays a central role for RTI**. Here, it is important to continue to provide targeted support to applicants in order to achieve a further increase in the quality and scope of Austrian participation in all three pillars of the EU Framework Programme. The implementation of the European Innovation Agenda, the EU missions, the EU partnerships and the 12 initiatives of the National Action Plan for the European Research Area (ERA-NAP) 2022–2025 are of particular relevance.

Although the available data are only of limited value due to the relatively short monitoring period at the beginning of Horizon Europe, it shows that Austrian research institutions and researchers are performing well in it. **Austria's success rate is clearly above the European average**, although no longer at the absolute top. In relation to the participation figures, **the returns to Austria** in particular have **increased in comparison to Horizon 2020**. It is once again clear that European cooperation is a central cornerstone of Austrian RTI policy. This is due to the high volume of funding acquired and because the scope and complexity of the projects carried out in Horizon Europe would be far from possible purely at the national level.

So far, Austria is characterised in particular by a strong representation of basic research-oriented institutions in Pillar 1 (Excellent Science), a strikingly active use of Pillar 2 (Global Challenges and European Industrial Competitiveness) by non-university research institutions, and an active participation of companies in Pillar 3 (Innovative Europe). Within the most highly endowed Pillar 2, the clusters "Climate, Energy and Mobility" and "Culture, Creativity and Inclusive Society" in particular can be identified as Austrian areas of strength compared to the European average.

Implementation of EU missions

Under the leadership of the BMBWF and the BMK, a **national implementation framework for the EU missions of Horizon Europe** in Austria was prepared and adopted by the RTI Task Force on 23 March 2023. The implementation framework is a strategy document with a planning horizon until 2030 and provides an outlook on the instruments and processes to be used for implementation in Austria. Both already established funding instruments and additional, new support measures are needed. In addition, a well-coordinated set of transfer measures is to transfer the results from research into sectoral application.

Green Deal, climate change and sustainability

The major societal challenges of our time – especially in the areas of climate protection and resource use – place new demands on RTI policy. These can only be inadequately addressed with the traditional portfolio of instruments and measures. To complement open-topic research funding, the Federal Government is therefore increasingly relying on a new generation of policy measures that can be summarised under

the term "**transformative innovation policy**". This requires greater coordination with other policy fields and their instruments as a key success factor for scaling them up.

The existing RTI policy portfolio is therefore being further developed in several directions in order to increase the effectiveness of research and development in terms of addressing societal challenges. The Austrian Federal Government is relying in particular on three **innovative instruments** for a transformative innovation policy, namely "innovation labs" to establish long-term learning and experimentation spaces in strategically important thematic areas, the instrument of "public-public partnership" (including public procurement promoting innovation) to strengthen the innovation capability of public institutions, and the instrument of "regulatory sandboxes" to enable research and innovation projects outside the existing regulatory framework to test new approaches to solutions.

Need to catch up with climate-relevant patents

The development of **climate-relevant patent applications** in international comparison provides an insight into how the knowledge and technology base for future competitiveness in green technologies is developing, and which specialisations and technological fields of competence exist. The analysis points to a pronounced international culture of cooperation. Austria stands out with a strong positive trend in patent applications, but there is some catching up to do in climate-related patents if Austria wants to keep up with the leaders in these future-oriented technologies and markets.

Sustainability transformation in the university and non-university research landscape

The contribution of **universities and non-university research institutions** to transformation takes place on two levels. On the one hand, there are measures that have an internal impact on the institution, e.g. strategies, infrastructural changes, etc. with the aim of becoming a sustainable, climate-neutral organisation. On the other hand, research institutions set sustainability priorities in their research activities and – in the case of universities – in teaching, thus creating the basis for corresponding innovations in the economy and society. This subchapter provides a broad overview of the contributions and activities of universities, universities of applied sciences and non-university research institutions that are under the jurisdiction of the Federal Government. In addition, the role of research infrastructures and platforms as a contribution to transformation is addressed.

Anchoring sustainability in the promotion of excellent scientists and scholars

This chapter concludes by addressing the topic of **sustainability in RTI funding instruments for individuals**. These funding schemes can be divided into excellence-oriented, often open-topic funding on the one hand, and funding schemes that also aim to increase the diversity of those conducting research on the other. The topic of sustainability is currently frequently taken into account in the design and/or the results achieved by existing measures. Both the current RTI Pact (2021–2023) and the future RTI Pact (2024–2026) provide for various measures to anchor the topic of sustainability in RTI funding instruments for individuals.

Evaluation culture

Austria's research, technology and innovation policy is characterised by an evaluation culture that focuses on quality and transparency. Programmes, and increasingly also institutions and various funding instruments, are regularly examined for goal achievement, impact and efficiency. The majority of evaluation reports are available to the public in the repository of the Austrian Platform for Research and Technology Policy Evaluation (fteval).

1 Current developments

Chapter 1 covers the latest developments at the level of governance, in terms of both research, technology and innovation policy and science and higher education policy. All political efforts are focused on strategically expanding Austria's innovation performance and international competitiveness and making essential contributions to transformation and resilience. The most important governance instruments here are the RTI Strategy 2030, the implementation of the Research Financing Act and the associated RTI Pact. The current developments are presented in Chapter 1.1, followed by an overview of the status quo of selected RTI sub-strategies that are important for Austria as an innovation location (Chapter 1.2). To complete the systemic view, current developments in the Austrian higher education sector are also presented in Chapter 1.3.

1.1 RTI Strategy 2030, RTI Pact and implementation of the FoFinaG

Implementation of RTI Strategy 2030[1]

Research, technology and innovation (RTI) provide answers to the crises of our time, they are part of the solution to secure our future. Russia's war of aggression against Ukraine, the COVID-19 pandemic, the supply chain issue, the climate and energy crisis, and currently the issue of inflation, but also the lack of trust in science and democracy, present the Austrian society and economy with extreme challenges that need to be overcome: converting the energy system, maintaining competitiveness, coping with the shortage of skilled workers, ensuring an efficient healthcare system, developing effective solutions to protect the climate and the environment, and strengthening trust in science and democracy.

The RTI Strategy 2030 provides a long-term framework for this and defines three goals:

- Become an international innovation leader and strengthen Austria's position as an RTI location
- Focus on effectiveness and excellence
- Focus on knowledge, talents and skills

The implementation of the RTI strategy is steered and accompanied by the RTI Task Force. In this body, which has been coordinating RTI policy at the federal level for over ten years, representatives of the following ministries work together at a high administrative level under the chairmanship of the Federal Chancellery (BKA): Federal Ministry of Finance (BMF) (Deputy Chair), Federal Ministry of Education, Science and Research (BMBWF), Federal Ministry of Labour and Economy (BMAW) and Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK). In its function as the European Commission's point of contact for Smart Specialisation in Austria, the RTI Task Force also works closely with the Federal Ministry of Agriculture, Forestry, Regions and Water Management (BML) and the office of the Austrian Conference on Spatial Planning (ÖROK).

One of the central tasks of the RTI Task Force as an interministerial coordination and steering body is the monitoring of the RTI strategy. In this role, it also formally welcomed the Federal Government's decision on the RTI Pact 2024–2026.[2]

From the RTI Pact 2021–2023[3] to the RTI Pact 2024–2026[4]

The goals of the RTI Strategy 2030 are operationalised through three-year RTI pacts. In accordance with the Research Financing Act, the RTI Pacts represent the link between the RTI Strategy 2030, funding and implementing institutions. This makes the RTI Pact an integrative element in the Austrian RTI landscape that creates a stable and reliable framework for RTI stakeholders.

Following the first RTI Pact for 2021–2023, the Federal Government adopted the second RTI Pact 2024–2026 in December 2022. It contains strategic priorities and measures to achieve the goals. The priorities of the RTI Pact 2024–2026 are shaped by the multiple crises of our time and the claim that research, technology and innovation can provide answers to these crises and offer solutions to secure our future. Building on the central strategic measures of the RTI

1 https://www.bundeskanzleramt.gv.at/dam/jcr:90b413e2-ce1b-4326-9c4a-dfbb3e67d4c9/RTI_Strategy_2030.pdf
2 https://www.bundeskanzleramt.gv.at/themen/forschungskoordination_fti/task-force-fti.html
3 https://www.bundeskanzleramt.gv.at/dam/jcr:a07cc716-1032-4ffe-a568-57d15be53c2c/RTI_Pact_2021%E2%80%932023.pdf
4 https://www.bundeskanzleramt.gv.at/dam/jcr:92051a80-56e8-428b-9821-d18cbc335af8/032023_FTI-Pakt_en.pdf

Pact 2021–2023, the Federal Government is setting the following priorities in the RTI Pact 2024–2026:

- Accelerate the sustainable transformation of the economy
- Increase trust in science and democracy
- Encourage excellence in research
- Promote top young talent
- Accelerate research to achieve the climate targets
- Expand cooperation between science and business
- Encourage technological sovereignty and openness

The Federal Government is making €5,048.673 million available for the years 2024–2026. This budget is intended to sustainably strengthen research funding and non-university research in the area of responsibility of the BMBWF, BMK and BMAW, with an increase of approximately 31% compared to the first Pact.

In addition, the strategic priorities of the RTI Pact 2024–2026 are also indirectly implemented via the objectives and fields of action prioritised in the applicable **Austrian National Development Plan for Public Universities** (GUEP), which correspond closely with the objectives of the RTI Strategy 2030.

On the one hand, the new RTI Pact must ensure the continued implementation of important priorities of the current RTI Pact 2021–2023. These include, for example, the "excellent=austria" funding initiative, knowledge and technology transfer, the implementation of the Austrian Research Infrastructure Action Plan 2030 and the use of register and statistical micro data in the Austrian Micro Data Center.

On the other hand, the RTI Pact 2024–2026 contains new measures based on its priorities. For example, the 10-point programme to strengthen trust in science and democracy, the sustainable embedding of GeoSphere Austria as a national competence centre for climate research and public services, or the implementation of non-commercial clinical research. In this context, the promotion of interest in the STEM field plays an important role, for example by providing incentives for the establishment and expansion of self-organised, regional STEM networks.

The measures of the climate and transformation initiative of the Austrian Federal Government are also anchored in the Pact. This supports Austrian industry in its transformation to a sustainable, digitalised economy based on renewable energies. It is aimed at industry, first and foremost at technology-developing lead companies, but also at SMEs and start-ups (e.g. qualification of employees), depending on the funding scheme. An additional budget of €5.7 billion is available for the thematic priorities until 2030 (of which €5.1 billion is allocated to the BMK and €600 million to the BMAW).

Furthermore, the RTI Pact 2024–2026 will continue the technology initiative in accordance with the RTI Strategy 2030 (core areas including open-topic RTI formats, cooperation between science and industry, digitalisation) and promote measures to strengthen the research and production location and competitiveness (especially the expansion and settlement of international technology companies and leading companies).

In addition, the European Union provides a central framework that extends beyond research, technology and innovation policy. The Recovery and Resilience Facility, the core element of NextGenerationEU, drives important research and infrastructure projects, including Quantum Austria and the IPCEI (Important Projects of Common European Interest) projects on hydrogen and microelectronics and communication technologies (IPCEI ME/CT). Horizon Europe plays a central role for RTI. Here, it is important to continue to provide targeted support to applicants in order to achieve a further increase in the quality and scope of Austrian participation in all three pillars of the EU Framework Programme. In particular, the implementation of the European Innovation Agenda, the EU missions, the EU partnerships and the 12 initiatives of the ERA-NAP 2022–2025 are of special relevance for the long-term structuring of Austrian RTI.

Finally, the international networking of Austrian scientists must be strengthened, and the targeted development and expansion of bilateral and multilateral research and innovation cooperation must be promoted on the basis of values and principles in RTI and with an awareness of possible security risks.

Performance / funding agreements of the central institutions

With this RTI Pact, for the first time, performance and funding agreements will be concluded with all central research and research funding institutions for the entire three-year period of the Pact.

In the area of research funding in particular, this involves changes: the reform and further simplification of research funding governance in implementation of the Research Financing Act (FoFinaG) to ensure improved and leaner processes and clear structures in the interaction between federal ministries and research funding institutions; the revision and optimisation of the programme and instrument portfolios of the funding institutions with the aim of providing funding applicants with easy-to-understand and clear access, as well as making larger programme lines available while maintaining programmes for experimental formats; in addition, in the area of basic research, the focus is on open-topic individual project funding, and in the area of applied research, mission oriented priorities play a role alongside open-topic funding.

In the course of 2023, it is necessary to conclude funding or performance agreements with the individual central research funding institutions or central research institutions.

Future Austria Fund

As in 2022, the Future Austria Fund, which is administered by the National Foundation for Research, Technology and Development, will again distribute €140 million to six beneficiary federal research funding institutions in 2023; these are the Austrian Research Promotion Agency (FFG), the Austrian Science Fund (FWF), the Austria Wirtschaftsservice mbH (aws), the Austrian Academy of Sciences (OeAW), the Christian Doppler Research Association (CDG) and the Ludwig Boltzmann Gesellschaft (LBG). These funds are complementary to the RTI Pact.

The following priorities for this year's funding allocation were agreed upon by the responsible federal ministries and adopted in March 2023:

Goal 1 RTI strategy – catch up with the international leaders and strengthen Austria as an RTI location:

- EU missions including Humanities, social sciences and cultural studies
- EU partnerships
- Digital Europe Programme
- Clinical research
- Artificial intelligence (implementation of AI strategy)
- R&D in the semiconductor sector – EU Chips Act

Goal 2 – Focus on effectiveness and excellence:

- Excellent special research areas and research groups
- Application-oriented basic research
- Trust in Science and Democracy
- Venture capital for scaling start-ups
- Disruptive/radical innovation

Goal 3 – Build on knowledge, talents and skills:

- Promoting young talents

Research, Science, Innovation and Technology Development Council

In order to increase the rigour of Austrian research and innovation policy, the Federal Government has proposed to merge the Council for Research and Technology Development and the Austrian Science Council. Instead of these two bodies, a "Research, Science, Innovation and Technology Development Council" (FWIT Council) will be established. The FWIT Council will also cover the thematic areas of the expired ERA Council Forum. Detailed regulations on this are contained in the FWIT Council Establishment Act: The bill was adopted by the Committee for Research, Innovation and Digitisa-

tion of the National Council on 12 April 2023 after the government bill of 1 February 2023 was submitted, taking into account an amendment, and subsequently in the plenary session of the National Council on 27 April 2023 in the second and third readings and by the Federal Council on 11 May 2023.

Twelve members of the council are appointed by the Federal Government: six councillors are appointed by the BMBWF, four by the BMK and one member by the BMAW. The member appointed by the Federal Chancellor in agreement with the Vice-Chancellor assumes the chair ex lege.

In addition to the council assembly, the bill also provides for a supervisory board and a managing director.

The tasks of the FWIT Council are:

- advising the Federal Government and individual members of the Federal Government on matters of Austrian and European science, research, technology and innovation policy, higher education and the development and exploitation of the arts
- the submission of proposals for the RTI Pact in accordance with §2 of the Research Financing Act – FoFinaG, Federal Law Gazette I No. 75/2020
- supporting the Federal Chancellor, the Federal Minister for Education, Science and Research (BMBWF), the Federal Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and the Federal Minister of Labour and Economy (BMAW) in analysing the implementation of the Federal Government's current research, technology and innovation strategy (RTI strategy) and in developing new RTI strategies, taking into account European and international standards
- the preparation of a biennial activity report to the Federal Government, which it shall forward to the National Council
- the independent preparation of analyses and recommendations, in particular also with regard to impact orientation in the areas mentioned in para. 1 to strengthen the Austrian research, science, innovation and technology development system, taking into account international standards
- the support of the Foundation Council pursuant to §11 para. 1 no. 1 of the RTD National Foundation Act, Federal Law Gazette I no. 133/200

Austrian Micro Data Center (AMDC)

On 1 July 2022, the Austrian Micro Data Center (AMDC)[5] started its active operation at Statistics Austria. Basic funding of €505,000 per year is provided by the BMBWF. In coordination with the BMBWF and with the involvement of the research community, as well as in compliance with high quality and highest security standards with regard to data protection, the operation of this future-oriented research infrastructure was realised in the form of a virtual safe centre. Since 1 July 2022, the AMDC has enabled scientists to conduct research with statistical microdata and administrative register data. Data sets can also be combined in a secure environment, opening up new opportunities to answer innovative and complex research questions.

On 28 October 2022, the BMBWF was the first ministry to release its own register data for research purposes via an ordinance pursuant to §38 b of the Research Organisation Act (FOG);[6] further register data of the BMBWF have already been accessible in

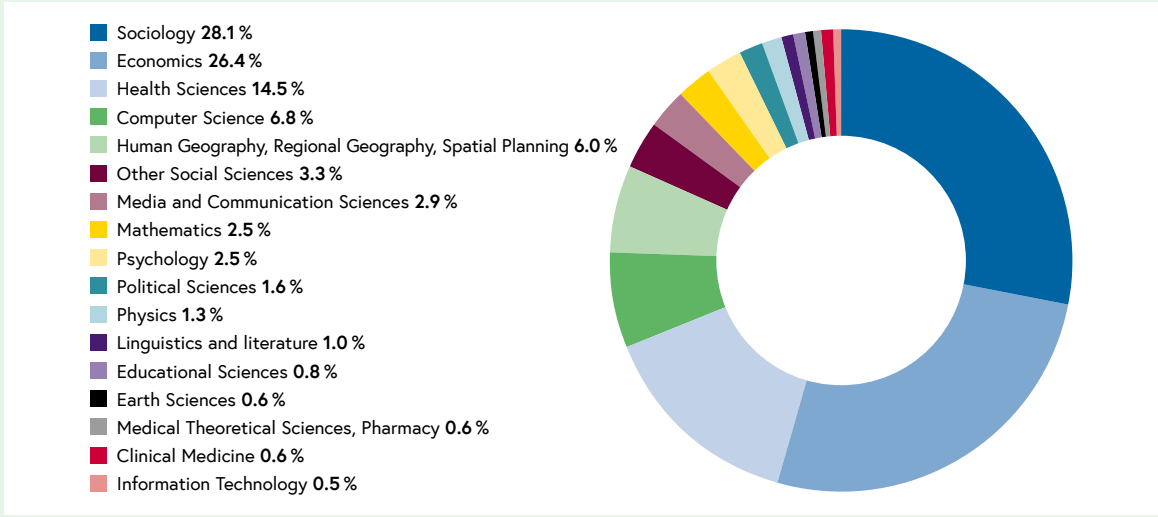
5 Website Statistik Austria, Austrian Micro Data Center AMDC https://www.statistik.at/en/services/tools/services/amdc-microdata-for-research; https://www.bmk.gv.at/themen/innovation/foerderrecht/Best%C3%A4tigung-gem%C3%A4%C3%9F-%C2%A72c-Abs.-2-FOG.html

6 See RIS BKA: Ordinance of the Federal Minister of Education, Science and Research on registers suitable for register research within the sphere of influence of the Federal Ministry of Education, Science and Research (Register Research Ordinance BMBWF – RFV BMBWF); StF: BGBl. II No. 400/2022; https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20012053

Excursus

In May 2022, the WWTF launched a funding call for projects that would use larger datasets relevant to social science research. The call created incentives to use the new possibilities of AMDC. 55 project outlines were submitted, with 73% of the projects planning to use AMDC data. The high proportion reflects the great need for registry data in the research landscape in Austria, which will continue to grow in the coming years. The submissions came predominantly from the faculties of social sciences of the Viennese universities and from economics-oriented non-university research institutions. Private universities were also among the submitting institutions. The variety of topics covered by the projects was large and reflected the existing areas of strength in Austrian research. Economic topics were strongly represented, as were the topics of health and work – often in thematic interconnections and interdisciplinary collaborations, which become possible on the basis of the linking possibilities of the AMDC data. The funding requested is more than €27 million, the award budget is €3 million. The funding decision will be made at the end of the second quarter of 2023, the projects will start in autumn 2023.

Figure 1-1: WWTF funding call for the use of the AMDC: Applications by thematic area



Legend: Self-declaration of scientific fields according to the Austrian Classification of Scientific Branches of Statistics Austria (3-digit) of the submitted projects that want to use AMDC data.

Source: WWTF

the AMDC as statistical microdata since 1 July 2022 due to the legal basis of the Education Documentation Act. The AMDC was presented to the research community and other departments at a kick-off event in October 2022.

Currently, this possibility is already being used in several research projects, which are among others divided among the disciplines of sociology, economics and health sciences. Since the summer of 2022, 42 scientific institutions have already been accredited, including eleven universities, the Austrian Academy of Sciences (OeAW), the Federal Institute for Quality Assurance in the Austrian School System (IQS), the Central European University, the Austrian Institute of Technology (AIT), the University of Applied Sciences Vorarlberg GmbH, the Karl Landsteiner Private University for Health Sciences, various research departments (Austrian Parliamentary Budget Office, Department of Economics, Department of Statistics as well as the Department of European Supervisory Principles and Strategy of the Austrian National Bank), the Austrian Institute of Economic Research (WIFO), the Institute for Advanced Studies (IHS), JOANNEUM RESEARCH Forschungsgesellschaft mbH, Austrian National Public

Health Institute (GÖG), the Complexity Science Hub Vienna (CSH) as well as other scientific institutions pursuant to §31 para. 7 Federal Statistics Act. 2000. More information on data sets available for research, on projects and research institutions is regularly published on the AMDC website.[7]

With the AMDC, Austria is catching up with the international standard, competitive disadvantages for Austrian researchers, such as in EU programmes, are being eliminated and the research location is being strengthened. This also supports the Federal Government's initiative with focus on "data-driven research on society" within the framework of the Future Austria Fund. This is intended to enable the targeted use of the new possibilities of the AMDC to answer current, more innovative and also more complex research questions and to generate more precise results. For this research programme, €9 million will be made available from the Future Austria Fund, with which the OeAW has been conducting calls for proposals since 2023.

Within the framework of the funding programme Data:Research:Austria,[8] the OeAW thus supports research projects in the field of register and microdata research in which data are used for fundamental research on socially relevant topics and issues.

The aim is to use administrative registers or microdata from other sources to create new perspectives on social trends and problem situations and to find answers to central social questions. The basis is existing data, which is to be scientifically re-used, linked and analysed via new research projects. In a broad spectrum of topics (health, demography, social affairs, economy, education, labour market, migration, integration, etc.), the development of existing data for extended empirical-quantitative applications should not only create knowledge, but also make important contributions to evidence-based policy. The first call for proposals was launched in March 2023. In a two-stage application process, with a first deadline in May 2023, research projects will be selected for funding by autumn 2023.

In education and higher education research, too, there is a trend towards more in-depth use of existing data (register data, statistical microdata) and their linking, here also with large data sets (BigData, AI approaches).

The AMDC is to play a further role in the development of the Austrian Socio-Economic Panel (ASEP). ASEP is the first long-term household panel to be established in Austria. The ASEP microdata sets will be made available to the research community via the Austrian Social Science Data Archive (AUSSDA) as well as via the AMDC in order to enable projects to link them to further register data or their own data.

1.2 RTI-relevant sub-strategies

The primary goal of positioning Austria internationally as an *innovation leader* has given rise to numerous RTI-relevant sub-strategies in addition to the RTI Strategy 2030. A common feature of the RTI sub-strategies is that they each focus on selected future topics or challenges and needs of the economy and society. Support for the green and digital transformation plays a central role here, also in coordination with European goals and initiatives, such as the *Green Deal*.

In order to provide an overview of current developments, the most recent RTI-relevant sub-strategies initiated at national level and the status quo of already established sub-strategies are briefly presented below, along with their objectives and content.

7 https://www.statistik.at/services/tools/services/amdc-mikrodaten-fuer-die-wissenschaft/remote-access-amdc
8 https://www.oeaw.ac.at/en/funding/funding-programmes/subsites/data-research-austria

Excellence Initiative (excellent=austria)

The Excellence Initiative, initiated by the BMBWF and managed by the Austrian Science Fund, pursues the following goals and perspectives:

- Support outstanding basic research – open topic, in line with the highest international standards, and with plenty of freedom for unconventional approaches
- Promote gender equality and diversity to a greater extent, and create attractive career opportunities for excellent junior researchers
- Expand long-term collaborations (national and international) to leverage synergies
- Strengthen Austrian universities, universities of applied sciences, and non-university research institutions in the world competition
- Enhance the international reputation of Austrian research institutions
- Boost the transfer of research results to business and society

excellent=austria was launched with the first round of calls for proposals for the "Clusters of Excellence" at the end of 2021, with funding commitments announced in March 2023. The research teams will have €135 million at their disposal for the next five years, 60% of which will be funded by the FWF and 40% provided by the participating research institutions. After five years, there will be an interim evaluation followed by the possibility of an extension for another five years.

The Excellence Initiative comprises three funding tracks:

- *Clusters of* Excellence (strengthening outstanding research areas by means of collaborations across institutions, disciplines, and national borders)
- Emerging Fields (identifying and supporting high-potential, forward-looking research topics)
- FWF Distinguished Professor (recruiting and appointing renowned researchers at Austria's universities)

Since the previous year, the following developments are worth mentioning:

Clusters of Excellence:

- Submission of 11 projects for full proposal in October 2022
- Decision by the FWF Board at the beginning of March 2023 on the basis of a funding recommendation by a multidisciplinary jury
- Announcement of the awards on 9 March 2023[9]

Emerging Fields:

- First call for proposals on 15 September 2022 (deadline 1 February 2023)
- Decision by the FWF Board in November 2023/March 2024

FWF Distinguished Professor:

- First tender in the second half of 2023
- First approvals 2024

Climate and Transformation Initiative

The aim of the Climate and Transformation Initiative launched by BMAW and BMK is to support the Austrian industry in its change towards a sustainable economy based on renewable energies and digitised in all sectors.

Companies are targeted, with a total support budget of €5.7 billion (of which BMK €5.1 billion and BMAW €600 million) at their disposal for transformation projects until 2030.

9 Results of the call for proposals: https://www.fwf.ac.at/en/news-and-media-relations/news/detail/nid/20230313-2850. See also Chapter 3, which lists the projects of AIT, OeAW and ISTA.

The BMAW is supporting this with €600 million for 2023–2026 based on three tracks along the value chain:

Track 1: Research and technology development funding:
- Promotion of technology-open application-oriented research – for all sectors, but especially in the automotive, semiconductor and life sciences sectors
- Business-science cooperation is advanced
- Implementation is primarily carried out by the FFG (basic programmes):
  - Transformative corporate R&D&I projects and manufacturing transition
  - Frontrunner

Track 2: Business location and investment promotion:
- Translation of research and development performance into production and practice (pilot and demonstration projects, etc.)
- Support for innovative/modernised production processes
- Implementation is primarily carried out by the Austria Wirtschaftsservice Gesellschaft mbH (aws):
  - Funding transformative demonstration and pilot plants
  - Investment financing up to first industrial deployment

Track 3: Qualification measures (FFG):
- A qualification initiative should offer retraining measures on and off the job, low-threshold qualification offers/training and further education
- Implementation is primarily carried out by the FFG:
  - Green & Digital Skills Vouchers
  - Qualification projects (as individual or consortium projects)
  - Continuing Education LABs (Innovation Lab)

In addition, the BMK is setting up an RTI initiative "Climate-neutral industry in the Climate and Energy Fund" with a funding volume of €210 million for 2023–2026, which will be handled by the FFG and Kommunalkredit Public Consulting GmbH (KPC).

This RTI initiative aims to develop technological solutions for energy-intensive industry that replace CO2-polluting technologies. The aim is to use showcase projects to prove that climate-neutral industrial production is technically and economically viable and to reduce the industries' annual greenhouse gas emissions by 1 million tonnes of CO_2-eq by 2030. The solutions found are to serve as models for broad implementation.

The initiative comprises four complementary modules:
1. Sector/industry cluster concepts (approx. €1 million R&D in 2023)
2. Research and innovation laboratory (approx. €5 million R&D in 2023)
3. Sector/industry cluster-specific project networks for development and testing in pilot plants (TRL 4–7, at least €30 million R&D per call, 2024–2026)
4. Demonstration projects with high innovation character (TRL 7–9, total ~ €150 million, from 2025)

Austria on the way to a sustainable and circular society – The Austrian Circular Economy Strategy

The central goals of the Austrian circular economy strategy are:
- Reduction of resource consumption
- Domestic material consumption (DMC): max. 14 tonnes per capita/year (2030)
- Material footprint (MF): max. 7 tonnes per capita/year (2050)
- Increasing domestic resource productivity by 50% (2030)
- Increasing of the circularity rate to 18% (2030)
- Reduction of material consumption of private households by 10% (2030)

In order to reform the Austrian economy and society into a climate-neutral, sustainable circular economy by 2050 an accelerated procedure at a wide range of levels is needed. This requires the interaction of numerous actors from economics, science, administra-

tion and civil society. The Austrian circular economy strategy sets out goals and concrete measures in selected key transformation areas. Based on the EU Action Plan on the Circular Economy 2020, the following seven transformation focal points were derived as relevant for Austria:

1. Construction industry and infrastructure
2. Mobility
3. Plastics and packaging
4. Textile industry
5. Electrical and electronic devices, information & communication technologies (ICT)
6. Biomass
7. Waste and secondary resources

In addition, various measures and activities were also implemented in the RTI context. These include, among others:

- Continuation of the previously started RTI initiative on the circular economy
- Mobilisation, networking and inclusion of stakeholders and experts for the further development of the RTI focus on the circular economy
- Anchoring circular economy subjects in existing theme-specific RTI initiatives
- Establish the circular economy as an interdisciplinary issue in all RTI-relevant activities of the Federal Government
- Initiation of flagship projects as well as pilot and demonstration projects in particularly relevant topics
- Broader use of European RTI funding for the circular economy and bioeconomy by providing information on European funding programmes and supporting Austrian actors in project development and participation in European consortia
- Initiation of dissemination and networking activities to create a comprehensive actor network

The Austrian circular economy strategy was adopted by the Council of Ministers on 7 December 2022.

Digital Action Plan

The Digital Austria in 2050 Strategic Action Plan initiates and implements several department-specific strategy processes that set targeted priorities in individual key aspects of digitisation in order to advance Austria in digitisation.

The starting point is a vision of the future for a "Digital Austria in 2050" developed by experts in a preliminary project, which is characterised in terms of regulatory policy by the digital responsibility society of citizens, the economy and the state, whereby digitally competent people use digitisation successfully – and as responsibly as possible – in all areas of life.

Since digitisation is an interdepartmental management issue, the relevant specialised ministries are involved in the key aspects of digitisation ("focus topics"), with the Federal Ministry of Finance assuming a coordinating role. Interdepartmental guidelines and principles serve as orientation. As a result of this process, the respective ministries will determine in topic-specific chapters of the Digital Action Plan which measures and implementation steps are to be taken up as a priority in the coming years in order to positively manage the digital transformation and to position Austria among the leading digitisation nations. Each action plan sets priorities, identifies fields of action and prioritises goals in the respective focus topic.

In the course of 2022, topic-specific chapters were developed in the following areas with the respective responsible departments:

- **Digitalisation and Tourism (BML)**
  Tourism holds great potential to increase value creation by making more and better use of existing data. This chapter of the Digital Action Plan therefore focuses on a concept for the development of a tourism data hub.
- **Future competences for a learning administration (BMKÖS)**
  The advancing digitalisation in public administration requires corresponding competences among

public officials. The results of this chapter serve as a starting point for the BMKÖS to meet these requirements in a structured and proactive manner.

- **Strategy Cultural Heritage Digital (BMKÖS)**
  The results of this chapter provide an orientation and a common framework for digitisation in the cultural sector. The particular challenge lies in the heterogeneity of the institutions with the variety of different art forms and their respective different target audiences.

AI Strategy AIM AT 2030

With its "Artificial Intelligence Mission Austria 2030 (AIM AT 2030)",[10] the Federal Government defines the framework conditions for a prosperous and responsible use of AI in all areas of life. AI is to be used in Austria on the basis of fundamental European values, with respect for privacy and the principle of equality, for the greatest possible benefit of all. AI should make its contribution to positioning Austria as a location for research and innovation as well as a competitive technology and industrial location. To this end, AI should also be used on a broad basis by Austria's small and medium-sized enterprises and in the administration.

In order to achieve the strategic goals of the Artificial Intelligence Mission Austria, 13 fields of action for a trustworthy AI and an AI ecosystem were defined. The 64 (horizontal) measures listed therein help Austria to create optimal and agile framework conditions for a public good-oriented and human-centred use of AI and to help shape the future of AI and its use in Austria. In addition, further 27 measures were proposed in 13 concrete fields of application.

Since its establishment in November 2021, the interministerial working group (AI Policy Forum) has met seven times under the chairmanship of the BMK and BMF (formerly BMDW). In addition, bilateral talks have been held with each ministry. In addition to increasing the ongoing exchange of information on AI activities in the specialised ministries, the main tasks were to set up ongoing monitoring of the measures of the AI strategy and their allocation to the responsible ministries.

The implementation status of the measures defined in the strategy is as follows (as of quarter 3/22): 62 out of 91 measures (68%) are being implemented or have already been implemented. A further 16 measures are in the planning stage. For 2023, it is planned to set up detailed monitoring and to present an overview of the individual activities per measure in the course of developing the update of the AI strategy. In addition, a website will be created that will provide an overview of relevant events and funding opportunities in addition to the content and implementation of the AI strategy.

In October 2022, the first AI networking meeting of the AI Policy Forum took place with the focus on "AI in administration", where there were many interesting inputs from experts from research, business and administration.

Climate-friendly aviation innovations – The Strategy for Research, Technology and Innovation for Austrian Aviation 2040+ (RTI Aviation Strategy 2040+)

Austria's aviation in the field of research, technology and innovation with a view to 2040+ has the following goals:

1. **"Green and efficient":** The aviation system is to be made more sustainable through climate-neutral aircraft, circular aviation industry and climate- and resource-friendly technologies.
2. **"Future-oriented and competitive":** Future-oriented technologies make a key contribution to

10 https://www.bmk.gv.at/themen/innovation/publikationen/ikt/ai/strategie-bundesregierung.html

future-proof value chains, increase the resilience of the entire aviation supply industry and strengthen international visibility.

3. **"Digital and intermodal":** Digitalisation and the mobility revolution open up potential and fields of competence for aviation. The latter is increasingly becoming part of an intermodal mobility system by establishing holistic mobility solutions. Digital and intermodal RTI solutions put people at the centre. RTI activities in the areas of safety and (cyber) security ensure the long-term safety and integrity of the entire air transport system.

In order to achieve the strategic goals, the following packages of measures will be implemented – under the responsibility of the BMK:

- Strategic coordination and monitoring by setting up a strategic funding portfolio and target group-specific instruments to promote economic potentials and competences
- Prioritisation of RTI topics for sustainable and safe aviation
- Interdisciplinary networking opportunities and knowledge exchange to deepen the system-of-systems approach
- Use of synergies from other topics and sectors for forward-looking RTI in aviation
- Expansion of international cooperation and impulses through co-design in international bodies and partnerships
- Foundations for sustainable and safe RTI activities through regulation and standardisation by interlinking air transport policy and RTI policy
- Excellent research through attractive education and training opportunities as well as intensification of knowledge transfer to develop talents
- Publicly effective presentation of RTI results and increase of visibility

The strategy is intended to strengthen the linkage of innovation and sector policies that is necessary due to the dynamics of change and to advance impact orientation in the system. The energy transition requires new technologies for aircraft, infrastructure and airports as well as research into their impact on the climate and the environment. Innovation drivers for this are the conversion of propulsion energy from fossil to renewable energy sources and the need for circular transformation.

Open Innovation Strategy for Austria

The Open Innovation (OI) Strategy for Austria, which runs until 2025 and is jointly supported by the BMBWF and BMK, comprises three core objectives:

- To open up, broaden and further develop the Austrian research and innovation system and in particular to develop new sources of innovation and to strengthen the networking capability of the participating actors and organisations.
- To increase the involvement of citizens (end users) in generating innovation. This may also contribute to significantly raising the value attached to innovation, research and development by the public.
- To increase the efficiency and orientation to results of the Austrian innovation system by, among other things, implementing innovative forms of knowledge transfer and incorporating to a greater extent the needs of society, business and public administration into the research and innovation system.

To ensure that these goals are achieved, both fields of action and measures were defined in the strategy. A total of 14 measures were developed that relate to the action areas "Culture & Competencies", "Networks & Cooperation" and "Resources & Framework Conditions" and are intended to contribute to anchoring open innovation as a guiding principle in the innovation system.

Ongoing and new Open Innovation initiatives related to the defined measures can be found in a tabular overview in Annex III. Further information as

well as the OI strategy and the interim report on the implementation of the strategy are published on the website.[11]

Foreign Trade Strategy 2018 / Addendum 2022

In December 2018, the Foreign Trade Strategy "An innovative foreign trade policy for a successful Austria" was adopted by the Austrian Federal Government. The foreign trade strategy, which comprises 63 measures, aims to strengthen the Austrian export industry through Austria's coordinated and concerted presence in economically interesting growth regions and to support domestic companies interested in doing business abroad by providing targeted assistance. The Federal Ministry of Labour and Economy (BMAW), the Federal Ministry for European and International Affairs (BMEIA) and the Austrian Federal Economic Chamber (WKO) primarily are responsible for the strategy's implementation.

The further development and new priorities in the Addendum to the Foreign Trade Strategy of 2022 were a reaction to recent global economic developments and geo-economic trends. Furthermore, in line with the government programme, a stronger focus was placed on national measures towards the European Green Deal. The focal points of the addendum include the chapters security of supply, internationalisation strategy "Green Economy" and strengthening exports through coordinated diplomatic visits, "ReFocusAustria", "go-international" and "export initiative".

The chapter "Foreign trade policy with a resilience focus" contains goals and measures to optimise and secure resilient and robust supply chains, to promote the resilience of domestic SMEs and to enhance international networking. Close cooperation with existing Austrian and international research institutions is sought in Measure 1 "Support for the Austrian Supply Chain Intelligence Institute (ASCII)". The institute's purpose is to produce analyses and recommendations in order to better address current and future challenges in supply chains, strategic dependencies and to secure production in Europe.

Measure 5 "Conclude resilience-building partnerships" focuses on the protection of critical infrastructure and technology and on access to strategically important raw materials for the export-oriented industry by concluding bilateral commodity agreements and partnerships.

The new measures in Chapter 2 "Internationalisation Strategy Green Economy" focus on strengthening Austria's position as an international pioneer in the sustainable technology sector, including Measure 8 "Green Economy focus in the internationalisation initiative and in export promotion".

Measure 16 in Chapter 3 "Export champion through strategic visit diplomacy" aims to use visit diplomacy as a lever to push the topics "green economy" and "Austrian technology".

Creative Industries Strategy for Austria

The goals of the Creative Industries Strategy for Austria include:

- Strengthening the Austrian innovation system and the competitiveness of the creative industries
- Promoting the role of the creative industries as innovation and transformation drivers for other economic sectors and society
- Strengthening Austria's international image as a creative country of culture and innovation

The creative industries strategy contains the three interlocking pillars of empowerment, transformation, and innovation, to which 22 measures are assigned in eight fields of action. Strategic support for the implementation of the strategy is provided by the Creative

11 https://www.bmk.gv.at/en/topics/innovation/policy/open_innovation_strategy.html

Industries Advisory Board established at the BMAW, whose independent experts provide advice, annually review progress in the implementation of the strategy and make current recommendations.

The current progress report of the Creative Industries Advisory Board from November 2022 shows developments as follows:

- As part of the 2022–2023 funding agreements, the aws funding programmes were revised and further developed. Within the framework of "aws First Incubator" and "aws Preseed | Seedfinancing – Innovative Solutions (creative, social and sustainable businesses)", individuals and companies from the creative industries who develop innovations with a positive impact on specific social/environmental challenges are also addressed.
- 2022, a digital communication campaign for the Austrian creative industries was launched on the recommendation of the advisory board. It is intended to make the innovative power and solution competence of the creative industries for macroeconomic and social challenges more visible and to raise awareness among the general public and decision-makers.
- Based on the work in 2022, seven further measures of the creative industries strategy were classified by the advisory board as largely implemented by the end of 2022:
  - Measure 3 – Implementation initiative "Stop Financial Burdens"
  - Measure 6 – Implementation initiative "Create investment incentives for private infrastructure investments and technology-neutral funding models"
  - Measure 8 – Implementation initiative "Scouting initiative that identifies and promotes ideas and talents at an early stage"
  - Measure 17 – Implementation initiative "Establish a digital marketplace for new innovation partnerships"
  - Measure 21 – Implementation initiative "Application of a broad concept of innovation in general R&D as well as innovation funding"
  - Measure 21 – Implementation initiative "Offering risk and growth capital for creative economy-based innovation projects"
  - Measure 22 – Implementation initiative "Create investment allowance"

Thus, 14 of the 22 measures are being implemented or have already been implemented. Five of the six Advisory Board recommendations from 2019 have already been successfully implemented. Two of the three measures from the Advisory Board's position paper developed on the occasion of the COVID-19 pandemic have also been successfully implemented in the meantime.

Strategy of the Austrian Federal Government for Intellectual Property (in short: IP Strategy 2017)

The IP strategy of the Federal Government is intended to offer inventors, business operators and research institutions protection and freedom in the use of their intellectual property and to ensure that their potential is fully exploited. This will strengthen the research location and the transformation of the economy and guarantee and increase Austria's competitiveness in the future.

Austria – like most developed countries – is facing challenges concerning the awareness of intellectual property, its use and the professional handling of it. In particular, the domestic economy, which is dominated by small and medium-sized enterprises, and researchers in Austria need to be supported in making efficient use of the instruments for protecting their intellectual property.

Currently, under the leadership of the BMBWF, the implementation of the European Commission's Guiding Principles for Knowledge Valorisation is driven forward and their implementation pursued. These

new guiding principles are intended to support R&I organisations in exploiting the value of their intellectual assets and to continue to involve all relevant actors in the research and innovation ecosystem.

Other important developments include:

- Establishment of the NCP IP Women's Network as an initiative to make the proportion of women in the IP sector visible
- Expansion of a free support service of the Austrian Patent Office for students and pupils of technical subjects
- Expansion of the range of target-group-specific webinars offered by the IP Academy as well as events for networking the creative scene
- Increasing the patent intensity of Austrian universities and research institutions
- Extension of the Spin-off Fellowships Programme and increase by a further €15 million
- Strategic further development in the performance agreements with universities and research institutions, including the expansion of networks and spin-offs
- Implementation of improvements in the application requirements for the FFG Patent Cheque
- Anchoring IP consulting in all aws tech start-up projects (preseed, seed, etc.)
- Continuation of prototype funding for universities and universities of applied sciences (WTZ3, funding period 2022–2023)
- Expanding the knowledge base and awareness of innovation protection in Austrian schools (among teachers and pupils) through aws (as part of "Jugend Innovativ")
- Addressing knowledge transfer in the form of collaborative innovation approaches specifically for SME practice (within the framework of the NCP-IP Open Innovation focus)
- Awareness-raising measures such as the PHÖNIX or World IP Day to inform the public on the topic of IPR and entrepreneurship

Research Infrastructure Action Plan 2030

The Austrian Research Infrastructure Action Plan 2030 ("Forschungsinfrastruktur-Aktionsplan 2030") pursues four priority goals for research infrastructure development:

- The creation of flexible access to research infrastructures for science and industry
- The integration of national infrastructures into European and international large-scale research infrastructure projects
- Evidence-based planning and long-term (competitive) funding models, in particular for participation in European and international research infrastructures
- The digitisation and expansion of (research) data infrastructures and (research) data management

The Research Infrastructure Action Plan, which was developed as part of the RTI Strategy 2030, focuses on the guiding principle of coordinated procurement and cooperative use of research infrastructures in Austria.

As a central instrument for research infrastructure development, the Austrian Research Infrastructure Action Plan 2030 focuses on the expansion of national research infrastructure and participation in European and international large-scale research infrastructure (especially the ESFRI Roadmap) by 2030.

The action plan is the result of a process that takes into account the concerns of the scientific community (bottom up) as well as the strategic goals within the framework of the RTI Strategy 2030 and the associated RTI Pacts (top down). Research infrastructures are an essential element of the framework conditions of any RTI system. The further development of research infrastructures (including e-infrastructures) is consequently an important and ongoing task of both national and European research policy. Austria will therefore continue to participate in the important processes and projects in the area of research infrastructures within the framework of EU research policy (including ERA) and also set new accents nationally.

Public Procurement Promoting Innovation (PPPI)

The procurement of innovative solutions is intended to stimulate efficiency and modernisation in the public sector and at the same time strengthen value creation in Austria.

The Public Procurement Promoting Innovation ("Innovationsfördernde öffentliche Beschaffung", PPPI) is firmly anchored in Austria's RTI policy as a demand-side instrument of innovation promotion, as well as in the current government programme. The strategic framework for the PPPI initiative is the PPPI Action Plan, adopted by the Council of Ministers in September 2012, the implementation of which has since been consistently pursued by the jointly responsible ministries BMAW and BMK. The update of the PPPI Action Plan in the form of the PPPI Strategic Framework 2030 is currently being prepared.

A core element of the implementation of the PPPI Action Plan is the establishment and operation of a PPPI service unit, which has been located in the Federal Procurement Agency (BBG) since autumn 2013 and has been operated since April 2019 on the basis of a public-public partnership between BMAW, BMK and BBG. Based on the evaluation carried out in 2022 (see Chapter 2.5), the course is now being set for the next period of cooperation, which is to extend over the years 2024–2028.

Other milestones achieved in 2022 were the ECOVATION 2022 conference on innovation-promoting and sustainable public procurement, the successful implementation of the "50. IÖB-Challenge", the continuation and development of the IÖB-Toolbox and the R&D Innovation Partnership as part of the BMK's 2022–2023 funding agreements with aws and FFG, the publication of a PSI criteria catalogue, and the implementation of a call, which awarded prizes to the top mobility innovations for the public sector. In addition, international exchange was further intensified in the sense of mutual learning.

An important milestone for the PPPI initiative in 2023 will be the adoption of the PPPI Strategic Framework 2030. The activities of the PPPI service unit will – for the first time on a multi-year basis – be focused on thematic priorities, namely on the topics "Climate Neutral & Smart Cities and Municipalities" and "Resource Security", for which there will be specific implementation measures. In addition, a special PPPI prize of the "Österreichischen Verwaltungspreis" (Austrian Public Administration Award) will be awarded for the third time in 2023, after 2019 and 2021.

1.3 Current developments in the higher education sector

The Austrian RTI location is shaped by the performance of Austrian universities. In view of this, the most important developments in the higher education sector are briefly outlined below, starting with the latest strategies in governance.

The Austrian Higher Education Plan 2030

With its comprehensive systemic approach, the Higher Education Plan is a first in Austrian higher education policy. It thus differs from the 2011 Higher Education Plan, which focused on the establishment of governance instruments that primarily concerned public universities. In the context of the existing strategy documents of the BMBWF for the four higher education sectors, the Austrian Higher Education Plan (HOP) is to be understood as an umbrella strategy that addresses the 77 Austrian higher education institutions in their entirety. This enables a coordinated development of the Austrian higher education system. The focus is on higher education teaching.

The aim of the Higher Education Plan is to complement the RTI Strategy 2030, i.e. to further expand existing strengths of the higher education system, to make greater use of development potential and thus, above all, to bring about a long-term, joint development of the Austrian higher education sectors. To this end, both quantitative goals and qualitative development lines are defined or described until 2030.

The four **quantitative target indicators of the Higher Education Plan** include:

1. Improving the student-teacher ratio: The greatest need for action here is at public universities (from 1 : 39 to 1 : 35)
2. Increase the number of degrees (and increase the STEM share): degrees are to be increased from 57,100 to 64,600 in the higher education sector and the STEM share of first degrees is to be increased from 28.5% to 34.2%
3. Internationalisation of graduates: the aim is to increase the proportion of graduates with a study-related stay abroad to 26% in all sectors
4. Equality: The proportion of women is to be raised significantly, especially at the higher career levels.
   At public universities:
   a. Women rectors: from 27% to 40%
   b. Heads of organisational units: from 25% to 40%
   c. Women professors: from 28% to 35%

   At the universities of applied sciences:
   a. Representative authority of the conservator: from 28% to 40%
   b. Women heads of study programmes: from 27% to 35%

The **five qualitative lines of development,** from which 18 fields of action are derived, include:

- Higher education landscape and location development: the interaction of the 77 higher education institutions in Austria as a location for science and higher education will be brought more to the fore.
- International contextualisation of Austrian higher education institutions: Austria's higher education institutions are internationally active and well networked, which strengthens Austria's research, science and EEK (Development and Exploration of the Arts) abroad.
- New educational biographies and permeability: an adequate range of courses is created for students with different study behaviour or changed educational biographies.
- Participation in education: public higher education in Austria continues to be accessible regardless of social factors, provided that defined access criteria are met.
- Teaching and research in the context of societal challenges: Austria's universities are actively shaping the digital transformation; they are active in the field of sustainability and educator training.

The Austrian National Development Plan for Public Universities 2025–2030

The Austrian National Development Plan for Public Universities (GUEP)[12] is a central, strategic planning document of the BMBWF, which includes and prioritises the most important objectives for the further development of the universities. The planning horizon is two performance agreement periods and is updated every three years – in preparation for the upcoming performance agreement negotiations. When drawing up their development plans, the universities are guided by the GUEP (§12b, para. 2, UG). The capacity-oriented statistical part of the GUEP is prepared in the second year of a performance agreement period by 31 October and serves as the basis for university financing.

In total, the GUEP 2025–2030 comprises **six system objectives,** the implementation of which is

12 https://www.bmbwf.gv.at/dam/jcr:4facba49-1ab7-4e11-85c6-74fdc3febaa8/GUEP_2025-2030_neu.pdf

realised on the basis of correspondingly defined goals and fields of action:

Objective 1: Further develop and strengthen the higher education system

a. Institutional differentiation and inter-institutional clustering
b. Sharpening the research profiles and thematic priorities
c. Strengthening higher artistic education & Development and Exploration of the Arts (EEK)

Objective 2: Strengthen university research

a. Strengthening universities as central institutions for basic research
b. Strengthening activities in the European Research Area
c. Ensure cooperative and competitive research infrastructures

Objective 3: Improve the quality and efficiency of university teaching

a. Further development (or increase) of quality in university teaching
b. Further development of cooperatively responsible teacher education
c. Strengthening new study programmes and improving permeability between higher education and education sectors

Objective 4: Promotion of young academics and artists as well as gender equality and social inclusion

a. Attractive career concepts for young academics and artists
b. Continued qualitative development of PhD studies
c. Gender equality and inclusion

Objective 5: Expansion of knowledge and innovation transfer and location advantages

a. Supporting the implementation of Open Science
b. Intensification of knowledge and technology transfer as well as entrepreneurship
c. Coordinated location policy with an international profile

Objective 6: Increase internationalisation and mobility

a. Strengthening internationalisation including the promotion of mobility in studies and teaching

Universities and digital transformation 2030

The strategic framework in the cross-cutting matter of "digital transformation" comprehensively presents the BMBWF's vision, definition and fields of action. The vision for the year 2030 on which the document is based considers universities as independent and autonomous institutions that actively and responsibly (co-)shape digitalisation, with universities providing the space for critical and reflective engagement with digital transformation processes.

The term "digital transformation" is broadly defined. It refers to significant changes in everyday life, science, the economy and society in the course of digitalisation due to the use of digital technologies and techniques and their effects. In the university context, digitalisation is understood as a cross-sectional matter that permeates all areas. As a social phenomenon, it is interdisciplinary research and teaching content between the cultural sciences, Development and Exploration of the Arts (EEK) and STEM subjects; in the transformation process, digitisation is changing the university as an institution. It opens up new possibilities for research, teaching and learning, changes demands on the organisation and enables new ways of interaction between science and other social systems. Cooperation is a prerequisite for actively shaping the digital transformation.

The digital transformation is lived in all areas of the university – research, teaching and learning as

well as organisation and infrastructure. To achieve the partial aspects of this vision, it is part of the BMBWF's mission:

- Create appropriate framework conditions via the available governance instruments and legislation
- Stimulate and coordinate cooperation and networking and, where appropriate, create platforms for exchange and networking among university stakeholders
- Advocate for appropriate funding for universities

The BMBWF's **fields of action** derived from this are:

- The digitisation of research and teaching should be taken into account in the governance instruments. Cooperation and the formation of networks as well as their coordination should also be encouraged.
- In addition, platforms and networking formats on digitisation are being created or existing platforms and networking formats are being expanded.
- Clear (legal) framework conditions for teaching and research are defined in the context of the digital transformation and competitive tenders are regularly held.
- In order to develop joint solutions in a cooperative manner, tenders are regularly issued.
- Studies to explore the impact of the digital transformation on teaching and research are commissioned in order to be able to act in an evidence-based manner.
- Initiatives in the areas of Open Science and Open Education will continue to be actively promoted and targeted measures will be taken to strengthen the international attractiveness of Austria as a research location.
- In addition, the BMBWF is committed to securing sustainable funding for selected core areas, in particular for the joint development and establishment of (shared) services through cross-university tenders.

BMBWF Call for Proposals "(Digital) Research Infrastructure"

Universities have the task of driving innovation and scientific progress through excellent research and research-led teaching. It is up to universities to develop solutions for the greatest societal challenges such as climate change, energy transition, resource scarcity, food security or digital transformation. The prerequisite for this is access to the necessary cutting-edge research infrastructures that enable researchers from all disciplines to develop challenging questions and new areas of research in the first place.

As a research, technology and innovation location, Austria is in global competition, both in terms of high-quality and competitive infrastructure equipment and access to European and international large-scale research infrastructures. The strategic (further) development of research infrastructures is therefore a central objective of the BMBWF as well as the Federal Government and is therefore anchored in the RTI Strategy 2030, the Austrian Research Infrastructure Action Plan 2030[13] as well as in the recently published Austrian National Development Plan for Public Universities (GUEP) and the current performance agreements of the 22 public universities.

The further development of research infrastructures is highly investment-intensive, which was one of the reasons for initiating the "Digital Research Infrastructure" call for proposals. The BMBWF provided €40 million for the expansion and/or modernisation of existing research infrastructures as well as the acquisition of new high-quality (digital) research infrastructures for the performance agreement period 2022–2024. A total of 28 project proposals from

13 RTI Research Infrastructure Working Group (2022): Austrian Research Infrastructure Action Plan 2030, Vienna, https://www.bmbwf.gv.at/dam/jcr:65ac2af1-bf8d-45d3-9f3c-380ab678dbd1/FI-Aktionsplan%202030_BF.pdf

19 universities will be supported with up to €4 million.[14] The projects cover all areas of science – from STEM, life sciences, humanities, social and cultural sciences to the arts, and the broad spectrum ranges from modern data infrastructures, robotics, artificial intelligence to cognitive neuroscience, digital humanities, cultural heritage, construction, climate research and image processing in medicine.

Above all, strategic cooperation is promoted so that research in Austria is increasingly conducted in networks, as well as interdisciplinary approaches. The free accessibility and availability of both research data and research infrastructures plays a decisive role, especially the development of and participation in European projects, above all the European Open Science Cloud.

Last but not least, the projects are about the demand-oriented acquisition and efficient use of both new and existing state-of-the-art infrastructures. Overall, the primary goal is to strengthen Austria as a science, research and technology location. In budgetary terms, the tender amount of €40 million is made possible through start-up financing, which basically comes from the university budget for the years 2022–2024, whereby this budget is refinanced through the EU crisis fund "Recovery and Resilience Facility" (RRF).

"Uni-Med-Impuls 2030" programme

In summer 2020, the Federal Government adopted the "Uni-Med-Impuls 2030" programme for the further development of the Medical Universities of Vienna, Graz, Innsbruck, the Medical Faculty of the University of Linz and the University of Veterinary Medicine Vienna. This will ensure the long-term development of medical research and teaching until 2030.

The following **goals** are aimed at:

- Increase the number of places in medical studies by a total of 200 places by 2028: The first increase of 50 places already took place in the winter semester 2022/23; in the final expansion, 2,000 study places (144 in dental medicine and 1,856 in human medicine) will be available.
- Attractiveness of general medicine will be further expanded based on the previous university measures.
- Likewise, the creation of 30 new professorships or career positions, especially with a focus on infectiology, epidemiology, public health and gender medicine, is planned, which are mainly to be implemented by 2024.
- The areas of public health, epidemiology and infectiology will be strengthened and national and international cooperation, as well as EU partnerships, will be expanded. The numerous research projects in infectiology and strategic national programmes will also continue to be supported.
- In addition, the digital medical research infrastructure and research databases as well as networking with international partners are being promoted, and the area of e-learning in medical studies is being expanded.

Establishment of the Ignaz Semmelweis Institute

The Ignaz Semmelweis Institute (ISI) is to be established at the Medical University of Vienna, an inter-university flagship institute for infection medicine at the MedUni Campus Vienna General Hospital. Therefore, the implementation as an inter-university cooperation centre, which is to conduct top-class basic and clinical infectious disease research throughout Austria, was anchored in performance agreements (LV) of the Medical Universities of Vienna, Graz, Innsbruck, the

14 The tender result can be viewed at https://www.bmbwf.gv.at/Themen/HS-Uni/Hochschulgovernance/Steuerungsinstrumente/ausschreibung.html

University of Veterinary Medicine Vienna and the JKU Linz. Project development for the establishment of the cooperation centre has already begun. The ISI will be endowed with one professorship each by all five participating universities.

Expansion of the pre-clinics at the Medical Universities of Vienna and Graz

The expansion of the pre-clinics at the medical universities of Vienna (MedUni Campus Mariannengasse) and Graz (Med Campus Graz) will establish modern and sustainable centres for medical research and teaching in Austria.

Until now, the pre-clinical facilities of the Medical University of Vienna were spread across several locations. The MedUni Campus Mariannengasse of the Medical University of Vienna, with a usable floor space of around 35,000m², has a gross investment volume including equipment of around €395 million and creates the option of bundling various locations in the immediate vicinity of the Vienna General Hospital. Construction is scheduled for completion by the end of 2026.

The Med Campus Graz of the Medical University of Graz, which comprises the new university buildings Module 1 and Module 2 as well as the Institute Building for Anatomy, is one of the largest university campuses in Austria with a usable floor space of around 45,000m². The gross investment volume, including equipment, amounts to about €460 million. University operations were started in stages from 2017 and will now be fully operational in 2023. The commissioning will mark the end of the university's new location on the grounds of the LKH-University Hospital Graz.

Starting signal for the establishment of the Center for Precision Medicine/CPM at Vienna General Hospital (AKH Wien)

Personalised Medicine enables the use of tailor-made therapies taking into account state-of-the-art diagnostic methods and the latest technologies. The construction of the "Center of Precision Medicine" (Eric Kandel Institute) on the grounds of the AKH Wien will not only ensure the provision of cutting-edge medical care for the Austrian population in the future but will also strengthen the translation of inventions and the founding of companies in the sense of a knowledge economy and thus Vienna as a location for science and business. 200 workplaces will be available on a usable area of around 6,000m².

The gross investment costs including equipment amount to €90 million. Funding is provided by the BMBWF with an amount of €75 million from the European Recovery and Resilience Facility (EU-RRF). Construction is scheduled for completion by the end of 2026.

Increased knowledge and technology transfer, more commercially successful academic spin-offs

With its RTI Strategy 2030, Austria has set itself the goal of generating "100% more economically successful academic spin-offs". Since then, the valorisation of research results for the benefit of the economy and society, in particular through business start-ups by students and researchers, has thus increasingly been the focus of science, business and research policy.

In addition to anchoring relevant goals and measures in the performance agreements, the BMBWF supports the commercial exploitation of academic research results in the form of spin-offs with the "Spin-off Fellowships" programme, modelled on the ETH Pioneer Fellowship Programme of the ETH Zurich. In three submission rounds of the first Spin-off Fellowships programme (2018–2021), there were over 90 submissions, of which a total of 24 projects were recommended for funding. So far, 16 spin-offs have emerged from these funded projects, which is a start-up rate of around 67%. In the course of the first submission round of the

extended second programme (2022–2026), 36 projects were submitted by universities, UAS and research institutions, with 10 projects currently being funded. The funding programme is administered by the FFG.

In fact, there is little empirical evidence on the impact of academic spin-offs on economic growth. A study using an innovation model developed at the University of St. Gallen[15] shows that targeted support for spin-offs not only strengthens third-party funding at universities, but for every euro of actual additional spending on spin-offs (including through the programme), the GDP increase is up to €7.

Spin-offs are also closer to university research than other start-ups. Analyses conducted at the micro level show that Austria's spin-offs (in relation to their respective assigned industry) actually have a very high R&D intensity. This R&D intensity averages 15.24% and is thus significantly higher than that of the comparison group, which is composed of venture capital-financed start-ups (5.83%). Spin-offs also grow very quickly in terms of the number of employees in the first years of their existence. According to estimates, annual growth rates can be in the double-digit percentage range. The higher the sector-specific R&D intensity, the faster spin-offs grow. Moreover, spin-offs prefer to settle in research-intensive regions, i.e. above all in the vicinity of large and/or many universities. The regional share of STEM graduates also has a positive influence on the number of spin-offs.

Spin-offs are thus an important part of the regional innovation system – even more: public funding can strengthen both the number of spin-offs and the resulting innovative power. Both contribute to a more productive economy and higher GDP in the medium to long term.

Taking off with the "European Universities"

European Universities are future-oriented higher education alliances that establish a new form of close and structured cooperation and aim to achieve top quality and excellence in education and research.

The Austrian European University Community is constantly growing and developing. Currently, 13 Austrian higher education institutions are already participating in the European Universities Alliances, two of them in a coordinating role. Austria thus participates in around 30% of the 44 alliances in Europe. In more detail, these are eight public universities, four universities of applied sciences and one private university, which are involved in a systemic, sustainable and structural transnational cooperation.

Experience to date shows that the European Universities are already regarded as models of good practice. Close cooperation in the Alliance leads to improved provision, increased quality and innovation in teaching and learning, performance and international competitiveness of the participating higher education institutions. By fostering academic excellence, the Alliances play a key role in the European Education Area and spill over into the European Research Area. The benefits of participation in the Alliance are not only evident at the European or national level, but also at the institutional and individual level. The added value of participation in the initiative for HEIs is improved institutional visibility, increased attractiveness for foreign students, increased institutional resilience in times of crisis, international reputation and enhanced cooperation opportunities. Close cooperation has created stronger links between research, teaching and innovation. The topics of "sustainable education" and "digitalisation"

15 See Keuschnigg et al. (2022).

have come into focus. Another consequence is the intensification of student and staff mobility as well as a deep engagement with societal challenges.

By anchoring corresponding projects in the performance agreements (LV), the eight participating Austrian public universities are also promised long-term security and plannability for their activities planned within the framework of the Alliance. Other Austrian universities and universities of applied sciences submitted applications under the 2023 Call, which was published on 30 September 2022 and has a budget of €384 million. Within the framework of the call, applications can be submitted by the 24 second-generation alliances as well as by new alliances.

The further development and implementation of the European Universities Initiative and the dismantling of barriers in transnational cooperation are thus a priority of national higher education policy.

2 Facts, figures and trends in research, technology and innovation

Chapter 2 begins with a current overview of the funding and R&D performance in Austria (Chapter 2.1), followed by the development of key RTI and digitisation indicators and a related picture of Austria's innovative capacity (Chapter 2.2). Chapter 2.3 discusses Austria's role in EU research, technology and innovation policy, followed by a comprehensive, systemic analysis of the priority topic selected for this report, "Supporting the Green Transformation in Research and the Economy" (Chapter 2.4). The latest in Austrian RTI evaluation culture and practice is summarised briefly and concisely in Chapter 2.5.

2.1 R&D sources of funds and sectors of performance in Austria

Expenditure on R&D

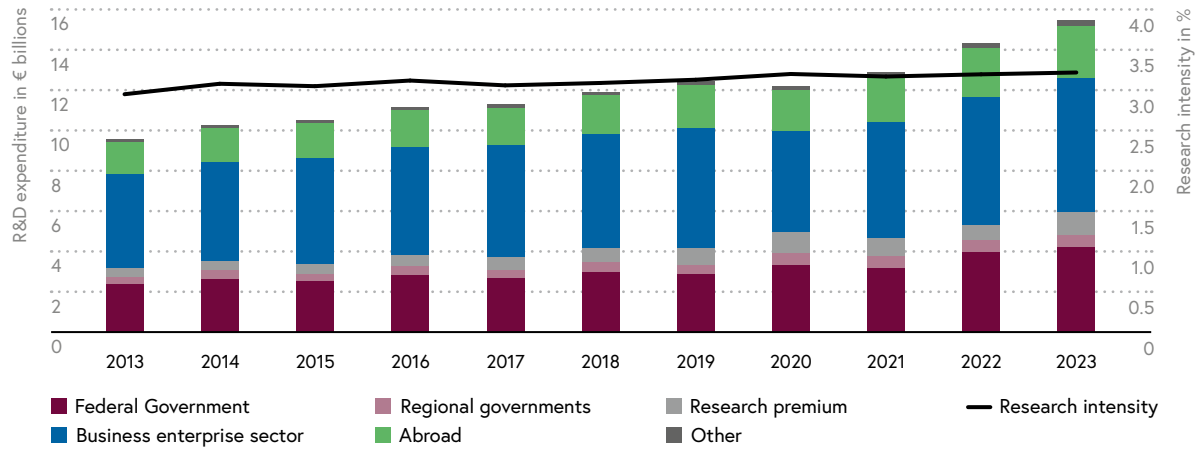
- According to the global estimate, Austria's research intensity will be higher in 2023 than ever before, at 3.22%
- This continued increase in research intensity during times of multiple crises is provided by public spending
- Resilience and technology sovereignty as economic policy priorities increasingly influence R&D

The following two chapters discuss the empirical and political RTI developments that accompany the current multiple crises. First, Chapter 2.1.1 documents and comments on Austria's R&D expenditures for the period 2013–2023 by sources of funds. Austria's R&D expenditure as a share of gross domestic product (GDP) is among the highest in the world and continues to grow steadily over the period. In detail, however, changes regarding sources of funds are evident during the current decade; the share of domestic companies as source of funds has declined. R&D performers are confronted with major challenges, in particular companies trying to reduce business risks in times of increasing uncertainties, partly also through lower R&D expenditures. Chapter 2.1.2 therefore discusses the effects of multiple crises, focusing in particular on the priorities of international and Austrian economic and industrial policies. Internationally, a paradigm shift in R&D related policy can be observed, placing resilience and technology sovereignty in the foreground and explicitly expressing preferred research goals. At the same time, the EU's and Austria's industrial policies set incentives to better cope with societal challenges such as climate change.

2.1.1 Global estimate for 2023

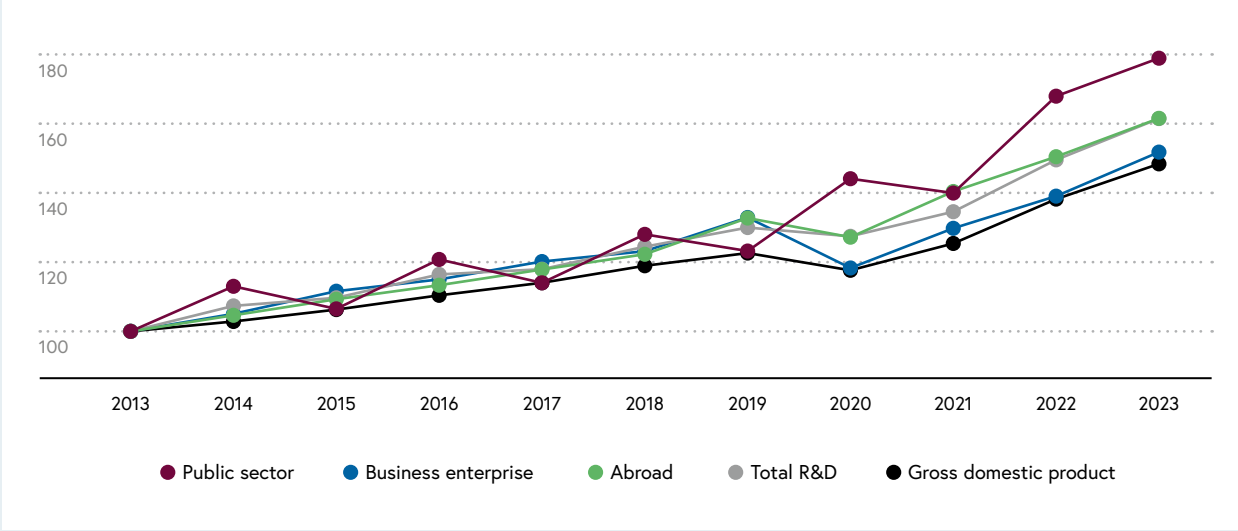
Austria's research intensity (= total R&D expenditure divided by GDP) equals 3.20% in 2022 and is thus identical to the 2020 value (ignoring the third decimal place

Figure 2-1: Development of R&D funding and research intensity in Austria, 2013–2023



Note: The category "Other" combines the two categories "Other public funding" (incl. higher education sector) and "Private non-profit sector".
Source: Statistics Austria, global estimate as of 21 April 2023. Graphic: WPZ Research.

Figure 2-2: Development of R&D funding, 2013–2023 (Index, 2013 = 100)



Note: The category "Public sector" contains the categories "Federal Government", "Regional governments" and "Other" (= "Other public funding" incl. the higher education sector and "Private non-profit sector"), the category "Business enterprise " includes the categories "Business enterprise sector" and "Research premium".

Source: Statistics Austria, global estimate as of 21 April 2023. Calculations and graphic: WPZ Research.

and beyond). However, the year 2020 was exceptional due to the recession caused by COVID-19. In nominal terms, R&D expenditure is higher than ever before at €14.31 billion in 2022, with a growth of 11.13% compared to 2021. Nominal GDP in 2022 is €447.65 billion and has grown by 10.22% in nominal terms compared to 2021. As a result, the research intensity has increased from 3.17% to the above mentioned 3.20%.

R&D expenditure is also expected to grow faster than GDP in 2023, resulting in the highest research intensity ever for Austria. While GDP is expected to rise to €480.63 billion, R&D expenditure is expected to reach €15.5 billion, equalling 3.22%.

Figure 2-1 graphically depicts the development of the R&D intensity and the R&D funding for the period 2013–2023. The line displays the development of the research intensity, which has increased by 0.27 percentage points over the entire period – from 2.95% in 2013 to 3.22% in 2023. When interpreting the columns, it should firstly be taken into account that R&D expenditure is shown at current prices; the high inflation rates in 2022 and 2023 in particular give the impression of higher growth (a breakdown of funding by share is shown in Figure 2-3). Secondly, the category "Abroad" includes financing by the foreign business enterprise sector as well as expenditure by the European Commission and international organisations, with the overwhelming share coming from the foreign business enterprise sector. Third, the "Research premium" – a tax credit amounting to 14% (until 2017: 12%) of business R&D expenditure – is shown separately here. Fourthly, the category "Other" consists of funds from local government units (excluding Vienna), professional chambers, social security institutions, the higher education sector and other public funding, as well as funding by the private non-profit sector.

For better comparability over time, Figure 2-2 displays the same period as Figure 2-1. GDP in 2023 in nominal terms is 48.38% larger than in 2013, with all categories of R&D funding having grown faster than

GDP.[16] When interpreting, however, it must be taken into account that the "public sector" includes the categories Federal Government, regional governments and other, but not the research premium, which is attributed to the business enterprise sector in Figure 2-2 according to the Frascati Handbook.[17] Funding by the business enterprise sector (excluding abroad) collapsed in 2020 due to the COVID-19 induced recession and has increased since. Public sector spending increased significantly in 2020 and continues to grow strongly.

Figure 2-3 shows the same categories as in Figure 2-2 – with two differences, namely that they are displayed as yearly shares of total funding, and that the research premium is shown separately. The largest share in each year originates from the business enterprise sector. Comparing the shares for 2013 with those for 2023, the share from abroad has remained constant, while the shares of the business enterprise sector have decreased, those of the public sector and the research premium have increased. Figure 2-4 shows the funding in the period 2013–2023 as shares of GDP, the research premium is here again included in the business enterprise sector. The shares of all three categories are higher than in 2013.

The development over the last ten years thus shows a picture for Austria in which R&D expenditure continues to rise faster than GDP; in 2021, Austria displayed the third highest research intensity within the EU-27 (see Figure 2-5). This increase was made possible in recent years primarily by the continuous increase in public funding, which has increased significantly, especially since the outbreak of the COVID-19 pandemic. This contrasts with a decline in the share of funding from domestic companies, which is discussed in more detail in the following chapters in connection with multiple crises. The share of R&D financed by foreign countries, which predominantly originates in the foreign business enterprise sector, has remained largely stable over the years.

2.1.2 R&D and innovation in times of crises

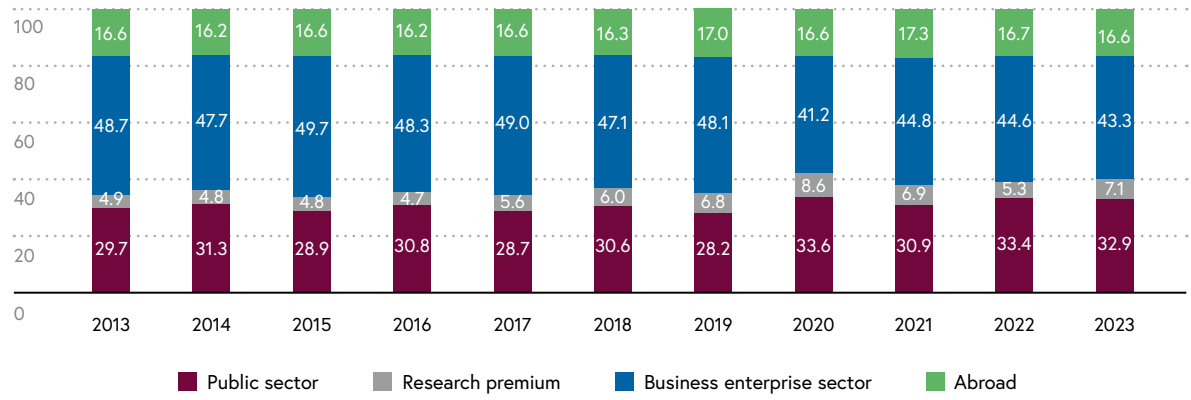
The interplay of multiple crises triggers turbulence, instability and uncertainty that affect the economy, politics and the environment. These crises also affect RTI policy, with concepts such as technology sovereignty and resilience emerging as new focus of RTI policy. The OECD expects economic and security policies to become increasingly aligned and technology-based global competition to intensify.[18] Research results show that business R&D investments are pro-cyclical: When economic outlook is optimistic, the propensity to invest is greater. It follows that the multiple crises facing the economy and society also potentially lower the propensity to invest in R&D.

Strategic autonomy policies must navigate a technological innovation landscape that is more collaborative and globally distributed than in the past, and also relies on technologies that have dual-use civilian and military potential. Moreover, international scientific cooperation has blossomed in recent decades, especially between OECD countries and China. On the other hand, China is often seen as a systemic rival to liberal market economies, including growing competition in critical technologies; technology leaders such as the EU and the US are thus increasingly seeking technological sovereignty and strategic autonomy as strategic policy goals.[19]

The extent to which priorities have shifted becomes apparent when reading the OECD's usually biennial report on global RTI (Science, Technology and

16 The fact that the figures are typically higher in even years than in odd years is due to the fact that the R&D survey takes place in odd years; in even years, the funding figures of the Länder are taken from the regional government budgets, which structurally results in a quantitative difference which also impacts research intensity values.
17 See OECD (2018).
18 See OECD (2023, p. 12).
19 See OECD (2023, p. 72).

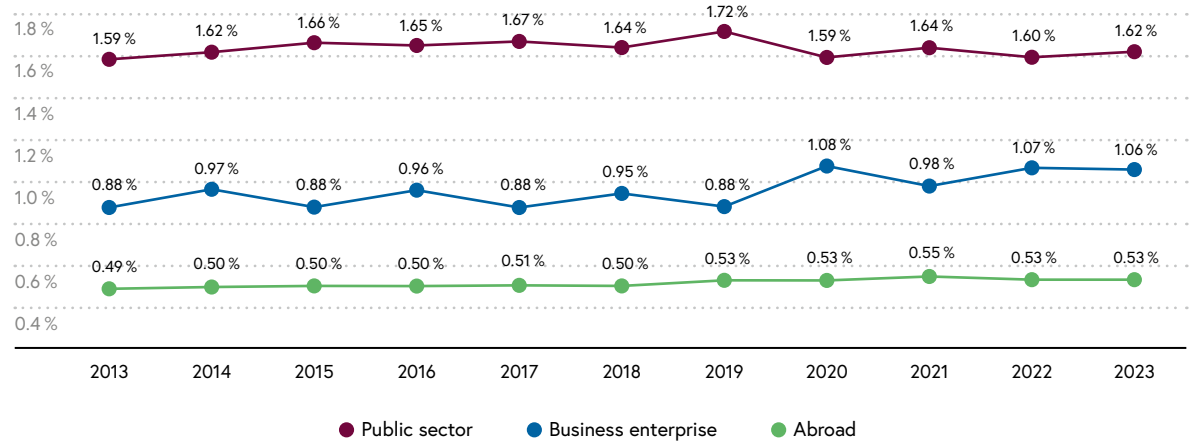
Figure 2-3: Shares of R&D funding by funding sector, 2013–2023



Note: The category "Public sector" contains the categories "Federal Government", "Regional governments" and "Other" (= "Other public funding" incl. the higher education sector and "Private non-profit sector").

Source: Statistics Austria, global estimate as of 21 April 2023. Calculation and graphic: WPZ Research.

Figure 2-4: R&D expenditure as a percentage of GDP by sources of funds, 2013–2023



Note: The category "Public sector" contains the categories "Federal Government", "Regional governments" and "Other" (= "Other public funding" incl. the higher education sector and "Private non-profit sector"); the category "Business enterprise" contains the categories "Business enterprise sector" and "Research premium".

Source: Statistics Austria, global estimate of as 21 April 2023. Calculation and graphic: WPZ Research.

Innovation Outlook (STI)). The term "resilience", understood as defence against negative consequences, was uncommon in the RTI outlooks during the 2000s. In the recently published report, on the other hand, the term is of central importance, exemplified by the following statement:[20]

20 See OECD (2023, p. 17).

Climate change, growing geopolitical tensions and the COVID-19 pandemic have highlighted risk, uncertainty and resilience as conditions and concerns for STI policy. Taken together, these have contributed to a growing "securitisation" of STI policy.

This is a turning point in economic policy, which is also expressed by the EU's growing mistrust of the economic powers USA and China.

R&D expenditure

If the purpose of globalisation is to reduce production costs by means of an international division of labour, then any policy that reduces this international division of labour due to security or other concerns must inevitably lead to an increase in production costs (compared to the most efficient scenario). Consequently, this also applies to R&D: if the options to conduct R&D at the global level where it is most profitable are reduced, then more R&D input will inevitably be required to achieve a given output target. China's rise is creating increasing rivalry in technologies critical to competitiveness and national security. As a result, particularly important technologies are no longer shared, but rather access to them is restricted or strategic alliances are sought with friendly countries.[21] It should not be overlooked that the distrust does not only come from the EU and the USA, but that China behaves similarly and tries to protect itself in areas considered strategically important. If access to certain technologies is denied, then they have to be developed independently, which means that R&D spending has to increase in order to achieve a certain output target.

The pandemic led to perhaps the first recession in which R&D intensity did not decline in OECD countries, largely because research and innovation, including digitalisation, played an important role in addressing the crisis.[22] Several OECD countries have announced major RTI investments to improve pandemic prevention, preparedness and response. Accordingly, these should be complemented by greater investment in research infrastructure capacity in low- and middle-income countries to improve global preparedness and response and provide equitable access to resources and data.

For Austria, official data show that R&D spending by the business enterprise sector declined significantly in 2020, which was more than offset by increased public sector spending, so that Austria's research intensity actually increased in 2020 (see chapter 2.1.1). Since then, business enterprise expenditure on R&D has risen again, but has not yet reached the 2019 level as a share of GDP (see Figure 2-4). SMEs in particular have also reduced their innovation activities in 2021.[23] In addition, a relationship with the funding system is apparent: companies that receive funding from the Austrian Research Promotion Agency (FFG) do not show a decline in innovation activities, in contrast to other companies.[24]

Russia's war of aggression against Ukraine is expected to lead to increased spending on defence R&D, but perceived security threats go far beyond traditional military concerns and extend to a range of issues.[25] The "securitisation" of RTI policy has also come to the fore in recent years as a way to combat illicit information transfer and foreign interference in public research. OECD country governments have taken steps to improve research security, emphasising the values,

21 See OECD (2023).
22 In the first year of the pandemic, hundreds of RTI policy initiatives were launched to mitigate the impact of the pandemic and develop solutions through research and innovation. In the first six months of the pandemic, national public research funding institutions announced more than USD 5 billion in public research funding programmes targeted at COVID-19 (OECD, 2021).
23 See Reinstaller (2022).
24 See Kügler et al. (2023).
25 See OECD (2023).

norms and principles that should constitute good scientific practice and govern international research collaboration.[26] The assumption here is that research and innovation capability make economies and societies more resilient, but they require long-term investment in research and development, skills and infrastructures, as well as in maintaining close relationships between strategic partners that support each other in times of crises.

Green transformation

A major project of the EU is the European Green Deal, which envisages significant reductions in greenhouse gas emissions, with decarbonisation of the energy system seen as crucial.[27] In the wake of the Russian war of aggression in Ukraine and the accompanying reduction of gas imports from Russia, resilience and clean energy are increasingly seen in connection. The European Commission's report "Science, research and innovation performance of the EU 2022" highlights this:[28]

> *The new emphasis on the need to reduce EU dependency on Russian gas implies that R&I investments and efforts must be strengthened to accelerate the development and deployment of energy efficient and clean energy technologies. This will not only help reduce the dependency on Russia but also significantly contribute to the implementation of the European Green Deal. In this context, R&I policy can play a major role in shaping the direction of innovations and choices concerning the portfolio of energy technologies.*

Reducing dependence on Russia thus accelerates the goal of the European Green Deal to reduce the share of fossil fuels in the EU's energy mix. In this context, the European Commission[29] also sees the need to increase R&I investments. Future innovation policy must therefore be seen as a triangle of transformation policy, competition policy and technology sovereignty.[30] The current level of R&D policy is seen by the European Commission[31] itself as too low to implement the European Green Deal as the EU's new growth model. Innovation represents the driving force of decarbonisation, where (i) the EU's research rate (2021: 2.15%) is lower than that of the US (2021: 3.46%) and roughly on par with that of China (2019: 2.23%),[32] and (ii) the EU is the innovation leader in areas such as vehicles and pharmaceuticals, but not in those areas that contribute to decarbonisation (such as clean energy).[33] The EU therefore needs to find ways to get the business sector to invest in R&D and develop disruptive innovations for energy.

It should be noted, however, that venture capital investments in European cleantech companies are booming; the volume in 2021 was seven times larger than in 2016 and has thus grown faster than the global volume.[34] Nevertheless, the EU's share of the global volume is only around 15%, so the volume of investment is far lower than in China (around 19%) and the US (around 53%).[35] As the European Commission[36] itself acknowledges, the EU lags behind China and the US in terms of venture capital volumes invested in cleantech companies. However, it is not certain that venture capital is the panacea for financing new, cleaner technologies. Some authors go so far as to call venture capital investment in cleantech companies "the wrong model for energy innovation".[37]

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26 See OECD (2023).
27 See European Commission (2019).
28 See European Commission (2022a, p. 14).
29 See European Commission (2022a).
30 See European Commission (2022a), Edler et al. (2021).
31 See European Commission (2022a).
32 Data according to OECD.
33 See Claeys et al. (2019).
34 See Dealroom (2021).
35 See European Commission (2022a).
36 Ibid.
37 See Gaddy et al. (2017).

The reason for this is their observation that such investments brought overall losses in the period 2006–2011.

The US Inflation Reduction Act (IRA) will certainly have an impact on EU climate and industrial policy, although as of now this impact is hard to assess. In the best case, increased competition in the fields of decarbonisation and cleantech will lead to a boost in innovation both in the EU and the US. The IRA includes subsidies and tax relief for R&D in environmental technologies, to which the EU is already responding (see below for details). Perhaps the most significant element of the IRA is to make reductions in greenhouse gas emissions not a burden on emitting companies, but a boon for industry and thus an incentive for those who avoid emissions. It is estimated that the planned subsidies for favoured industries amount to no less than 0.5% of US GDP.[38]

The COVID-19 pandemic

The long-term effect of the COVID-19 pandemic on industrial and technology policy remains an open question, too. When the pandemic broke out, the scientific community was forced to quickly join forces with other fields to provide technological tools and evidence in order to most effectively address the pandemic politically.[39] This has led to controversy, and in some cases a loss of confidence due to conflicting scientific views and how these were communicated to the public. Especially when scientific recommendations lead to unpopular measures, blame may be shifted on scientists for unpopular developments.[40]

On the other hand, the pandemic has also led to an acceleration of the promotion of open science. This concerns the three pillars of open science, namely open access to scientific publications, improved access to research data and public participation.[41] The pandemic made it clear from the outset that free access to scientific information and data would be essential for all countries to overcome the pandemic.[42] Accordingly, the pandemic has led to an increase in the importance of openness and transparency. In fact, the proportion of freely accessible scientific articles on COVID-19 is far higher than for other medical topics. Thus, on the one hand, access has improved, and on the other hand, many studies are published immediately after completion, which means that they are not yet peer-reviewed at the time of publication. According to the OECD, the media and public made little distinction between preliminary research results published in pre-prints and peer-reviewed articles in scientific journals.[43]

In this context, it is increasingly seen as a concern that attitudes towards science may become less positive or that science in general may lose credibility. However, findings on this are not always clear-cut and there are large differences within the EU. For example, a Eurobarometer survey in 2021 showed that 86% of EU citizens think the overall influence of science and technology on society is positive. In comparison, the corresponding proportion in Austria is relatively low at 80%, while in other countries such as Portugal (99%) or Estonia (96%) it is almost 100%. When asked how well informed they feel about new scientific discoveries and technological developments, Austria (63% "very" or "moderately" well-informed) is just below the EU average (66%). On the other hand, Austrians show the third highest participation in the activities of a non-governmental organisation dealing with science and technology related issues.[44] A number of initiatives

38 See The Economist, February 4th-10th 2023, p. 17.
39 See OECD (2023).
40 See Greer et al. (2022).
41 See OECD (2015).
42 See OECD (2023).
43 Ibid.; for a detailed discussion, also regarding the role of policy, see Greer et al. (2022).
44 All data given in this paragraph from European Union (2021).

have then been launched in Austria to reduce science scepticism, such as the increased consideration of knowledge communication in performance agreements or the OeAW's call for essays on the question "Fact or Fake: How do we deal with science scepticism?"[45] In addition, the BMBWF is implementing a 10-point programme to strengthen trust in science and democracy in Austria ("TruSD"); the programme points include the establishment of a central point of contact in Austria for the topic of science and democracy communication as well as sending 300 "science ambassadors" to schools.[46]

Initiatives at EU level

Even before COVID-19, the European industrial sector was facing major challenges – driven, among other things, by the ecological and digital transformation and accompanied by changes in the geopolitical landscape and thus also in the shaping of competition. The COVID-19 pandemic has further intensified these developments. In response, the European Commission has updated its industrial strategy (alongside the European Green Deal and derivative initiatives) and published it on 5 May 2021. The updated industrial strategy aims to draw lessons from the experience of the pandemic and to ensure that the European Commission's industrial policy ambitions take full account of the new realities in the aftermath of the COVID-19 crisis.

The updated strategy reiterates the priorities set out in the Communication published in March 2020 – just one day before the WHO declared COVID-19 a pandemic – and proposes new measures to make the Single Market more resilient. It also includes new measures to accelerate the green and digital transitions. The updated industrial strategy thus focuses on the following key areas:[47]

- Strengthening Single Market resilience
- Dealing with dependencies: open strategic autonomy in practice
- Accelerating the twin transitions

Within the framework of the European industrial strategy, the reduction of strategic dependencies thus plays an important role. The European Commission has undertaken a bottom-up analysis based on trade data to provide initial insights into the scope of the issues to be addressed. Of the 5,200 products imported by the EU, the analysis identifies 137 products (accounting for 6% of the total value of goods imported into the EU) as vulnerable and classifies them as strategically important. The main country of origin of these products is China with 52%, followed by Vietnam with 11%. This relative dominance is especially true for energy-intensive industries, which account for 20% of these strategically important goods. Likewise, numerous products can be assigned to the health ecosystem (e.g. active pharmaceutical ingredients and other health-related products).[48] Particularly in the case of highly complex and knowledge-intensive technology products, such as the semiconductor industry, the development of a holistic technology ecosystem with corresponding RTI intensity is crucial in order to build up comparative advantages and reduce dependencies in the competition between locations in the long term. A targeted RTI landscape under the aspect of technology sovereignty is thus of decisive importance for the future-oriented securing

45 https://www.oeaw.ac.at/preisfrage/preisfrage-2022
46 https://www.bmbwf.gv.at/Themen/HS-Uni/Aktuelles/NB--TrUSD22.html
47 See European Commission (2020a), European Commission (2021a).
48 See European Commission (2021a).

of strategic goods. In this context, corresponding dependencies along strategic value chains are neither necessarily problematic per se nor completely avoidable in a globalised world based on the division of labour. However, the risk of a potential supply shortfall poses a far-reaching economic threat. For this reason, there is a strong desire on the part of the Member States to identify and reduce strategic dependencies[49] – even though it is not yet clear when exactly such a dependency exists.[50]

According to the European Commission, recent global developments make rapid action even more urgent and highlight the need to address strategic dependencies in key technologies and critical raw materials in particular. The European Commission formulates this in the New European Innovation Agenda as follows:[51]

> *Prompted by considerations for a more circular, digitalised and resource efficient economy, the pandemic, or Russia's aggression against Ukraine, companies will need to build new capabilities and seek trusted partners to build supply chain resilience, develop new trade opportunities and collaboration given the increasingly international nature of innovation.*

Horizon Europe, Erasmus+ and other EU programmes and policies have supported such cooperation, including through association agreements. The May 2021 Communication on a Global Approach to Research and Innovation provides a better framework for developing such cooperation. In turn, the new EU Global Gateway connectivity strategy[52] and the European Commission's Communication on the "Trade Policy Review"[53] underline the need to deepen international partnerships, diversify trade relations and take advantage of the openness and attractiveness of the EU Single Market.

The New European Innovation Agenda lists 25 concrete measures and proposals for action in five key areas. In these five areas, the European Commission still identifies needs in innovation policy:[54]

1. Improving access to finance for European start-ups and scale-ups
2. Improving the conditions for experimenting with new ideas
3. Support for the creation of "regional innovation valleys"
4. Attracting and retaining talent in Europe
5. Improving the tools for policy-making

In connection with the key areas of the new industrial strategy, the New European Innovation Agenda also addresses a strengthening of the integration of the internal market in an environment in which necessary protection is to be achieved in harmony with a desired innovation dynamic. Among other factors, the improvement of framework conditions and the elimination of inhibiting factors in the area of financing start-ups and scale-ups play an important role in order to catch up internationally and reduce future technological dependencies vis-à-vis other economic areas such as the USA and China. Especially against the backdrop of the "double transition", a corresponding innovation policy forms both a crucial foundation and link for future industrial policy. The bundling in regional networks such as the regional innovation valleys or the creation of real laboratories, as for example envisaged in the course of the Renewable Energy Directive (REDII),[55] actively work towards the goal of an accelerated transition.

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49 See European Council conclusions of 2 October 2020: https://www.consilium.europa.eu/media/45910/021020-euco-final-conclusions.pdf.
50 See Morwinsky & Schebesta (2021).
51 See European Commission (2022b, p. 2).
52 https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/global-gateway_de
53 https://eur-lex.europa.eu/resource.html?uri=cellar:5bf4e9d0-71d2-11eb-9ac9-01aa75ed71a1.0003.02/DOC_1&format=PDF
54 See European Commission (2022b), European Commission (2021b).
55 https://eur-lex.europa.eu/resource.html?uri=cellar:dbb7eb9c-e575-11eb-a1a5-01aa75ed71a1.0013.02/DOC_1&format=PDF

The newly shuffled global-economic coordinates caused by the Russian war of aggression against Ukraine also pose new challenges for locations in the face of multifocal crisis situations and intensified subsidy competition to secure strategic resources (RTI, capital, production, human capital, etc.) for the energy transition. The proposed regulation on the Net-Zero Industry Act was presented on 16 March 2023 as part of the EU Green Deal Industrial Plan and is based on the Industrial Strategy and the Circular Economy Action Plan (CEAP). It is considered a response to the above-mentioned US IRA and aims to expand the production capacity of clean technologies ("net-zero technologies") in the EU through favourable investment conditions, including shorter approval times and streamlined procedures, as well as accelerated access to finance. A Net Zero Europe platform will be set up to help the Commission and Member States coordinate actions and exchange information.

Initiatives at Austrian level

Against the backdrop of current crises, the Austrian Council for Research and Technology Development (RFTE, in future reconstituted as the FWIT Council) is also dedicated to industrial policy issues and thus focused part of its most recent work on the transformation of energy-intensive industries and the expansion of the concept of sovereignty to the production sector.[56] Accordingly, the RFTE recommends reorienting Austrian industrial policy. Such a future industrial policy should, according to the Council, pursue three overarching goals:[57]

1. Ensuring technological sovereignty and the state's ability to act
2. Proactively supporting Austrian industry and the entire innovation system in developing future competitiveness and contributing to resilience and security of supply
3. Transformation away from a linear economy towards a circular economy[58]

The topic of technology sovereignty is also addressed in the Austrian Federal Government's RTI Pact 2024–2026,[59] where it states: "Providing targeted support for research and technology infrastructure makes a key contribution to securing Europe's technological sovereignty, increasing productivity in key technologies in the long term and enabling a European leadership role in research and globally competitive sectors"[60] and is reflected with regard to selected topics in the objectives of funding initiatives such as Quantum Austria[61] or Digital Technologies 2022[62] and also in the support of Austrian companies in their participation in the European IPCEI large-scale projects.[63]

In order to promote an Austrian discourse along concrete use cases, the RFTE launched the Forum on Technology Sovereignty, at the start of which experts dedicated themselves to the topic of quantum technologies in November 2022. With the Forum on Technology

56 https://www.rat-fte.at/newsreader/gruene-transformation-und-technologische-souveraenitaet-als-zentrale-themen-fuer-2023.html
57 See RFTE (2021).
58 See also starting points for the transformation of industry, including the construction industry, textile industry, plastics and packaging industry, vehicle industry, electrical and electronics industry, ICT sector according to the Austrian circular economy strategy (BMK, 2022a).
59 See Federal Government of the Republic of Austria (2022).
60 Relevant technology sectors highlighted in the RTI Pact include innovative and sustainable energy technologies, artificial intelligence/robotics, high-performance computing, electronics and the semiconductor industry; nanotechnology, advanced manufacturing, additive manufacturing; innovative and alternative vehicle and mobility technologies, etc.
61 https://www.ffg.at/quantum-austria
62 https://www.ffg.at/AS_digitaletechnologien2022
63 IPCEI stands for "Important Projects of Common European Interest". The initiative is described in more detail in Chapter 2.4.1 (New RTI approaches and instruments for the Green Transformation).

Sovereignty, an open platform was launched on which the relevant actors in the RTI system could formulate Austrian interests and introduce them into the European debate, also in cooperation with European partners such as the Fraunhofer Society for the Promotion of Applied Research ("Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V."). Building on the results achieved so far, the merger of the RFTE with the Austrian Science Council now offers the opportunity to think about the topic in an even more networked way and to develop systematic solutions.[64]

Competitiveness, macroeconomic resilience and security of supply today depend heavily on the innovative capacity of the manufacturing industry. In this regard, the Federal Ministry of Labour and Economy (BMAW) submitted a reflection paper with proposals for strengthening innovative production to the Competitiveness Council (COMPET) in September 2021, in which the following core topics are highlighted in particular:

1. Facilitated access to IPCEI for innovative SMEs
2. Extension of the Temporary State Aid Framework
3. More innovation-friendly legal framework for public procurement
4. Increased protection of intellectual property
5. Industrial alliances[65]

The third project report of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) on Green Industrial Policy proposes eleven measures on four topics "on the basis of the numerous discussions with industry representatives and stakeholders as well as EU strategy documents, studies and discussion processes available as of September 2022 … from the personal assessment of the Special Representative":[66]

Theme I: Create planning certainty and a long-term support framework for decarbonisation investments by industry

1. Transition fund €400 million per year modelled on the National Foundation for Research, Technology and Development
2. Investment support modelled on the ERP Fund and for IPCEI
3. Carbon Contracts for Difference for long-term hedging of price fluctuations in operating costs

Topic II: Securing access to low-cost green hydrogen for industry with international partnerships

4. Building international energy and H2 partnerships: "Lab of Tomorrow" with Tunisia
5. Participation in EU hydrogen infrastructure and market development (H2Global)
6. Vienna as a forum for multilateral cooperation (UNIDO, IAEA, Energy Community, OSCE, OPEC)

Theme III: Set decarbonisation technology priorities around existing areas of strength and open up new market prospects

7. PV and heat pumps, participation in EU initiatives
8. Sustainable Carbon Cycles – CCU, Carbon Removals: Carbon Cycle Strategy Development

Theme IV: Enabling access to EU funds institutionally and providing professional support

9. Support for applications to the EU Innovation Fund
10. Access to new EFSD+ guarantee instrument and develop interministerial initiative concept
11. Communicating the EU Green Deal and the Financial Framework 2021–2027 in a practical way for companies/project applicants

64 https://www.rat-fte.at/newsreader/auf-dem-weg-zur-technologischen-souveraenitaet.html
65 https://www.bmaw.gv.at/Themen/Europa/Aktuelles/St%C3%A4rkung-of-innovative-production-in-Europa.html
66 BMK (2022b, p. 37).

The circular economy as an essential part of a future-oriented, new industrial policy deliberately focuses on the circular economy as a principle of thought and action that must work horizontally through all (governance) issues and sectors. With the publication of the Austrian circular economy strategy[67] in 2022, an important strategic framework was created to serve as a guideline for future transformation. The aim is to penetrate the existing RTI landscape as a cross-cutting issue. By setting priorities in programmes on technologies in the area of production and digitisation, among others, existing areas of strength are to be expanded and the market positions of Austrian products strengthened abroad.[68] The RTI initiative "Circular Economy" is strategically anchored as a key topic in the RTI landscape.[69] Initiated in 2021, the transformation from a linear to a circular economy is to be advanced. To this end, systemic innovations are initiated along the value-added cycle. The conceptual framework of the RTI initiative is based on the following strategic goals, which take into account the thematic interconnection with the aspects of technology sovereignty and resilience in a holistic approach: Positive climate and environmental impact, security of supply and social responsibility, technology leadership as well as knowledge building and cooperation. In 2022, the second round of calls for proposals was already carried out with a budget of €12 million (2021: €10 million).[70]

2.2 Austria's position in international comparisons

One consequence of the crises in recent years (see Chapter 2.1.2) is the effort to reduce mutual (technological) dependencies. For example, the EU, China, and the USA have taken initiatives to strengthen domestic RTI capacities and reduce international dependence on technology.[71] In addition to the Inflation Reduction Act described in Chapter 2.1.2, other examples of US initiatives are the CHIPS and Science Act or the Infrastructure Investment and Jobs Act. China (Made in China 2025, Belt and Road Initiative, 14th Five-Year Plan, Dual Circulation Strategy) and the EU (CHIPS Act for Europe, NextGenerationEU, New Industrial Strategy Europe) have also launched initiatives that demonstrate increasing strategic competition in the technology sector. In particular, the priorities are to reduce the risks of RTI interdependencies and restrict international technology flows. Further, industrial performance is to be increased through RTI investments and international RTI alliances are to be strengthened between like-minded economies.

China's rapid rise as a scientific and technological superpower also poses challenges for RTI policy (see Chapter 2.1.2) and can be measured in concrete figures. While China's research intensity was still 1.7% in 2010, it has risen steadily over the years to 2.4% in 2020, enabling the country to surpass the EU-27's research intensity of 2.2%. The US remains ahead of China with a research intensity of 3.5% in 2020, and the gap between the US and China has not narrowed in the last five years. On the contrary – while the difference in the research rates of the two countries was 0.73 percentage points in 2015, it increased to 1.1 percentage points in 2020. Austria, like the USA, is still ahead of China, but China has been able to catch up. In 2015, the difference between Austria's and China's research intensity was 0.99 percentage points and decreased

67 BMK 2022a.
68 https://www.bmk.gv.at/themen/klima_umwelt/abfall/Kreislaufwirtschaft/strategie.html
69 https://nachhaltigwirtschaften.at/de/themen/kreislaufwirtschaft/#initiative
70 https://nachhaltigwirtschaften.at/de/ausschreibungen/kreislaufwirtschaft-2-as.php
71 Ibid.

to 0.82 percentage points in 2020. In terms of the number of human capital, China has the largest human potential in R&D worldwide in 2020, with 2.28 million researchers, compared to 1.89 million in the EU-27 and 1.59 million in the USA. The increase in the number of researchers has also been greatest in China, more than tripling in 20 years. Despite this huge increase, there is room for further expansion, especially considering that China reports only three researchers per thousand employees in 2020. Another indicator that demonstrates China's rapid rise is the number of patents. In the period from 1998–2000, China accounted for 1% of IP5 patent families,[72] while the US share at that time was 26%. In the following years, from 2016 to 2018, China increased its share to 11%, while the US share dropped to 18%.[73]

Climate change is one of the greatest global ecological, social, and economic challenges. For political action, this means that previous developments must be reconsidered, priorities must be set anew, and the topic of climate protection and sustainability must be assigned an urgent, priority need for action. Likewise, the importance of sustainability on an individual as well as economic level will continue to increase.[74] An open question remains of what impact the current energy crisis triggered by the Ukraine war will have on climate protection. The necessary reorientation of the EU's energy supply could, if properly designed, provide an opportunity to achieve the goals of the European Green Deal more quickly.[75] The connections between social, ecological and economic issues will thus have to be incorporated even more strongly into political decisions in the future, especially since sustainable (innovative) solutions not only have a direct effect on the climate and the environment, but can also contribute to the resilience of an economy. For example, renewable energies contribute positively to a country's climate balance and at the same time also to energy security.[76]

The successful implementation of national and global sustainability goals requires a profound transformation of the economy and society. This transformation towards greater sustainability will be a central factor for technical and social innovations in the foreseeable future, as it creates new potential for modern societies and new markets. Consequently, the future competitiveness of an economy will largely depend on the extent to which it succeeds in advancing research and innovation in this area. The Federal Government's RTI Pact 2024–2026[77] and the Austrian Action Plan for the European Research Area (ERA-NAP) 2022–2025[78] explicitly formulate the goal of advancing the digital, green and sustainable transformation of the economy and society. For example, the support of applied research and its impact on the economy and society is noted as a field of action for Austrian RTI policy in order to promote the digital, green and sustainable transformation.[79] In addition, specific goals are mentioned that are considered decisive for the green and digital transformation of industry, such as the goal of "developing innovative technologies for the recycling of raw materials in industrial processes", or the goal of "creating visibility and relevance for the topics of circular economy and low-carbon technologies"[80] (see also the Federal Government's climate and

72 IP5 patent families are patents filed simultaneously with at least two offices worldwide, one of which must be one of the five largest patent offices: the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Patent Office (KIPO), the United States Patent and Trademark Office and the National Intellectual Property Office of the People's Republic of China (NIPA).
73 See OECD (2023).
74 See Accenture (2021).
75 See Liu et al. (2023).
76 See Wuppertal Institute (2022).
77 See Federal Government of the Republic of Austria (2022).
78 See BMBWF (2022).
79 See Federal Government of the Republic of Austria (2022, p. 10 ff).
80 See BMBWF (2022; p. 48 ff).

transformation initiative).[81] Furthermore, the focus is on research and technology development promotion, location and investment promotion and qualification measures in order to promote Austria as a business, research and production location and to strengthen the country's domestic labour market.

Against the backdrop of major global changes and the uncertainties that accompany those, the following chapter focuses on Austria's position in research, technology and innovation in an international comparison. In particular, four aspects will be addressed: Chapter 2.2.1 analyses Austria's performance in research and development on the basis of a series of selected key input and output indicators. Chapter 2.2.2 then describes Austria's position in the areas of digitalisation, quantum research and artificial intelligence in international comparison. Chapter 2.2.3 shows Austria's innovation and transformation capacity in international comparison, and Chapter 2.2.4 takes a closer look at Austria's position in the areas of environmental sustainability and resilience.

In each section, relevant indicators from different sources for the 27 EU Member States are compared. The EU average values shown in each case are calculated for the EU countries with available data.[82] Depending on data availability, a comparison is also made with Switzerland as a highly successful science and innovation nation over the years, as well as with economies from other continents, such as the USA, China, Brazil, South Africa and Australia.

The key findings of important indicators are highlighted at the beginning of the respective sections. Within the sections, the indices used for the empirical analysis are described in more detail, and for selected indicators the development over time is presented. The data sources used are listed in Annex I. In addition, the development of key RTI indicators is compared to the corresponding targets in the RTI Strategy 2030.[83]

2.2.1 Development of Austria's position in terms of the key performance RTI indicators

RTI indicators

- R&D expenditure 2021 (Eurostat): Austria still ranks third in the EU and fifth in terms of R&D employees
- Venture Capital 2021 (European Innovation Scoreboard): Austria still shows a need to catch up, but could move up three ranking places
- Patent intensity 2020 (OECD): Austria improved by two places and is again among the top 5 within the EU in terms of triadic patents (5th place)

This section presents classic indicators of the input and output of the RTI system in an international comparison. Input indicators are expenditure on research and development, venture capital investments and staff employed in research and development. Output factors include patent intensity (triadic patents), citable scientific publications, the raising of European funds (such as ERC grants) and the number of outstanding universities in the country (measured by the Times Higher Education World University Ranking).[84] These indicators were already analysed in the Austrian Research and Technology Report 2022 and are supplemented by output indicators in the area of product and process innovations in this report. The analysis of these indicators together with the consideration of global innovation rankings such as the

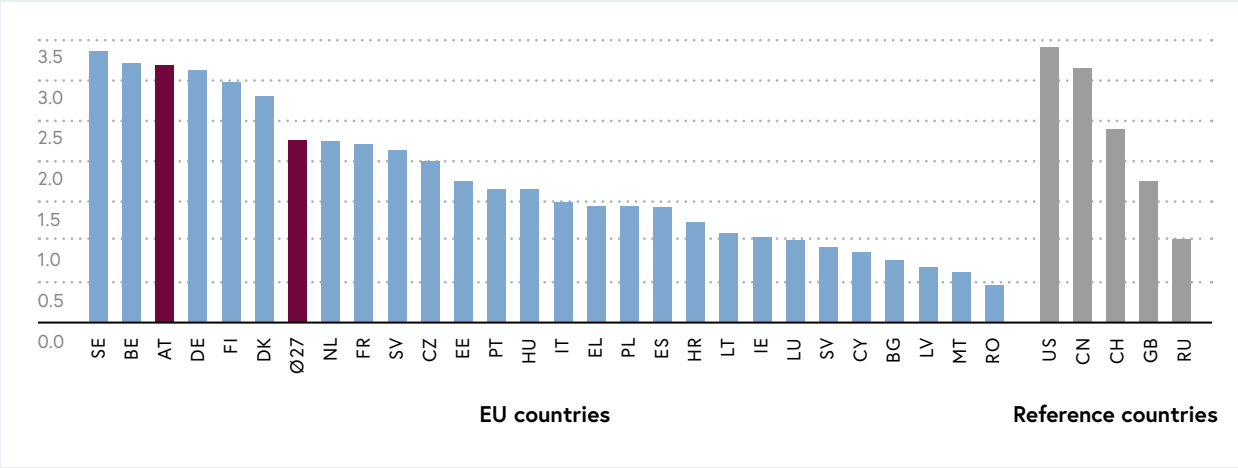
81 https://www.bmk.gv.at/service/presse/gewessler/2022/20221011_transformation.html; https://www.bmaw.gv.at/Presse/News/Klima--und-Transformationsoffensive.html

82 For some indicators, values for individual countries are missing from the data sets. As the indicators come from different sources, the year of the currently available data differs in some cases.

83 See Federal Government of the Republic of Austria (2020).

84 See Times Higher Education (2023a); Times Higher Education (2023b).

Figure 2-5: R&D expenditure as a percentage of gross domestic product (in %), 2021



Note: No current data are available for Brazil, Australia and South Africa. The data for the USA and China are from 2020, those for Switzerland, Russia and the United Kingdom from 2019. The data for 2021 are preliminary figures from Eurostat.

Source: Eurostat (2022). Graphic: iit.

Global Innovation Index[85] and the European Innovation Scoreboard[86] provides an international comparison of Austria's position with regard to performance and efficiency in research, technology and innovation.

R&D expenditure

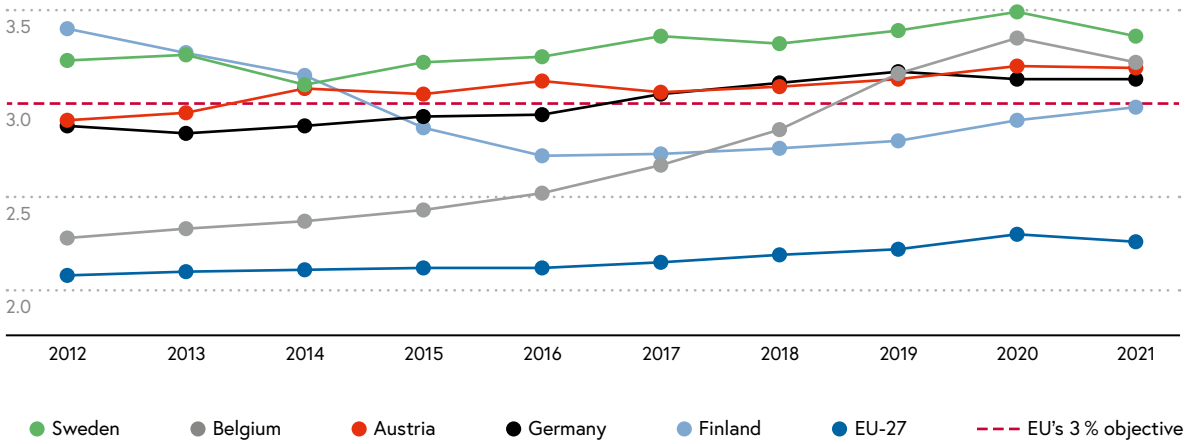
An established input indicator is the R&D intensity. This is the percentage of a national economy's gross domestic product (GDP) spent on research and development. Austria's goal as defined in the RTI Strategy 2030 for this indicator is a global ranking among the top 5 nations.[87]

Figure 2-5 shows the research intensity in international comparison for the year 2021.[88] As in previous years, Austria was able to demonstrate a high research intensity. With a research intensity of 3.19% in 2021, Austria is in third place behind the long-time leader Sweden (3.36%) and Belgium (3.22%). It should be emphasised that Austria has been able to continuously improve its ranking since 2019, starting from 4th place, narrowing the gap with Sweden in 2021.[89] Research intensity in Sweden, as in the EU as a whole, decreased in 2021 compared to 2020 (Sweden: 3.49% 2020, 3.36% 2021; EU: 2.30% 2020; 2.26% 2021). Austria's research intensity also fell slightly from 3.20% in 2020 to 3.19% in 2021, although this decline was much smaller compared to Sweden and the EU. In a global comparison of OECD countries, Austria does not yet meet the RTI-2030 target in terms of increasing R&D spending and is ranked 7th in 2021 behind Israel, South Korea, the USA, Sweden, Japan and Belgium.[90]

Figure 2-6 shows the development of the research intensity of Austria and selected EU Member States over time (2012–2021). It is clear here that Austria has been able to establish itself among the top

85 See WIPO (2022).
86 See European Commission (2022c); European Commission (2022d).
87 See Federal Government of the Republic of Austria (2020, p. 7).
88 Due to data availability, the year 2021 was chosen for the comparison.
89 The values for the research intensity in Austria differ between Eurostat (3.19%) and the global estimate of Statistics Austria (3.17%), as the values for the global estimate were updated in April 2023. For better comparability with other countries, the data from Eurostat are used in this chapter.
90 See OECD (2022a).

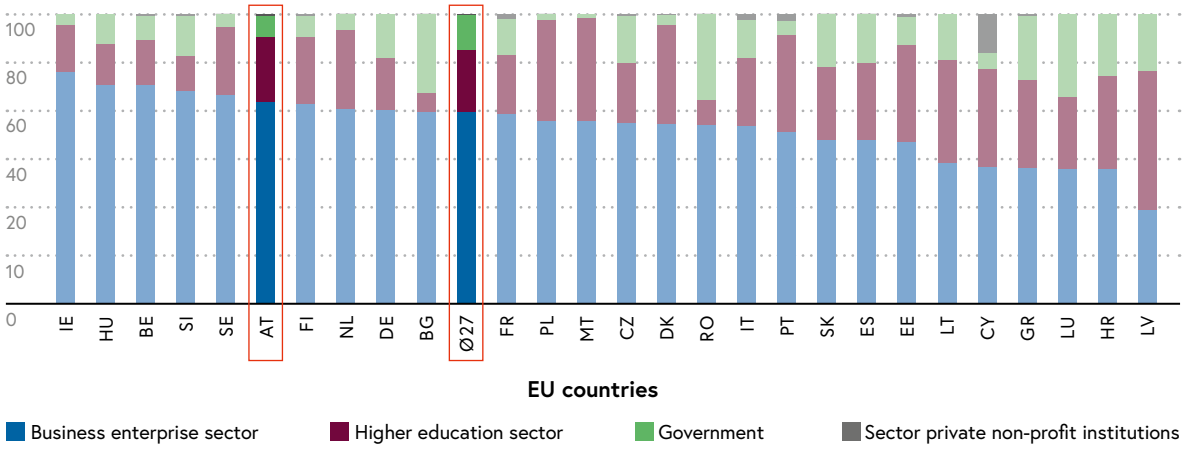
Figure 2-6: R&D expenditure as a percentage of gross domestic product (in %) over time, 2012–2021



Note: The data for 2021 are preliminary figures from Eurostat.

Source: Eurostat (2022). Graphic: iit.

Figure 2-7: R&D expenditure by sector of performance in international comparison, 2021



Note: No current figures are available for the reference countries. The data for 2021 are preliminary figures from Eurostat.

Source: Eurostat (2022). Graphic: iit.

nations in the EU in recent years. Since 2014, the EU's objective of 3%[91] has always been exceeded, and since 2017, a continuous increase in research intensity has been recorded up to 2020. In 2021, the research rate declined slightly again, resulting in the third highest EU value behind Sweden and Belgium. Sweden has been the leader since 2015, in some cases by a considerable margin, whereby Austria was able to slightly reduce

91 The European Council adopted the *Europe 2020* Strategy in summer 2010 (see European Commission, 2010). One of the central goals of the *Europe 2020* Strategy is to increase spending on research and development to 3% of gross domestic product.

the gap with Sweden in 2021. Belgium's development over the last ten years is also worth mentioning: The country has strongly increased its research intensity and, starting from 7th place in 2012, has been able to achieve second place within the EU since 2020.

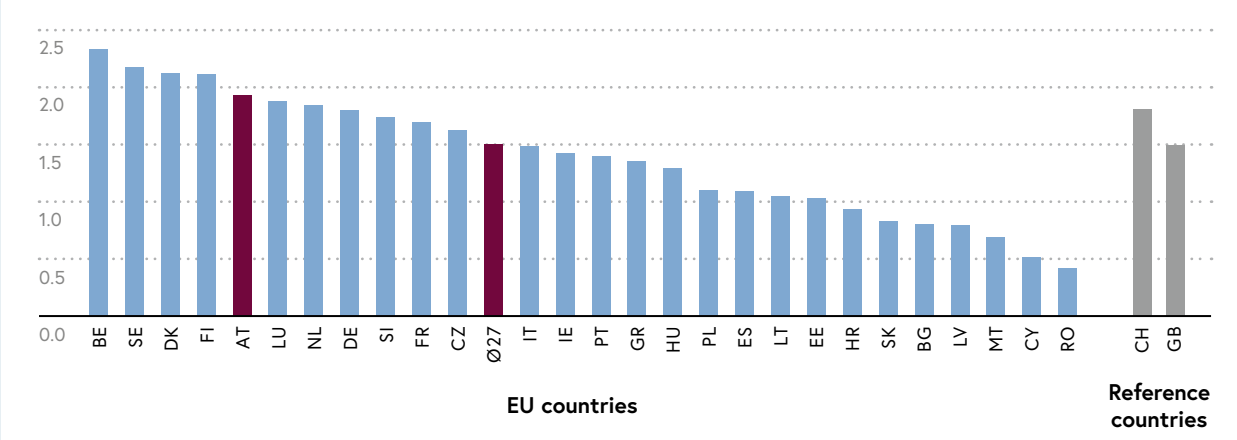
A country's R&D expenditure is made up of different implementing sectors, namely the business enterprise sector, the higher education sector, the government sector and private non-profit organisations. Figure 2-7 presents the composition of R&D expenditure by implementing sector in a country comparison. For better comparability of the sector's importance across countries, the percentage shares of R&D expenditure by sector are illustrated as a stacked bar chart. The total expenditure for each country thus adds up to a total of 100%. As in previous years, it can be seen that the business enterprise sector accounts for the largest share of R&D expenditure (with an average share in the EU of about 60%; Latvia is an exception). In most EU Member States, the higher education sector plays the second most important role in R&D expenditure, followed by the government sector and non-profit private organisations. In terms of R&D expenditure in the business enterprise sector, Austria is again in a leading position (6th place) in the EU Member State comparison with 69.57%. Overall, the share of the business enterprise sector has increased in the EU Member States (EU average: 65.9% in 2020; 66.1% in 2021), the share of the higher education sector has decreased (EU average: 22.0% in 2020; 21.6% in 2021), the share of the government sector has increased (EU average: 11.6% in 2020; 11.9% in 2021) and the share of non-profit private organisations remains unchanged (EU average: 0.4% in 2020; 0.4% in 2021). Austria is thus predominantly in line with the EU trend, as the share of R&D expenditure in the business enterprise sector increased by 0.32 percentage points, while the share in the higher education sector decreased by the same amount and the remaining two sectors did not show any changes.

Venture capital

Venture capital investments represent another input in the RTI system that is intended to lead to innovations. Venture capital is invested in young, research-intensive companies, which means that the volume of venture capital can be regarded as an indicator of the relative dynamics of an economy. In 2021, the share of venture capital investments in Austria's gross domestic product was 0.108%, according to the European Innovation Scoreboard (EIS). This is a significant increase compared to 0.05% in the previous year. The values given in the EIS represent the three-year average 2019–2021 or 2018–2020 to dampen the effect of outliers and include growth capital, which does not correspond to the scientific definition of venture capital. The data from Invest Europe provide an annual insight into venture capital investments excluding growth capital.[92] The data show an even more significant increase in 2021 to 0.173%, following 0.028% in 2020 and 0.02% in 2019 (the three-year average of venture capital investment excluding growth capital is consequently 0.073%). In an international comparison, Austria traditionally shows weakness in venture capital investments. According to the method of calculation in the European Innovation Scoreboard, Austria was able to improve by three places in the EU-27 comparison compared to the previous year due to the increased volume of venture capital, but is still in a lower position at 17th place. The reason for the increase in venture capital investments in 2021 is the investment in two companies (Bitpanda and GoStudent). At the same time, however, the share of domestic venture capital has declined and, at 14.2% in 2021, is among the lowest since the surveys began.[93] With regard to the goal defined in the RTI Strategy 2030 of increasing venture capital investment in gross domestic product from 0.02% to

92 Invest Europe is the organisation on whose data the European Innovation Scoreboard is based.
93 See Sardadvar (2022).

Figure 2-8: R&D staff as percentage of the working population (in percent), 2021



Note: The figures for Switzerland and the United Kingdom refer to 2019. No current data are available for Australia, Brazil, China, the USA, Russia and South Africa. Source: Eurostat (2022). Graphic: iit.

0.1%, a major step towards achieving this goal was taken in 2021.[94] In 2021, the values without growth capital and with growth capital were both significantly above and, in some cases, twice as high as the issued target (0.173% without growth capital and 0.211% with growth capital). Assuming the three-year average is used as a basis for target achievement, the target is achieved if growth capital is included in the venture capital investments (0.108%); this is not the case, however, if growth capital is excluded (0.073%).

R&D employees

Human capital, in addition to the financial resources already presented, are another input for the RTI system and are captured here with the number of employees in research and development. Figure 2-8 shows the share of R&D employees in the total labour force in 2021 in an international comparison. For better comparability, the calculations are based on full-time equivalent (FTE). Austria, with a share of 1.93%, is in the top field, as in previous years, but loses one place and ranks fifth behind Belgium (2.33%), Sweden (2.17%), Denmark (2.12%) and Finland (2.11%). This is due to the fact that Sweden was able to increase its share disproportionately (from 1.81% in 2020 to 2.17% in 2021). The development of the share of R&D employees in the labour force can be assessed positively for Austria, despite the drop in rank. The country was able to increase its share of R&D employees by 0.1 percentage points and thus follows the trend in the EU (the EU average rose from 1.43% in 2020 to 1.50% in 2021).

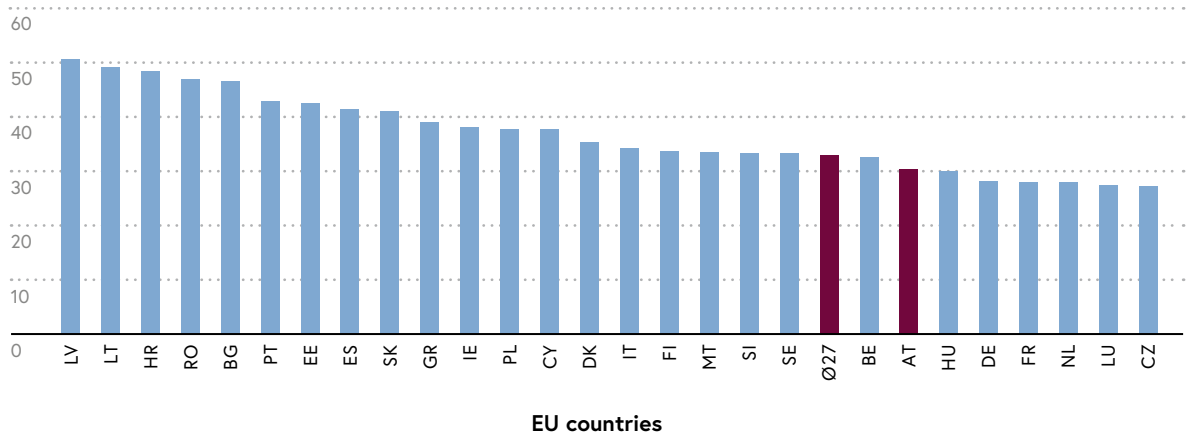
With regard to the proportion of women in research, Austria clearly needs to close the gap (Figure 2-9). With a share of women (in relation to all fields of performance) of 30.40%, Austria is below the EU-27 average (32.90%) but still ahead of nations such as Germany (28.10%) or the Netherlands (27.90%). Latvia (50.60%), Lithuania (49.10%) and Croatia (48.30%) are ranking highest.

Triadic patent applications

The number of patents filed is a "classic" output indicator. Triadic patents are particularly suitable for international comparisons. These are a "family" of patents for

94 See Federal Government of the Republic of Austria (2020, p. 7).

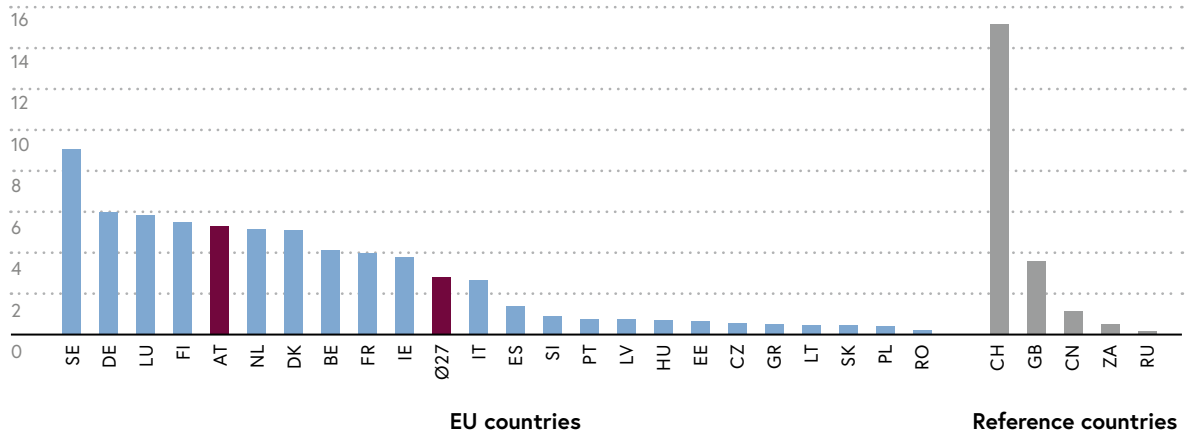
Figure 2-9: Share of women in research (in %), 2019



Note: No current data are available for Australia, Brazil, China, the USA, the United Kingdom, Switzerland and South Africa. The data for France refer to 2017.

Source: OECD (2022). Graphic: iit.

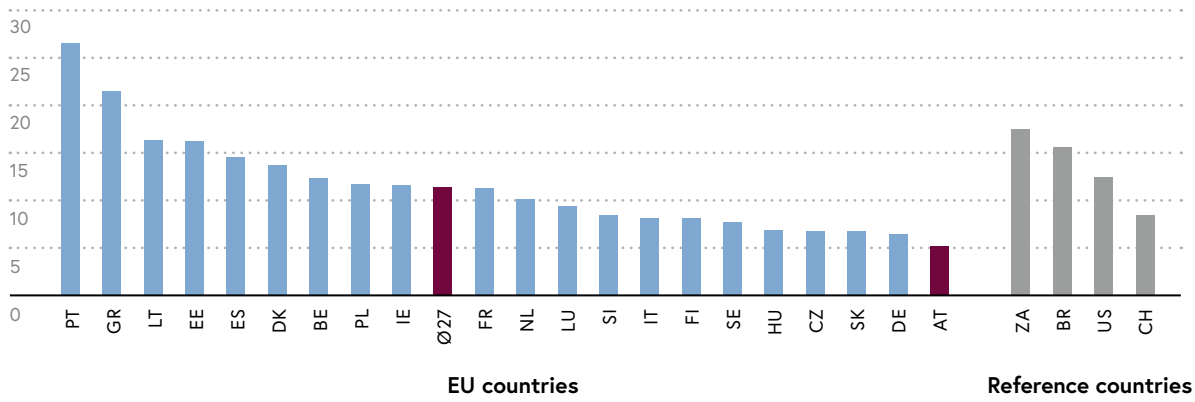
Figure 2-10: Patent intensity (triadic patents) per 1,000 R&D employees, 2020



Note: No data available for Bulgaria, Malta, Croatia, Cyprus, Australia, Brazil and the USA. The data on R&D employees for Switzerland and South Africa refer to 2019.

Source: Eurostat (2022c). Graphic: iit.

Figure 2-11: Share of women in the total number of inventors of IP5 patent families (in %), 2019



Note: No data are available for Bulgaria, Malta, Croatia, Cyprus, Australia, Latvia, Romania, Russia and China.

Source: OECD (2022c). Graphic: iit.

the same invention filed simultaneously with the three major patent offices in Europe (European Patent Office, EPO), Japan (Japanese Patent Office, JPO) and the USA (United States Patent and Trademark Office, USPTO).[95] Patent applications in several countries can be seen as an indicator of the quality of inventions.

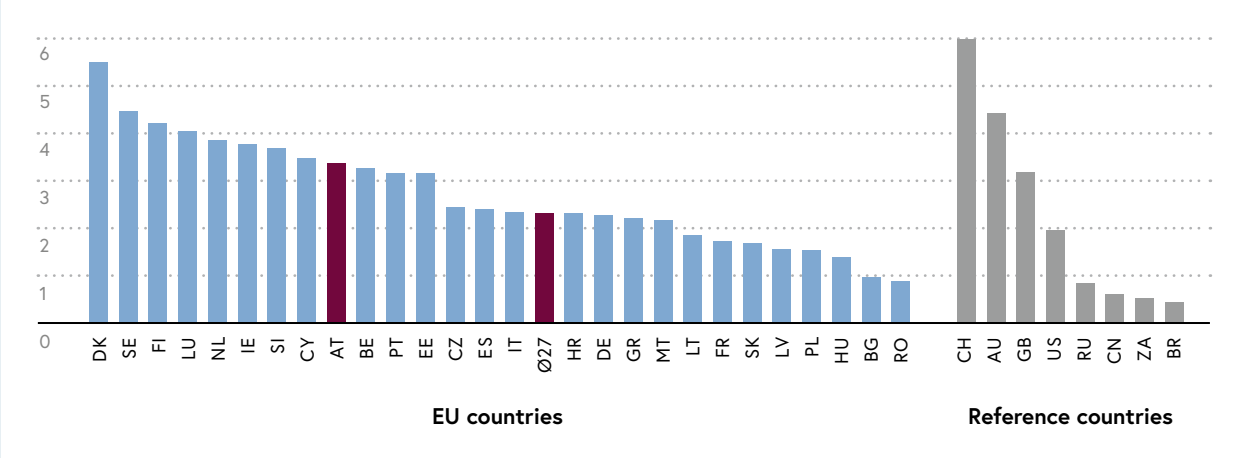
Figure 2-10 shows the number of triadic patents filed per 1,000 R&D employees by country of origin. In an international comparison, Switzerland continues to hold an outstanding position with a triadic patent intensity of 15.19. In comparison with the EU Member States, Austria was able to improve its position in 2020 and is now back in the top group in 5th place (Austria had slipped out of the top group in 2019 in 7th place, after being part of it in 2018 in 5th place). It is noteworthy that Austria was able to significantly increase its triadic patent intensity from 4.58 in 2019 to 5.32 in 2020, while at the same time the top three countries Sweden, Germany and Luxembourg all recorded a decrease in triadic patent intensity. Finland, ranked 4th, was able to increase its triadic patent intensity (5.50; + 0.21), as was Austria, reflecting the overall trend in the EU (the triadic patent intensity grew by 0.42 to 3.82 on average in the EU in 2020). This means that Austria not only improves in the ranking, but also narrows the gap to the leading nations in absolute terms.

The share of women in the total number of inventors of IP5 patent families is shown in Figure 2-11, comparing countries.[96] Overall, the EU average share of female inventors is 11.4%. With regard to this indicator, Austria's need to catch up also becomes evident, as the country is in last place compared to the other EU Member States with a share of 5.2%. However, there is also a need to catch up for Germany, which is in second-to-last place, but also countries like Sweden and Finland, which are below the EU average. Portugal leads the ranking by far (26.6%), followed by Greece (21.5%) and Lithuania (16.3%).

95 See OECD (2022b).

96 Gender was determined using a dictionary of gender-specific names (first names by country).

Figure 2-12: Number of scientific (citable) publications in all disciplines, standardised by country population, 2021



Source: Scimago Journal & Country Rank (2022). Graphic: iit.

Austria's international position with regard to science

Science

- Scientific publications 2021 (Scimago): Loss of one rank from 8th to 9th place
- ERC Grants 2021 (European Research Council): Austria is in 3rd place and achieves the RTI Strategy 2030 target of being among the top 10
- Times Higher Education World University Ranking 2022: Austrian universities improve compared to 2021, but are not yet among the top 100

Austria's scientific performance in international comparison is shown below with the help of the output indicators (i) number of citable scientific publications, (ii) raising of competitive funds (ERC grants) and (iii) international university rankings.

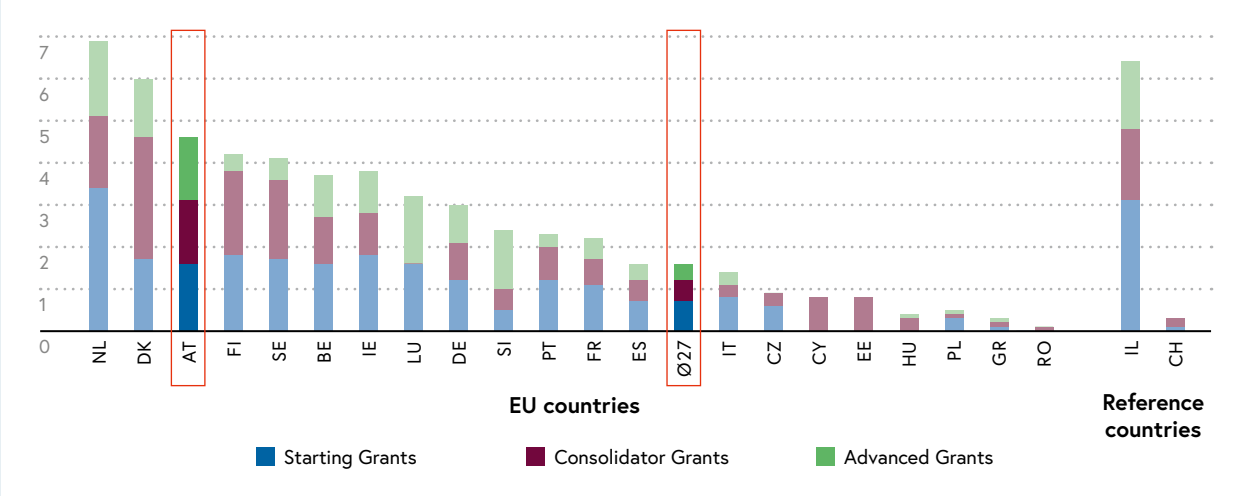
Citable scientific publications

A central element in the quality assurance of research results is the peer review process in the publication of scientific findings, especially in journals and books. Research results that have successfully undergone this process can be considered citable and are therefore a suitable indicator of a country's scientific research performance.

Figure 2-12 shows the result of a bibliometric analysis based on the Scimago publication database, which takes into account the citable publications (including scientific studies, reviews, books, articles) per country and sets their total number in relation to the country population.[97] Compared to the previous year, the ranking has changed little. Denmark, with 5.40 citable publications per 1,000 inhabitants, continues to lead among the EU Member States, followed by Sweden (4.46) and Finland (4.21). Austria has to give up its 8th place from the previous year to Cyprus and, with 9th place, occupies a position in the European midfield. Despite this relative deterioration, Austria

97 See Scimago Journal & Country Rank (2022).

Figure 2-13: Number of European science awards (ERC grants) in Horizon Europe per 1 million inhabitants, 2021



Note: Only countries that have received ERC grants in 2021 are listed.

Source: European Commission (2022f). Graphic: iit. The data were retrieved from the data portal provided online by the European Research Council as of 15 March 2023

was able to increase the number of publications per 1,000 inhabitants in absolute terms from 3.06 in 2020 to 3.36 in 2021. Austria's increase in the number of citable publications is thus higher than the increase in the EU average (which rose from 2.14 to 2.32). In a global comparison of countries, Switzerland remains the front-runner; however, Austria is ahead of large scientific nations such as United Kingdom or the USA.

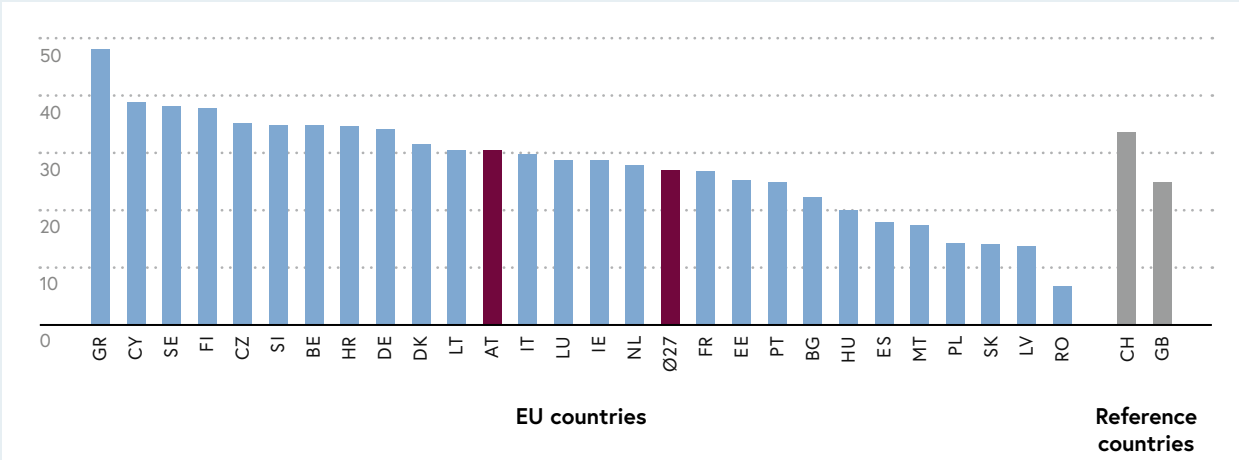
European Research Council (ERC) grants

The European Research Council (ERC) grants are intended to support cutting-edge research in all fields of research. ERC grants are part of the Excellence Science pillar of the Horizon Europe programme and are considered very prestigious in the scientific community. The number of ERC grants acquired can therefore be seen as an indicator of the quality of a country's science system and serves as an indicator of future high-quality scientific research results. ERC grants are awarded in five categories: ERC Starting Grant, ERC Consolidator Grant, ERC Advanced Grant, ERC Proof of Concept and ERC Synergy Grant.[98]

Figure 2-13 shows the number of ERC Starting Grants, ERC Consolidator Grants and ERC Advanced Grants raised per million inhabitants in 2021. The data are based on the data portal made available online by the ERC.[99] The data were retrieved as of 15 March 2023 for the year 2021 and describe the year of the call, i. e. ERC grants in Horizon Europe in 2021. The ERC Proof of Concept Grants are not included due to the comparatively low funding volume. Similarly, the ERC Synergy Grants are not shown in a country comparison, as one ERC Synergy Grant funds two to four researchers, partly from different countries. If all three ERC grant categories are added up, Austria was able to acquire 4.5 ERC grants per million inhabitants and thus takes 3rd place.

98 See European Commission (2022e).
99 https://erc.europa.eu/project-statistics/project-database

Figure 2-14: Share of SMEs introducing product innovations (in %), 2020



Note: The figures for the United Kingdom and Luxembourg refer to the year 2018, for Switzerland to the year 2016.
Source: European Commission (2022c). Graphic: iit.

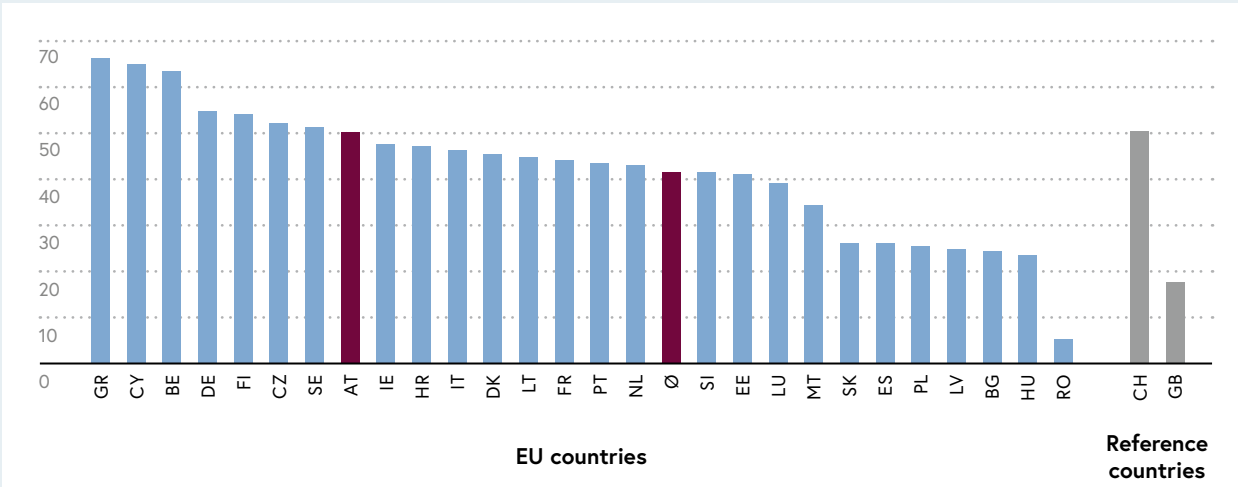
With this ranking, the goal defined in the RTI Strategy 2030[100] of being among the top 10 has been achieved. The Netherlands remains the leader in the ranking with 7.0 ERC grants acquired per million inhabitants. Austria is also among the top 10 in the individual ERC grants, ranking 8th in the ERC Starting Grants, 8th in the ERC Consolidator Grants (2020: 1st place) and 6th in the ERC Advanced Grants (2020: 1st place).

Universities

Another output indicator for a country's performance in science is the number of outstanding universities. Those are central players in the national knowledge and innovation system, as they generate new knowledge and drive technological developments. The goal of the RTI Strategy 2030 is to place at least two domestic universities among the top 100 universities worldwide in the Times Higher Education World Ranking (THE ranking).[101] The THE ranking compares universities based on a total of 13 performance indicators in the areas of teaching, research, knowledge transfer and international outlook. The positive trend for Austrian universities observed in recent years continues. After ranking 161st in 2017, 143rd in 2019 and 137th in 2022, the University of Vienna was able to improve further in the ranking and occupies 124th place in the current THE Ranking 2023. In addition, Austria was able to place another higher education institution among the top 200 universities and is now also represented by the Medical University of Vienna in 194th place, alongside the University of Vienna and the Medical University of Graz. The Medical University of Graz was also able to continue its positive trend from last year and improve significantly from 196th place to 168th place in 2022. In an international comparison, among the top 100 universities, the USA continues to lead by far (34 universities), followed by the United Kingdom (10 universities) and Germany (9 universities).

100 See Federal Government of the Republic of Austria (2020, p. 7).
101 See Times Higher Education (2023a).

Figure 2-15: Share of SMEs introducing process innovations (in %), 2020



Note: The figures for the United Kingdom and Luxembourg refer to the year 2018, for Switzerland to the year 2016.
Source: European Commission (2022c). Graphic: iit.

Austria's international position in terms of product and process innovations

Product and process innovations

- In 2020 (European Commission), Austria is in the European midfield in terms of product and process innovations (11th and 9th place, respectively)
- Turnover from market and company innovation 2020 (European Commission): Austria lies within the European average

This chapter looks at output indicators at the company level and presents them in an international comparison. The focus is on the share of small and medium-sized enterprises (SMEs) that introduce product and process innovations. SMEs are important innovation drivers of an economy, as they are able to implement new ideas efficiently and successfully and contribute to bringing innovations from research to the market.[102]

Product innovations

Product innovations are innovations through which new products (for example new brand names) can be created and which can increase the competitiveness of the innovation-driving company. A higher share of product innovators in a country can therefore be seen as an indicator of the level of innovation activity in a country.

Figure 2-14 shows the share of SMEs that have introduced at least one product innovation that is either new to the company or new to their market.[103] In an international comparison, Austria demonstrates a share of 30.39% ranking in the midfield in 11th place and thus above the EU average of 26.97%. Greece is the leader in this category with a share of 47.99%, followed by Cyprus (38.79%) and Sweden (38.13%).

Process innovations

Process innovations play perhaps an even greater role than product innovations for many SMEs, as the hurdles

102 See European Commission (2014).
103 All enterprises with 10 to 250 employees are considered SMEs.

to carry out innovations in the area of company processes are lower. Company process innovations include process, marketing and organisational innovations.

Figure 2-15 shows the share of small and medium-sized enterprises that have introduced at least one process innovation that is either new to the enterprise or new to their market. Compared to product innovations, the share of SMEs that have produced at least one process innovation is higher in most countries. This is an indication that for SMEs the hurdles to implement process innovations actually seem to be lower than to accomplish product innovations. In Austria, every second SME introduced at least one process innovation in 2020 (50.17%). With this value, Austria positions itself in the upper midfield in 9th place and is also above the EU average here (41.60%). The leader in the international comparison is once again Greece with 66.31%, closely followed by Cyprus (64.94%) and Belgium (63.44%).

Turnover with market and company innovations

Figure 2-16 shows the share of turnover achieved with new or significantly improved products in 2020. This includes both products that are new only to the company and products that are new to the market. The indicator thus captures both the creation of cutting-edge technologies (products that are new to the market) and the diffusion of these technologies (products that are new to the company) and can be seen overall as a measure of the novelty of the products or the innovative strength of the products.

In an international comparison, Ireland (36.94%) leads by a clear margin over Spain (21.74%) and Greece (20.35%). The share of turnover that could be achieved in Austria in 2020 with new or significantly improved products was 12.99%. This puts Austria in 13th place, just below the EU average of 13.14%.

Austria's position from the perspective of global innovation rankings

Global innovation rankings: Global Innovation Index (GII) & European Innovation Scoreboard (EIS)

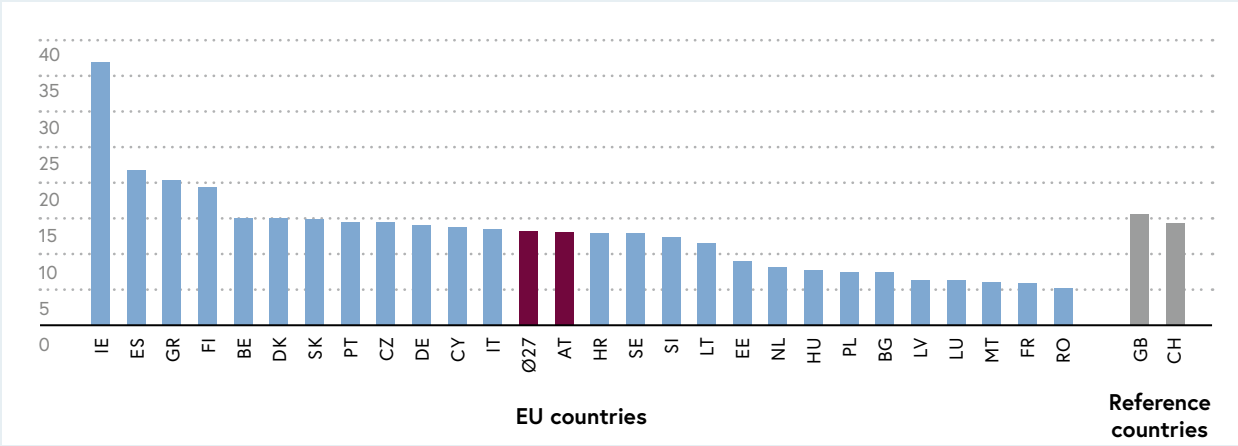
- **GII 2022 (WIPO): Improvement by one rank to 7th place (EU-27 comparison)**
  - Improvement by three places in the innovation output sub-index (21st place in the overall ranking), although there is still a need to catch up
  - Loss of a rank in the innovation input sub-index (to 17th place in the overall ranking)
- **EIS 2022 (European Commission): Consistent 8th place (EU-27 comparison)**
  - Top 5 rankings in the areas of "Finance and support", "Firm investments" and "Intellectual assets".
  - Loss of a rank in the area of "Use of information technologies" (rank 15)

For an overarching international classification of Austria, it is worthwhile to condense the large number of individual innovation areas into an overall index and thus obtain an internationally comparable overall value for the country. Two central international general indices for innovation are presented below: the Global Innovation Index (GII)[104] and the European Innovation Scoreboard (EIS).[105]

The Global Innovation Index 2022 (GII) consists of two equally weighted sub-indices and provides a measure of the innovation capability and performance of each country. The Innovation Input Sub-Index is made up of five dimensions that include elements of the economy that enable and facilitate innovative activities (e.g. institutional frameworks, human capital or information and communication technologies). The Innovation Output Sub-Index consists of two dimensions and measures the output of innovative activities in the economy (e.g.

104 See WIPO (2022).
105 See European Commission (2022b).

Figure 2-16: Share of turnover with market and company innovations (in %), 2020



Note: The figures for the United Kingdom and Luxembourg refer to the year 2018, for Switzerland to the year 2016.
Source: European Commission (2022c). Graphic: iit.

Table 2-1: Austria's international position in the GII and EIS, 2022

	European Innovation Scoreboard (EIS)	Global Innovation Index (GII)
Editor or publisher	European Commission	WIPO
Publication rhythm	Annually (summer)	Annually (summer)
Current issue	2022	2022
Number of reference countries	39	132
Top 3 nations	Switzerland, Sweden, Finland	Switzerland, USA, Sweden
Top EU-27	Sweden, Finland, Denmark	Sweden, Netherlands, Germany
Rank Austria	11	17
Rank Austria EU-27	8	7
Number of sub-indices	4 main types and 12 innovation dimensions	2 sub-indices and 7 pillars
Number of indicators	32	81

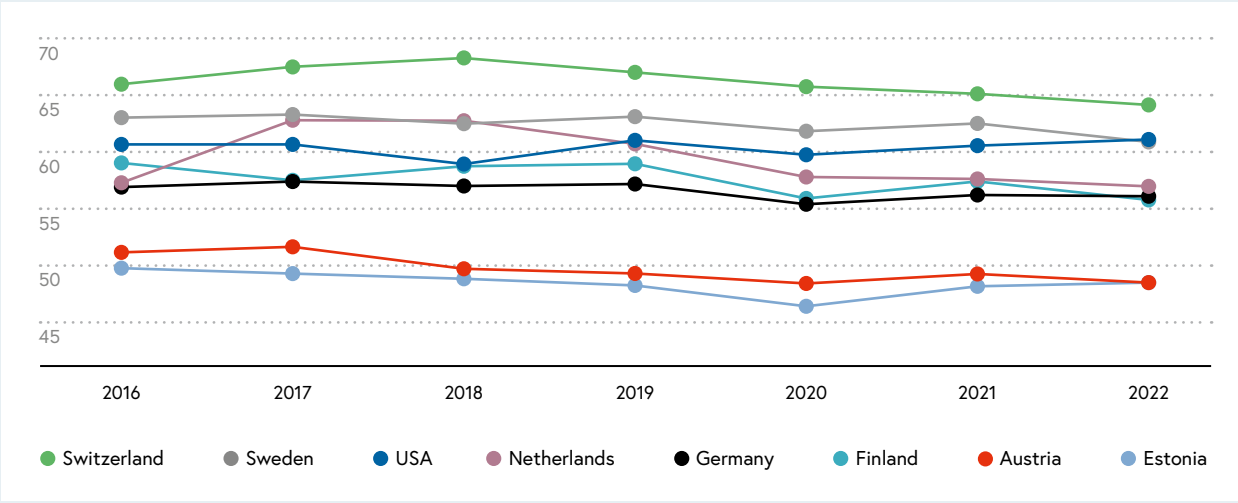
Source: WIPO (2022); European Commission (2022c). Graphic: iit.

knowledge creation, knowledge diffusion or creative goods and services).

The goal defined in the Austrian Federal Government's RTI Strategy 2030 is to be among the top 10 nations in the GII.[106] Austria is also coming closer to this goal this year, as the country was once again able to improve its ranking by one place (since 2019, Austria has been able to improve its ranking every year). In

106 See Federal Government of the Republic of Austria (2020, p. 7).

Figure 2-17: Global Innovation Index (GII) over time, 2016–2022



Source: WIPO (2022). Graphic: iit.

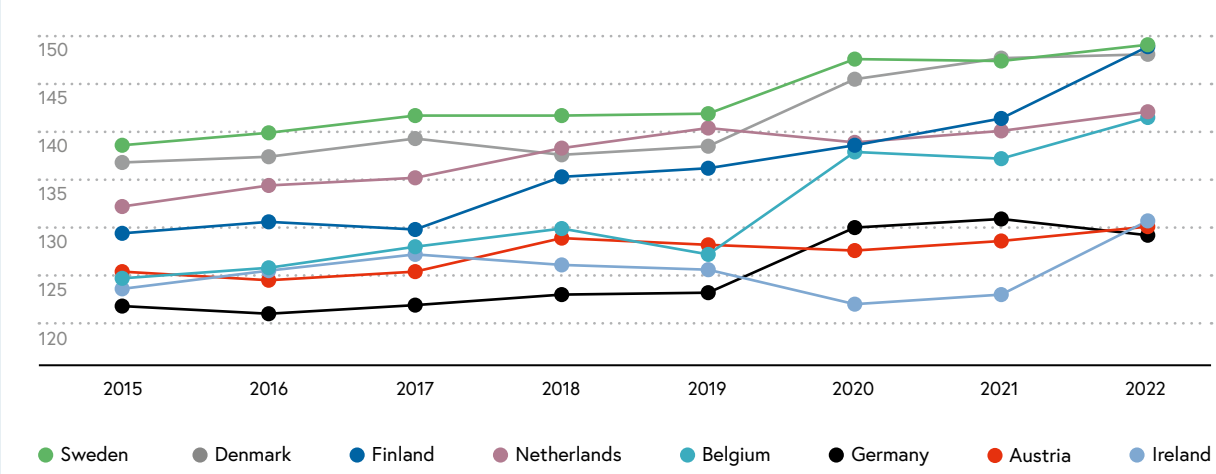
2022, Austria ranks 7th in the EU-27 comparison or 17th in the overall ranking (out of 132 countries), although the index score deteriorated slightly from 50.9 to 50.2 (see Figure 2-17).

Figure 2-17 shows the development of the GII in international comparison for the period 2016–2022. Switzerland has been able to consistently lead the ranking in recent years, but the gap to the second and third ranked countries, the USA and Sweden, has narrowed in recent years. For Austria, it can be observed that the index value has fallen continuously since 2017 (with one exception in 2021, when a slight increase was recorded). However, this does not mean that Austria has also deteriorated in its annual rankings. In contrast to the index score, the country has actually been able to increase in its overall rankings over the last few years. While in 2016 and 2017 it was ranked 20th and in 2018 and 2019 it was ranked 21st, Austria was able to improve its ranking by two places in 2020 and by one place in both 2021 and 2022.

If the sub-indices of the GII 2022 for Austria are considered in the overall ranking, a positive development can be seen in the Innovation Output Sub-Index. While the country lost one position in this sub-index in the previous year, an improvement of three positions to 21st place was recorded this year. This is due in particular to the fact that the rankings in the indicators on "creative outputs" improved (26th place). In contrast, there was a slight deterioration from 16th to 17th place in the Innovation Input Sub-Index. Although Austria was able to improve by eight positions in the indicators on "institutions" (8th place), it lost positions in human capital (11th place, previously 7th place), infrastructure (9th place, previously 7th place) and "company sophistication" (18th place, previously 15th place).

The European Innovation Scoreboard (EIS) is used to assess the research and innovation performance of EU Member States and the relative strengths and weaknesses of research and innovation systems. The EIS is compiled using four dimensions, namely: (i) framework conditions, (ii) investments, (iii) innovation activities and (iv) impacts. The four dimensions each consist of three sub-dimensions, which in turn are each composed of two to three indicators. The overall performance of each country's innovation system is finally expressed in a combined index, the Summary Innovation Index. Austria's

Figure 2-18: European Innovation Scoreboard (EIS) over time, 2015–2022



Source: European Commission (2022c). Graphic: iit.

long-term goal of ranking among the top five nations in this index is defined in the RTI Strategy 2030.[107]

In the EU-27 ranking, Austria continues to occupy 8th place in 2022. The goal according to the RTI Strategy 2030 remains to move up into the group of Top 5 Innovation Leaders.[108] The top five nations include Sweden, Finland, Denmark, the Netherlands and Belgium. In the EIS, EU Member States are defined as Innovation Leaders if their overall index relative to the EU mean is greater than 125% and as so-called Strong Innovators if the overall index is between 100% and 125%. The innovation leaders include the five nations named above in the ranking, and, together with six other EU Member States (Cyprus, Estonia, France, Germany, Ireland and Luxembourg), Austria belongs to the Strong Innovators with a value of 118.3% (the index value indicates the performance relative to the EU in 2022). This value is below the previous year's value (2021: 118.7%, 2022: 118.3%), which means that Austria falls behind in relation to the target threshold of 125%, which would be necessary for qualification as an innovation leader. Within the group of Strong Innovators, Austria ranks above the average value for this group (114.5%) with 118.3%.[109]

Figure 2-18 presents the EIS values for Austria and selected nations comparatively over time (2015–2022). In 2021, the indicators of the EIS were changed to a greater extent. The values shown in the figure were calculated retroactively on the basis of the new indicators. Therefore, a comparison of EIS values in this Research and Technology Report with EIS values in previous Research and Technology Reports is no longer possible. Austria's value in the Summary Innovation Index has developed positively from 127.6 to 130.1 since 2020 (the index values in each case indicate performance relative to the EU in 2015). However, no change in ranking was achieved during this period (8th place in all three years). In 2022, Austria was able to overtake Germany in the ranking, but was itself overtaken by Ireland, which saw a strong increase compared to 2021. As the figure clearly shows, most EU Member States – as well as Austria – were able to improve continuously over time. In the period under

107 See Federal Government of the Republic of Austria (2020, p. 7).
108 See EIS 2022.
109 European Commission (2022b).

consideration, the EU average performance has risen by 9.9 percentage points since 2015. Since Austria's performance has only increased by about half as much (4.6 percentage points) in the same period, according to the European Commission[110] the lead over other nations has become smaller.[111]

In the individual sub-indices of the EIS, Austria ranked 4th in the area of "Finance and support" and thus improved by one rank compared to the previous year. In addition, a top 5 ranking was achieved in the areas of "Firm investments" (rank 5) and "Intellectual assets" (rank 1). In "Intellectual assets", Austria ranked first for the first time; these include "PCT patent applications", "Trademark applications" and "Design applications". However, Austria still needs to catch up in the area of "Use of information technologies" (rank 15).

2.2.2 Austria's position in terms of digitalisation

In the coming years, fundamental processes in research, technology and innovation will experience a digitalisation boost and will be dynamically developed further through digital systems and services.[112] The digital transformation is supported, among other factors, by the Austrian Federal Government's Recovery and Resilience Plan 2020–2026.[113] This plan reserves €1.8 billion for digitalisation. This corresponds to 52.8% of the planned expenditures in the Recovery and Resilience Plan 2020–2026 and clearly exceeds the minimum of 20% required by the European Commission.

The current status of digitalisation in Austria can be described using the indicators of the EU country comparison. In the following, Austria's performance in the Digital Economy and Society Index (DESI) of the European Commission,[114] in artificial intelligence (AI) and in quantum technology will be specifically addressed. In the Austrian Research and Technology Report 2022, the use of the Internet of Things among the population and – in the form of the Readiness for Frontier Technologies Index 2021[115] – the ability to apply future technologies were addressed at this point. Since there are no current data available on this, this research and technology report will focus on the use of the Internet of Things in companies instead of the use of the Internet of Things in the population.

Digital Economy and Society Index (DESI)

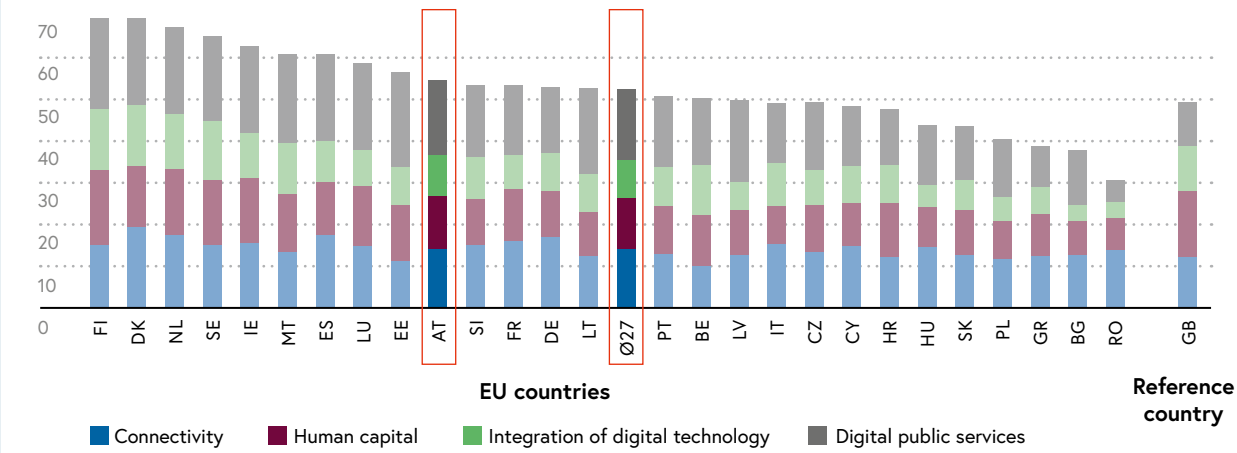
Digital Economy and Society Index (DESI)

- DESI 2022 (European Commission): Unchanged rank 10
- Deterioration in index value
- Three sub-areas of the DESI are above the EU average, connectivity is below it

The Digital Society and Economy Index is published annually by the European Commission and measures indicators of Europe's digital performance. It includes four key aspects of digitalisation: (i) connectivity, (ii) human capital, (iii) integration of digital technologies and (iv) digital public services. In 2021, the DESI was adjusted to take account of the latest technological and policy developments as well as to better reflect the changing context. This allows taking into account the two major policy initiatives that will have an impact on the digital transformation in the European Union in the coming years, namely the Recovery and Resilience Facility and the Digital Decade Compass.[116]

110 European Commission (2022b).
111 Only six other EU Member States have a growth rate equal to or lower than Austria. These include – percentage points are given in parentheses – Slovakia (4.6), Slovenia (2.0), Bulgaria (1.5), Luxembourg (1.4), Romania (0.2) and France (-1.0).
112 See OECD (2020).
113 BMF (2021).
114 See European Commission (2022g).
115 See United Nations (2021).
116 See European Commission (2021).

Figure 2-19: Digital Economy and Society Index, 2022



Source: European Commission (2022g). Graphic: iit.

Figure 2-19 shows the structure of the composite DESI index in international comparison, i.e. taking into account the cumulative values of the EU Member States in all four dimensions. Austria was unable to improve its position in digitalisation in an international comparison and, as in the previous year, occupies 10th place. With an index value of 54.7, the country even recorded a deterioration compared to its index value of 56.9 in 2021. The gap to 9th place has also widened, meaning that Austria has rather moved further away from the goal formulated in the RTI Strategy 2030 of being among the best five EU Member States (the gap to 9th place widened from 0.6 index points in 2021 to 1.8 index points in 2022).[117] Over the last five years (2017–2022), Austria's average relative growth rate in the index score was 8 percentage points per year, in line with the EU average.[118] The top places in the ranking are occupied by Finland (69.6), Denmark (69.3), the Netherlands (67.4) and Sweden (65.2). These were also the leading nations in 2021, with the difference that, this year, Finland swapped places with Denmark and the Netherlands with Sweden. Austria remains above the EU average (52.3), but its lead over the EU average has narrowed from 6.2 in 2021 to 2.4 in 2022. While Austria was above the EU average in all four main DESI domains in 2021, it suffered a relative setback in the connectivity domain, landing below the EU average again, as in 2020 (the absolute score in connectivity increased from 53.0 in 2021 to 56.5 in 2022). In the other three areas of human capital, integration of digital technologies and digital public services, the country remains above the EU average.[119]

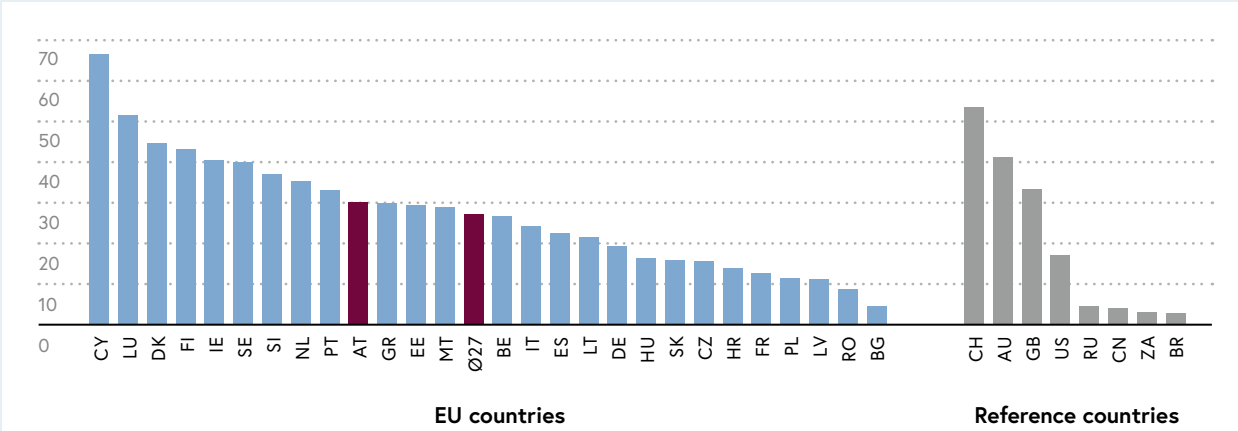
Artificial intelligence (AI) and the Internet of Things (IoT)

Artificial intelligence and the Internet of Things

- Scientific publications in the field of AI 2021 (Scopus): Deterioration by two places (rank 10)
- Internet of Things (IoT) 2021 (Eurostat): Austria leads the EU in the share of companies using IoT

117 See Federal Government of the Republic of Austria (2020, p. 7).
118 See European Commission (2022h).
119 See European Commission (2022h).

Figure 2-20: Number of scientific publications in the field of AI per 1 million inhabitants, 2021



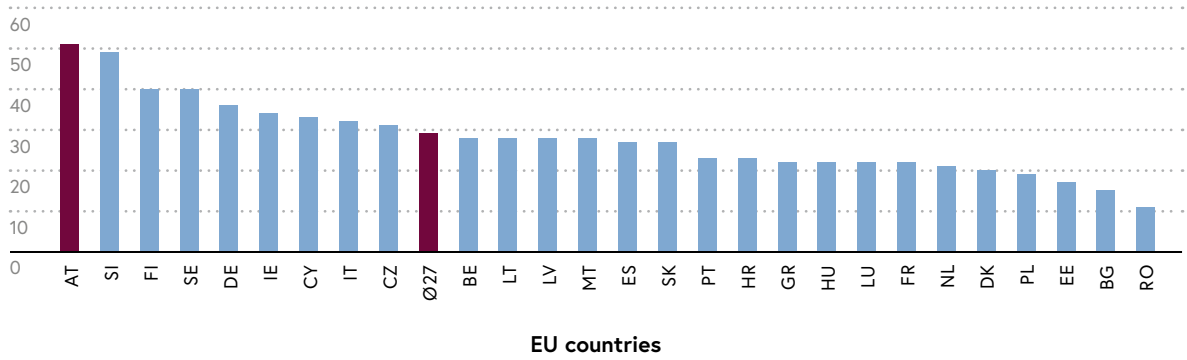
Source: Scopus (2022). Graphic: iit.

The RTI Strategy 2030 formulates the strengthening of (key) technologies in the area of digitalisation as a central field of action.[120] This also includes – in addition to the Internet of Things (IoT), Big Data, Blockchain, 5G, 3D printing, robotics, drone technology, genome editing, nanotechnology, photovoltaics, and other areas – artificial intelligence (AI), which is one of the most important forward-looking technologies, as it has the potential to generate new markets and industries through the development of new products and services.[121] The United Nations estimates the market for AI to grow from $16 billion in 2017 to $191 billion in 2024. [122]

Figure 2-20 shows the citable scientific publications in the field of AI in a country comparison and is the result of a bibliometric analysis conducted on the basis of the publication database of Scopus.[123] On Scopus, the keywords "ai" and "artificial intelligence" were used to identify all publications in 2021 that were published as scientific articles, reviews, books, book chapters, notes, short surveys or letters. Austria ranks 10th in 2021 with approximately 30 publications in the AI field per million inhabitants. Although the country was able to increase its number of publications per million inhabitants from 24 in 2020 to 30 in 2021, it loses two places in the ranking. The reason for this is that the publication rates have risen overall. Also, the increases in other countries, such as Slovenia and Portugal, which were able to overtake Austria in the ranking, were stronger. On average in the EU, publications per million inhabitants almost doubled from 2020 (14.60) to 2021 (27.24). Austria is thus in the middle and above the EU average, but has lost some of its lead over other countries. The leader in AI publications continues to be Cyprus (66.63), followed by Luxembourg (51.64) and Denmark (44.73). These countries were able to significantly increase their publication rates compared to the previous year, with an increase of between 15 and 30 publications per million inhabitants. Cyprus leads the ranking, not least because the University of Cyprus in Nicosia specialises strongly in research into future technologies.

120 See Federal Government of the Republic of Austria (2020, p. 10).
121 See Szczepanski (2019).
122 See United Nations (2021).
123 See Scopus (2022).

Figure 2-21: Percentage of companies using Internet of Things, 2021



Source: Eurostat (2022). Graphic: iit.

The picture is different for the use of the Internet of Things in companies. Figure 2-21 shows the percentage of companies in a country that were using Internet of Things applications in 2021. These applications include interconnected devices or systems that can be monitored or controlled remotely via the internet. All companies with ten or more employees are included, excluding the financial sector. In Austria, about every second company used Internet of Things applications in 2021 (51%). With this value, Austria leads the ranking just ahead of Slovenia (49%). Finland and Switzerland follow at a slight distance, each with about 40%. On average in the EU, only around 29% of companies use the Internet of Things. Austria's value is thus almost twice as high as the EU average and underlines the country's leading role in this area.

Quantum technology

Quantum technology

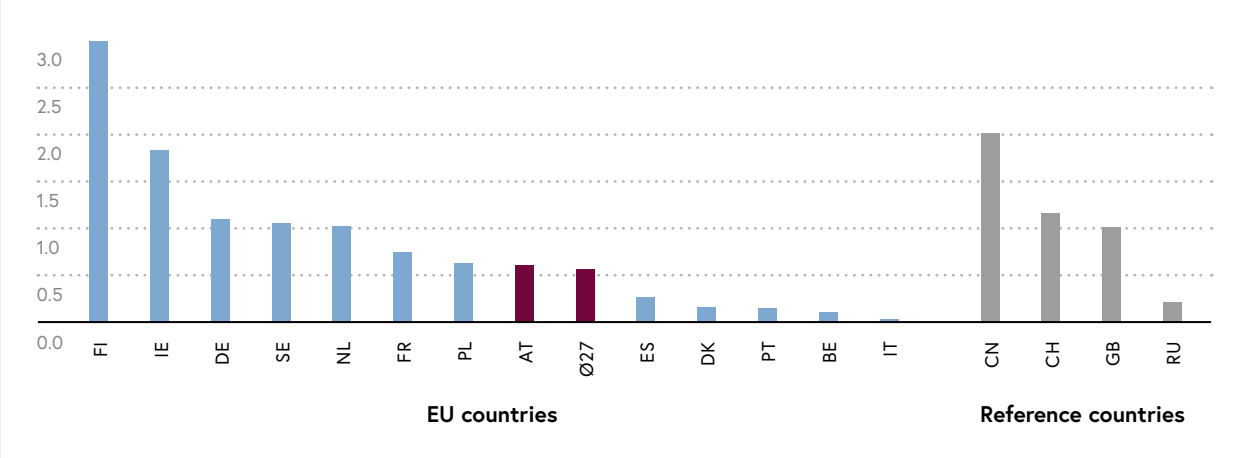
- Patents 2020 (European Patent Office): Decline in patent registrations (from 2nd to 8th place)
- Publications 2021 (Scopus): Leading position in scientific publications

In the Austrian Recovery and Resilience Plan 2020–2026, the promotion of quantum research is an important field of action.[124] To this end, the Quantum Austria funding programme with a volume of €107 million was launched "to successfully use quantum science for innovative products and services and to push European technological sovereignty in this field".[125]

A country's innovation and performance in the field of quantum technology is quantified with the help of a patent analysis and a bibliometric analysis. For the patent analysis, Cooperative Patent Classification Codes (CPC codes) and keywords are used to filter out the patents displayed at the European Patent Office.[126] CPC codes and keywords from four different areas of

124 BMF (2021).
125 See BMF (2021, p. 10).
126 See European Patent Office (2022).

Figure 2-22: Patents in the field of quantum technology per 10,000 R&D employees, 2020



Note: No patent data and/or R&D personnel data are available for Hungary, Latvia, Estonia, Czech Republic, Lithuania, Slovenia, Slovakia, Luxembourg, Romania, Greece, Bulgaria, Croatia, Malta, Cyprus, Brazil, Australia, South Africa and the USA.
Source: European Patent Office (2022). Graphic: iit.

quantum research are used for the analyses:[127] Quantum Computing, Quantum Key Distribution, Entanglement and Cold Atom Interferometry.[128]

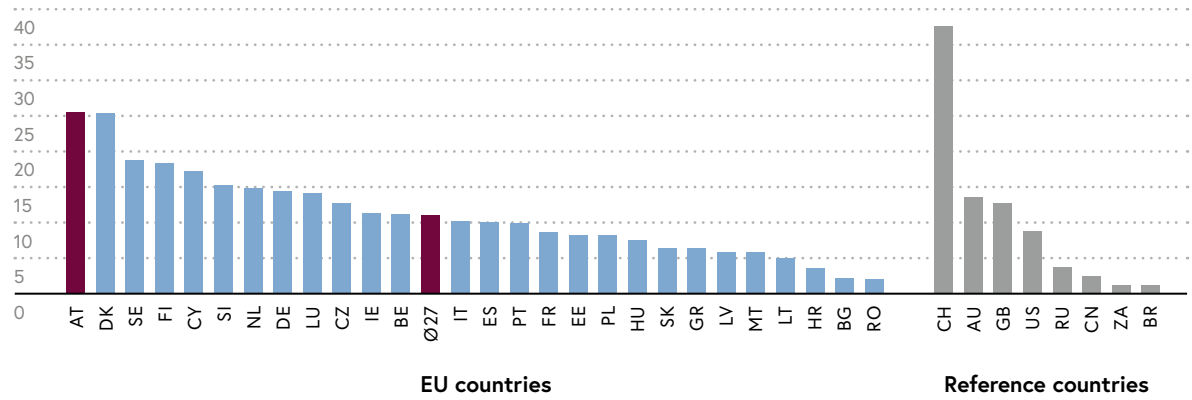
Figure 2-22 shows the number of patents across all four areas of quantum research per 10,000 R&D employees (measured in FTEs). Since patent applications are usually published 18 months after the filing date at the European Patent Office, the year 2020 was chosen for the patent analysis in this report.

Austria is slightly above the EU average and is thus no longer one of the leading nations, after it was still able to take second place in the field of quantum research with its patent applications in 2019. Overall, the number of patents filed with the European Patent Office has increased from 1,683 patents in 2019 to 1,839 patents in 2020. However, the number of patents filed for Austria was down, decreasing from nine patents in 2019 to five patents in 2020. This decrease is probably due to a "natural" fluctuation in low case numbers. If Austria had been able to keep the number of patents constant at nine, the country would be in fourth place in the ranking. Leading among the EU Member States is Finland with a total of 16 patents (2020: rank 1; 2019: rank 3), followed by Ireland (2020: rank 2; 2019: rank 1) and Germany (2020: rank 3; 2019: rank 3).

Figure 2-23 shows the result of a bibliometric analysis for the year 2021, which was carried out with the help of the publication database Scopus. It includes publications that were issued as scientific article, review, book, book chapter, note, short survey or letter.[129] After taking third place in 2020 with approximately 21 publications per million inhabitants, Austria was able to increase its scientific output in the field of quantum technologies in 2021 and take a top position with 25.6

127 The CPC codes used for the patent analysis and the keywords used for the bibliometric analysis are based on analyses conducted by the Joint Research Center (see Travagnin, 2019).
128 See European Commission (2022i).
129 See Scopus (2021). Keywords used: qbit; qbits; qubit; qubits; quantum computer; quantum computers; quantum computation; quantum computations; quantum memory; quantum memories; quantum error correction; quantum simulation; quantum simulations; quantum key distribution; qkd; quantum cryptography; photon; photons; photonic; entangled; or entanglement; entangling; entangle; cold atom; atom; atoms; atomic; interferometer; interferometry.

Figure 2-23: Number of scientific publications in the field of quantum research per 1 million inhabitants, 2021



Source: Scopus (2022). Graphic: iit.

publications per million inhabitants. Denmark (25.4) and Sweden (18.8) follow close behind. In an international comparison, only Switzerland, with 37.6 publications per million inhabitants, achieved an even better performance than Austria. Overall, it can thus be stated that the number of scientific publications in the field of quantum research has increased. Consequently, the EU average rose from 9.5 publications per million inhabitants in 2020 to 11.1 in 2021. It should be emphasised that Austria was able to increase disproportionately compared to the EU average, and the gap to the EU average was widened from 11.4 in 2020 to 14.5 in 2021.

2.2.3 Austria's innovation capability

In this subchapter, indicators that can provide information about a country's innovation capability are first presented in a cross-country comparison. Subsequently, Austria's position in an international comparison in the areas of ecological sustainability and resilience is described. Innovative capacity is understood as the ability to generate something new and translate it into competitive products, processes and services. Innovation capability plays a central role in the RTI system, as it is one of the most important prerequisites for competitiveness and prosperity in developed economies. In order to be able to approximate the innovation capability of a country, indicators are used to determine the initial situation or framework conditions for innovative activities. These indicators can be grouped into three areas: human capital, complexity capital and relationship capital. Human capital is seen as the knowledge of people, especially working people; complexity capital as the diversity of useful knowledge that allows complex products to be produced; and relationship capital as the ability to pool knowledge across organisational boundaries. The importance of human and relationship capital as important determinants of innovation capability is reflected in the theoretical work of Alwert (2006)[130] in the context of intellectual capital reporting, among others, and complexity capital draws on the theoretical considerations and empirical data on which the Atlas Of Economic Complexity is based.[131]

130 Alwert (2006) also lists *structural capital* as another important determinant of innovative capacity. Due to the lack of current data, however, *structural capital* is not examined in greater detail in this report.

131 See Hausmann et al. (2013).

Human capital

Talents

- IMD World Talent Ranking 2022: Loss of one rank (currently 5th)
- Tertiary education attainment in 2021 (OECD): Unchanged share of 25–64-year-olds with a tertiary degree (14th place)
- STEM Graduates 2020 (UNESCO): (Again) 2nd place
- Continuing education 2021 (European Commission): Above-average share of 25–64-year-olds participating in continuing education (8th place)

Formal, non-formal and informal learning processes contribute to a nation's human capital, which is a key factor for innovation capability. The better employees are trained and researchers are qualified, the higher the probability of developing and implementing high-quality and novel innovations. Since informal learning is hardly represented in the relevant statistics and indicators, Austria's position in the area of formal (tertiary education) and non-formal learning (continuing education) in particular is shown below. Overall, the status of Austria's human capital in an EU country comparison is considered on the basis of four indicators: (i) the IMD World Talent Ranking (WTR), (ii) the percentage of 25–64-year-olds with a tertiary degree, (iii) the percentage of graduates in STEM subjects and (iv) the percentage of 25–64-year-olds with participation in CET.

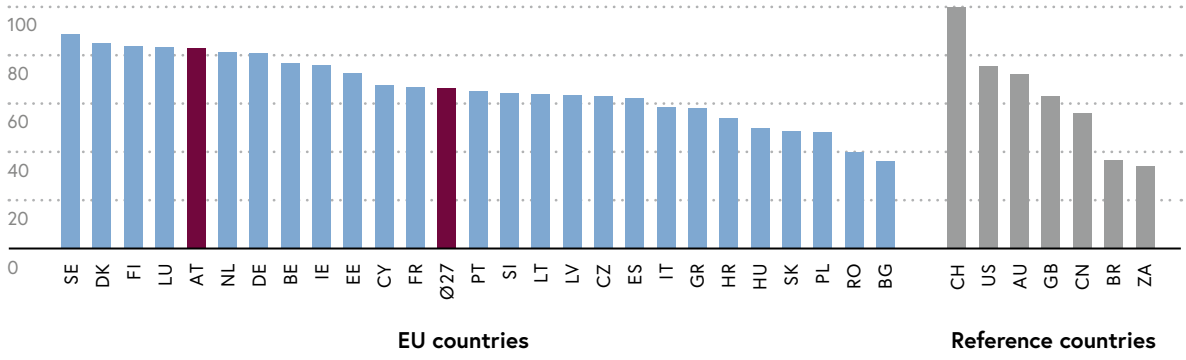
The IMD World Talent Ranking (WTR)[132] includes both "hard" education data (e. g. public spending on education) and "soft" factors (e. g. perceived quality of management training) and represents the development of skills and retention as well as the international attractiveness of or for highly qualified workers. A goal formulated in the RTI Strategy 2030 includes being among the top three nations in this ranking.[133] Figure 2-24 shows the IMD World Talent Ranking 2022 for the EU Member States and selected comparison countries and shows that Austria, in fifth place, has not yet achieved the goal of the RTI Strategy 2030. Compared to the WTR 2021, Austria worsened its position by one rank and also lost about 2.5 percentage points compared to the international leader Switzerland (Austria's WTR value 2021: 85.36; 2022: 82.87). Austria was overtaken by Finland, which took third place in the EU-27 comparison behind Sweden and Denmark.

The next two indicators – the percentage of 25–64-year-olds with a tertiary degree and the percentage of graduates in STEM subjects – quantify how high the share of potential employees with tertiary degrees or with tertiary degrees specifically in STEM subjects is. This is based on the assumption that tertiary education enables people to innovate in a special way.

Figure 2-25 presents the percentage of 25–64-year-olds with a tertiary degree. Both short-cycle tertiary education (e. g. degrees from higher education institutions and higher education courses) and Bachelor's and Master's degrees are taken into account.[134] Austria again ranks 14th within the EU in 2021, but was able to increase overall participation in tertiary education in Austria by 0.4 percentage points to 34.6%. Austria is thus (again) below the EU average of 38.3%, and a comparison of the gap between Austria and the EU average shows that it has increased slightly by 0.3 percentage points within one year (gap 2020: 3.4%; gap 2021: 3.7%). Differentiated by tertiary educational attainment, no significant changes can be seen in Austria, and the share of short-cycle tertiary degrees was 15.0%; Bachelor's and Master's degrees were 4.9% and 13.6%, respectively, and PhDs accounted for 1.1%. Leading the EU comparison is Ireland with 53.7%,

132 See IMD World Competitiveness Center (2022).
133 See Federal Government of the Republic of Austria (2020, p. 7).
134 Tertiary degrees in the OECD data set include: "short-cycle tertiary", "Bachelor's or equivalent", "Master's or equivalent" and "Doctoral or equivalent". "Post-secondary non-tertiary" is reported separately by the OECD and is not included in the evaluation.

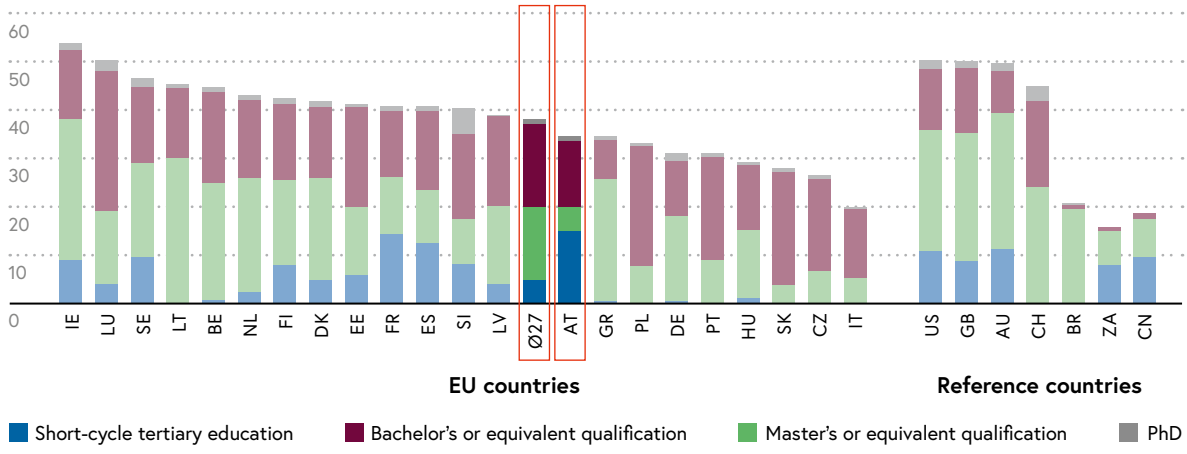
Figure 2-24: IMD World Talent Ranking, 2022



Note: No data available for Malta and Russia.

Source: IMD World Competitiveness Center (2022). Graphic: iit.

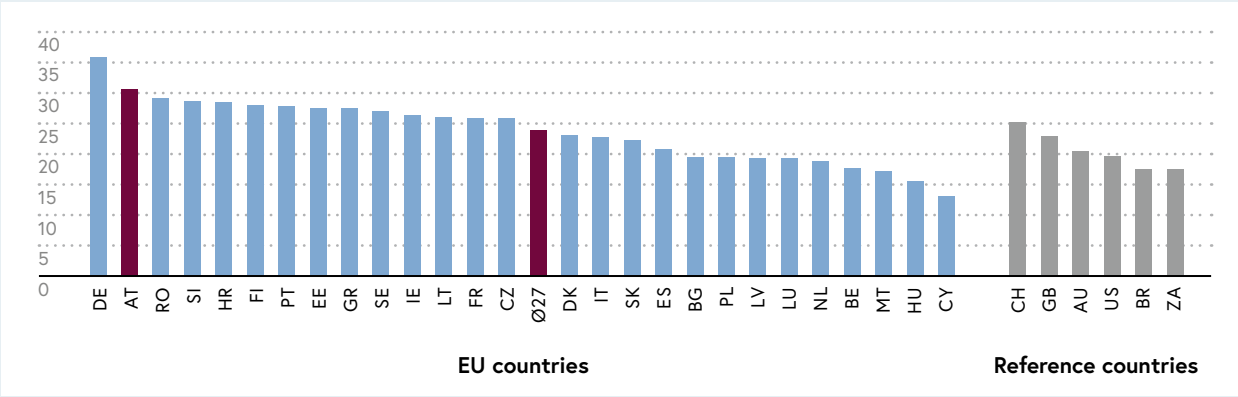
Figure 2-25: Percentage of 25–64-year-olds with tertiary education, 2021



Note: Figures for China and South Africa are from 2020. No data available for Bulgaria, Cyprus, Croatia, Malta, Romania and Russia. No data available for PhD for China and South Africa.

Source: OECD (2022d). Graphic: iit

Figure 2-26: Proportion of graduates in STEM subjects, 2020



Note: No data available for China.

Source: UNESCO (2022). Graphic: iit.

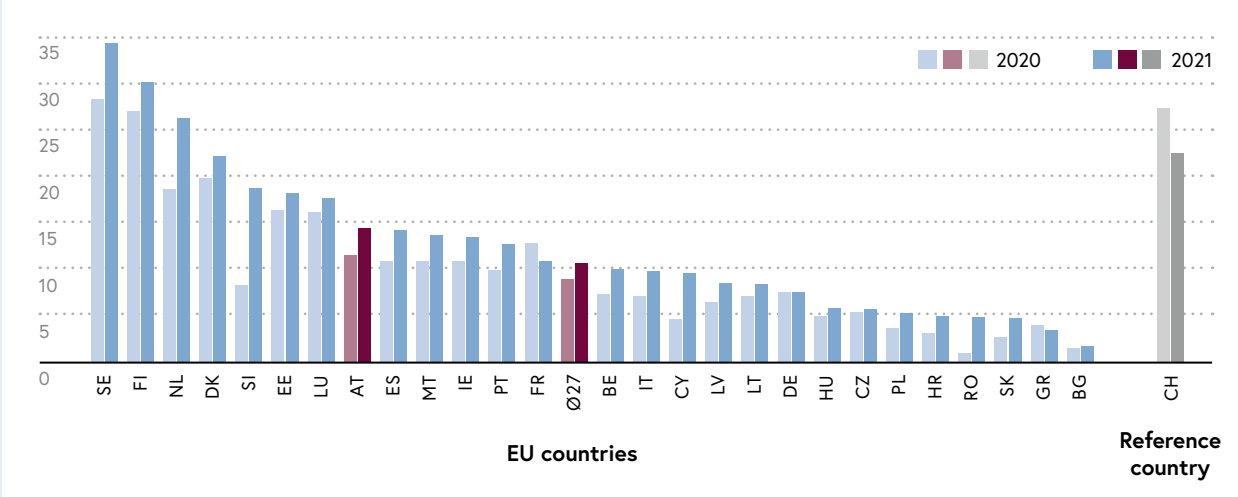
overtaking the top performer in 2020, Luxembourg (50.3%). However, a comparison of the share of tertiary education qualifications in Austria with the leading group of Ireland, Luxembourg and Sweden is only meaningful to a limited extent, as there are important structural differences between the education systems. For example, the value for Austria is "traditionally" relatively low, since in Austria dual vocational training plays a much more central role in the training of skilled workers and takes place outside the academic system. Therefore, it makes sense to compare Austria with Germany and Switzerland – countries in which dual vocational training has a comparable status to Austria. Here it can be seen that Austria has been able to improve in comparison to both countries. The lead over Germany (31.1%) was increased by around 0.5 percentage points and the lead over Switzerland (44.9%) was reduced by around 0.7 percentage points.

Interestingly, among the EU-27, those countries in which dual vocational training plays a central role in the training of skilled workers lead in the share of graduates in STEM subjects.[135] Figure 2-26 shows the proportion of graduates in STEM subjects in an international comparison. Germany is in first place in this ranking with 35.8%, followed by Austria with 30.6% and Romania with 29.1%. Graduates in STEM subjects are important future workers in technology-based industries, and a large share of STEM graduates therefore promises sustainable positive prospects for the country's future innovation capability. Despite the large proportion of graduates in STEM subjects in 2020, a comparison with 2019 shows a decline in the proportion from 31.4% in 2019 to 30.6% in 2020.

Due to the ongoing scientific and technological change and the trend towards longer employment biographies, the next indicator, continuing education, is gaining in importance. Figure 2-27 shows the percentage of 25–64-year-olds who have participated in CET in a country comparison for the years 2020 and 2021. Austria is in 8th place in 2021 with a value of 14.6%. This places Austria among the top 10 and above the EU average of 10.8%. Sweden (34.7%), Finland (30.5%) and the Netherlands (26.6%) lead the ranking in 2021. In 2020, the share of 25–64-year-olds who participated in CVT decreased in almost all EU Member States compared to 2019, before increasing again in almost all countries in 2021. Thus, the EU average and the value for Austria in 2021 are almost identical to the level of 2019.

135 However, this does not necessarily mean that this relationship can be interpreted causally. For example, Switzerland is not a leader in graduates in STEM subjects and is only slightly above the EU-27 average.

Figure 2-27: Percentage of 25–64-year-olds taking part in training in 2020 and 2021



Note: No data available for Brazil, China, Russia, the USA, Australia, South Africa and the United Kingdom.

Source: European Commission (2022g). Graphic: iit.

Complexity capital

Complexity capital

- Economic Complexity Index 2020 (The Growth Lab at Harvard University): Rank 3
- The Austrian economy continues to be characterised by a very high degree of complexity
- Complexity decreases in Austria and in the EU average as a whole

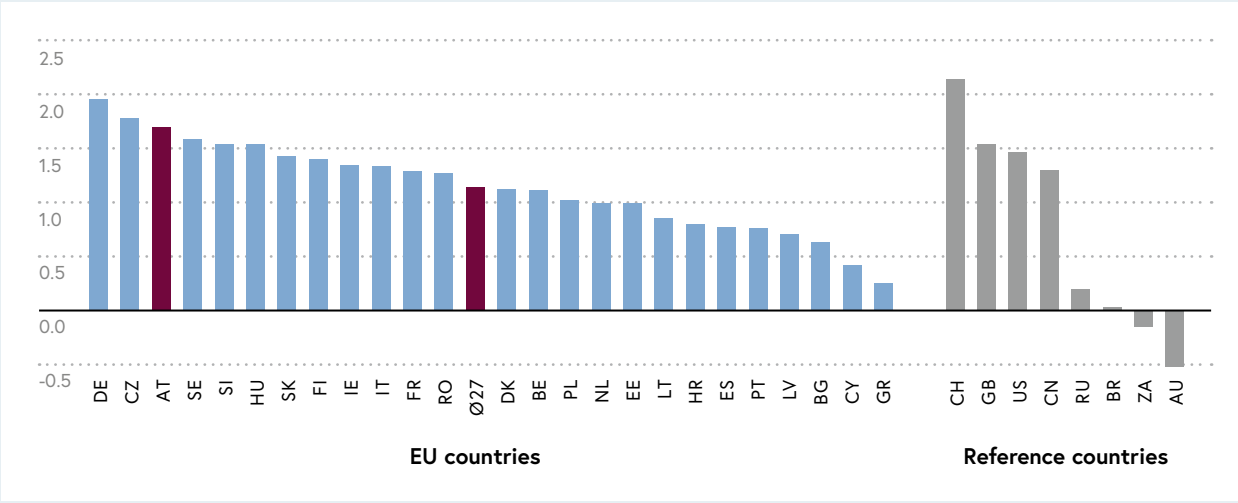
Complexity capital, along with human capital, is an important dimension to approach a country's innovation capability. This is due to the fact that in order to manufacture products of high complexity, different knowledge stocks must be combined and have to work together in the R&D, innovation and production process. Consequently, countries that are able to produce complex products should have a set of highly developed, specialised skills, which in turn are related to a country's innovation capability.

Complexity capital is subsequently measured by the Economic Complexity Index (ECI).[136] By means of this index, not only the absolute number of products manufactured in and exported by the country is considered, but also in particular how complex and diverse these products are. If the number of complex products in the total export volume of a country increases, the value of economic complexity also increases. On the other hand, the value decreases if the number of countries that also export this product increases. The ECI analysis is based on export data and is standardised to values between -2.5 and +2.5.

Figure 2-28 shows the economic complexity in a country comparison for the year 2020. It shows that the trend of decreasing complexity continues. While the EU average was still 1.19 in 2018, it decreased continuously in the following years and was 1.16 in 2019 and 1.14 in 2020. Austria's complexity is also subject to this trend and decreased from 1.77 in 2019 to 1.70 in 2020. One reason for the decrease in Austria's complexity could

136 See The Growth Lab at Harvard University (2022).

Figure 2-28: Economic complexity, 2020



Note: No data available for Luxembourg and Malta.

Source: The Growth Lab at Harvard University (2022). Graphic: iit.

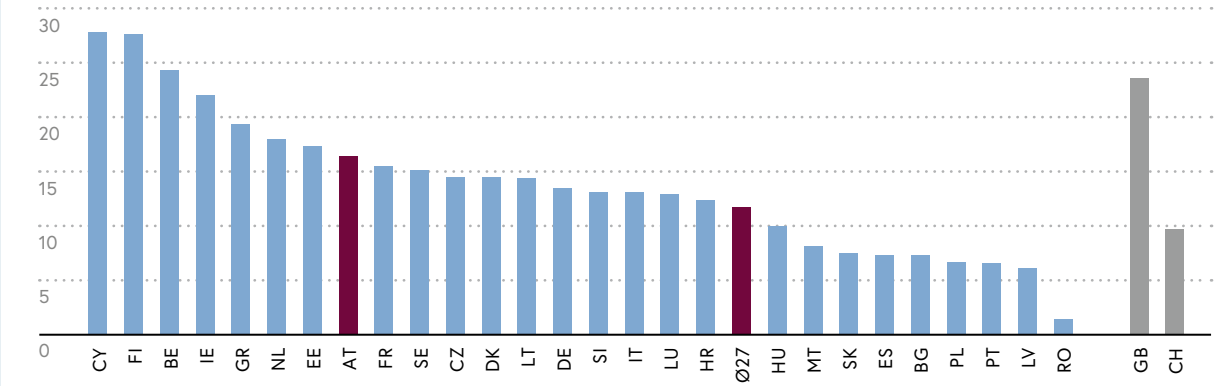
be the stagnating diversification of exports.[137] With this value, however, Austria continues to be characterised by a very high level of complexity, occupying 3rd place in the country comparison and thus maintaining its position from the previous year. Austria's diversified (export) economy is mainly due to numerous "hidden champions", i. e. successful companies that are often (world) market leaders in their field despite a low level of awareness among the general public. They concentrate on global niche markets and score with high innovative strength and qualified employees.[138] Overall, there were no changes in the rankings of the top 5 nations. Germany continues to lead the ranking ahead of the Czech Republic, Austria, Sweden and Slovenia. Products with high complexity that accounted for a relatively high share in Austria's exported basket of goods in 2020 were (as in previous years) products of mechanical engineering – including machinery for rubber and plastics processing as well as calendars and other rolling machines – measuring instruments, serums and vaccines, and automobiles and parts thereof. Products with a lower trade volume but even higher complexity included apparatus and equipment for photographic laboratories, machines for processing materials by means of lasers and similar processes, composite materials of ceramics and metals (cermets) and chemical elements for electronics. In the case of ceramic and metal composites, Austria again holds the second highest market share (16.98%) after Germany (38.64%).[139]

137 https://atlas.cid.harvard.edu/countries/15

138 See Außenwirtschaft Österreich (2022), Österreichische Exportwirtschaft 2022/2023, Vienna. https://www.wko.at/service/aussenwirtschaft/exportwirtschaft.pdf

139 Within Europe, Austria holds the third highest market share of apparatus and equipment for photographic laboratories after the Netherlands and Germany.

Figure 2-29: Collaboration by SMEs with partners in the innovation process, 2020



Note: The figures for Luxembourg and the United Kingdom refer to 2018, those for Switzerland to 2016. No data available for Brazil, China, Russia, the USA, Australia and South Africa.

Source: European Commission (2022c). Graphic: iit.

Relationship capital

Relationship capital

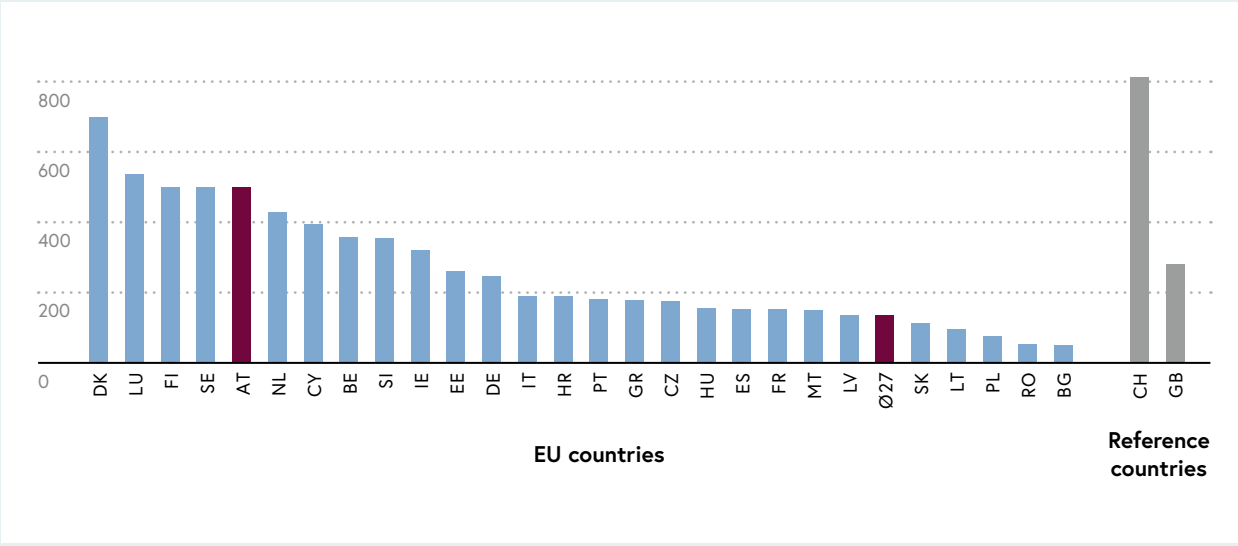
- Cooperations of SMEs 2020 (European Commission): Austria ranks 8th in the upper midfield for the number of cooperations of SMEs with other companies
- Joint publications by public and private partners 2021 (European Commission): 4th place
- Job mobility of science and technology workers 2020 (European Commission): Improvement by one rank to 11th place

New innovations and products are often created through cooperation between research institutions and industry. Knowledge exchange, technology transfer and cooperation networks are therefore a decisive factor in increasing research efficiency and accelerating the development of new or improved products and technologies. In order to map Austria's relationship capital, a number of indicators are discussed in more detail below: (i) the number of SMEs with cooperative relationships on innovation activities with other companies or institutions, (ii) the number of cooperative public-private research publications with domestic and foreign participation, and (iii) the job mobility of employees in science and technology.

Figure 2-29 shows the share of SMEs cooperating with partners in the innovation process in 2020. This indicator refers to the flow of knowledge between public research institutions and companies as well as between companies. The indicator is limited to SMEs, as almost all large companies are already involved in innovation cooperation.[140] Austria is in the upper midfield in 8th place, but above the EU average. Taking the past years into account, a downward trend emerges for Austria. While the country was still in 4th place in the country comparison in 2016, it was in 7th place in 2018 and slipped further down to 8th place in 2020.[141] The number of joint publications by public and private partners is visualised in Figure 2-30 and is related to the country population (per million inhabitants). With 498.3 joint publications, Austria

140 See European Commission (2022c).
141 In the EIS 2022, the values for this indicator are given at two-year intervals.

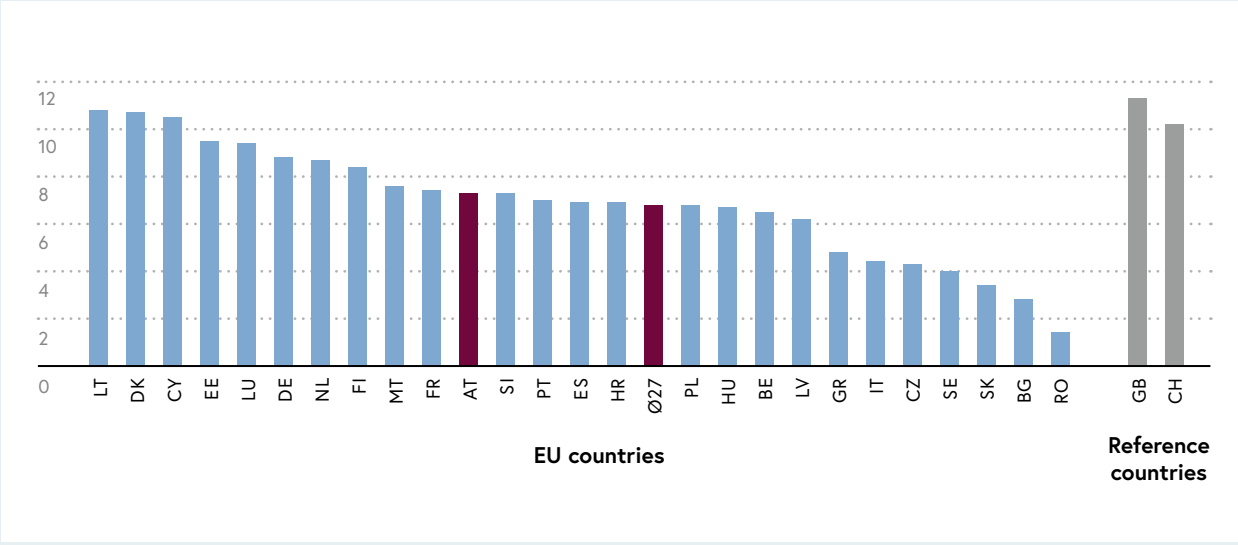
Figure 2-30: Joint publications by public and private partners per 1 million inhabitants, 2021



Note: No data available for Brazil, China, Russia, the USA, Australia and South Africa.

Source: European Commission (2022c). Graphic: iit.

Figure 2-31: Job mobility of employees in science and technology, 2020



Note: The figures for the United Kingdom refer to 2019. No data available for Ireland, Australia, Brazil, China, Russia, USA and South Africa.

Source: European Commission (2022c). Graphic: iit.

is in 5th place, just behind Sweden with 498.8 joint publications. Among the EU Member States, Denmark (699.0) is the leader, followed by Luxembourg (537.2). In an international comparison, Switzerland is still ahead of Denmark with 812.9 joint publications.

High job mobility should be associated with a higher likelihood of knowledge creation and diffusion, as it is assumed that knowledge exchange will result from people moving from one job to another. Figure 2-31 therefore shows the job mobility of science and research

workers in 2020.[142] Overall, job mobility in EU Member States has decreased in 2020, after steadily increasing from 2014–2019. One explanation for this could be the outbreak of the COVID-19 pandemic in spring 2020. Although job mobility in Austria has also decreased in 2020, Austria is still above the EU average and could show an improvement in the country comparison. In the ranking, Austria overtakes Portugal, which recorded a relatively strong decline in job mobility in 2020 and is now in 11th place.

2.2.4 Austria's position on ecological sustainability and resilience

In the following, Austria's innovation capability in the field of ecological sustainability as well as Austria's resilience capacities and weaknesses are analysed. As described at the beginning of the chapter, sustainable solutions are a market of the future and the European Green Deal[143] is intended to help drive the transformation towards a sustainable future. This transformation will most likely change the current linear economy towards a circular economy, which will require the development of innovative company models and the introduction of new technologies in almost all sectors. With regard to a country's resilience, empirical analyses point to a positive correlation between research and innovation performance on the one hand and crisis resilience on the other.[144]

Ecological sustainability

Ecological sustainability

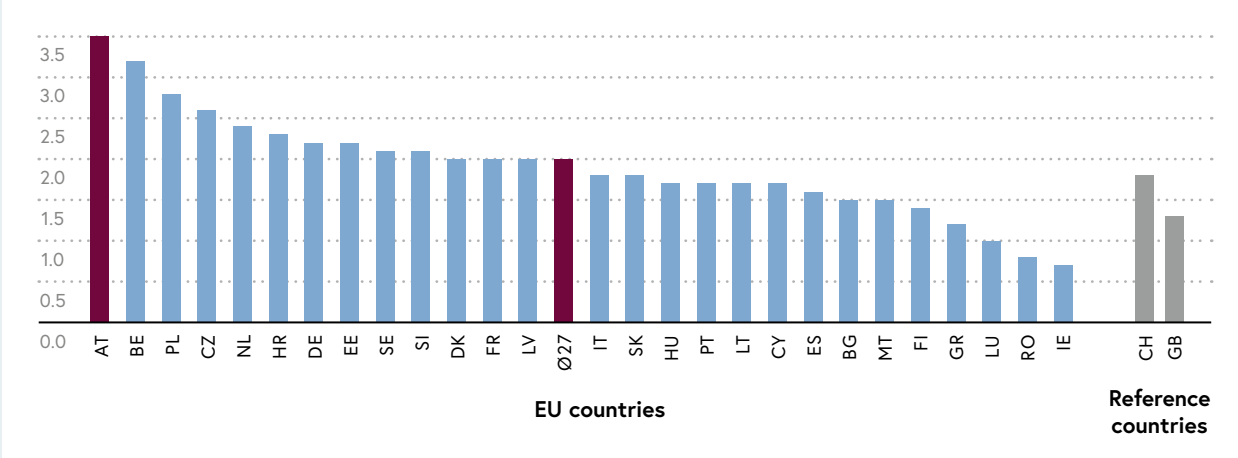
- Top position in national spending on environmental protection (Eurostat 2019)
- Average positioning in the circular material use rate (Eurostat 2021)
- Resource productivity 2021 (Eurostat): Austria shows need to catch up (12th place)
- Gross final energy consumption 2020 (Eurostat): High share of renewable energies in gross final energy consumption (4th place)

Austria's status in the field of ecological sustainability is presented in a country comparison using four indicators: (i) national expenditure on environmental protection, (ii) circular material use rate, (iii) resource productivity and (iv) share of renewable energies in gross final energy consumption.

Figure 2-32 shows the share of national expenditure on environmental protection measured as a percentage of gross domestic product for the year 2019.[145] Expenditure corresponds to the sum of current expenditure on environmental protection activities and investments, including net transfers to the rest of the world, used by resident units to protect natural habitats in a given period. Austria is the frontrunner in this indicator with a value of 3.5%, followed by Belgium (3.2%) and Poland (2.8%).

142 Science and technology workers include people who either have a tertiary education qualification or are employed in a science and technology occupation for which a tertiary education qualification is normally required.
143 See European Commission (2021d).
144 See Friesenbichler et al. (2020).
145 Characteristics reported for environmental protection expenditure include: Output of environmental protection services (distinguishing between market output, non-market output and output of ancillary activities), intermediate consumption of environmental protection services by specialised producers, imports and exports of environmental protection services, VAT and other taxes less subsidies on products on environmental protection services, gross fixed capital formation and acquisitions less disposals of non-financial non-produced assets for the production of environmental protection services, final consumption of environmental protection services and transfers (received and paid) for environmental protection.

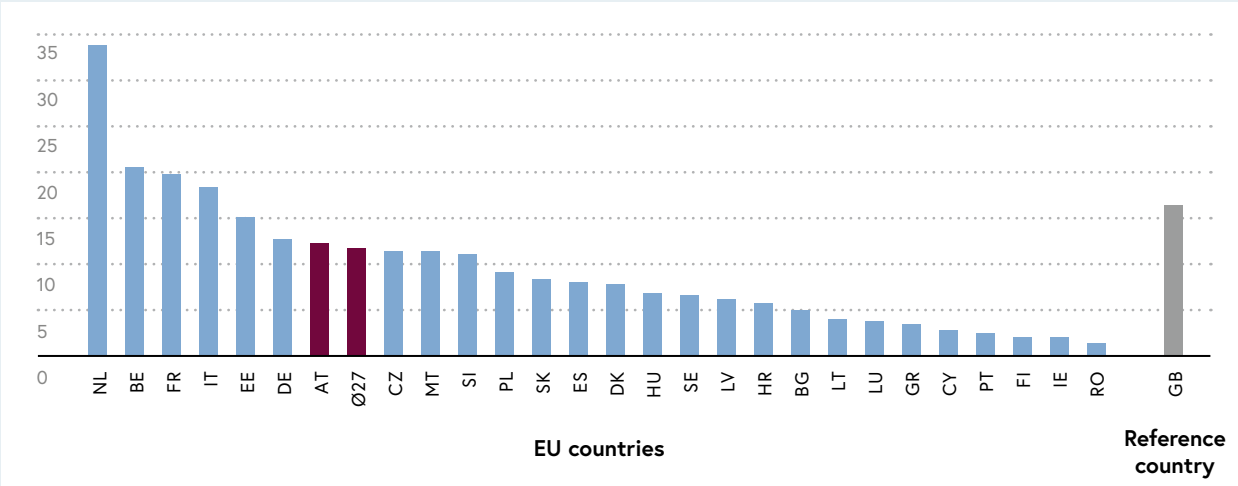
Figure 2-32: National expenditure on environmental protection as a percentage of gross domestic product (in %), 2019



Note: The figures for the United Kingdom refer to the year 2017.

Source: Eurostat (2022). Graphic: iit

Figure 2-33: Circular material use rate, 2021



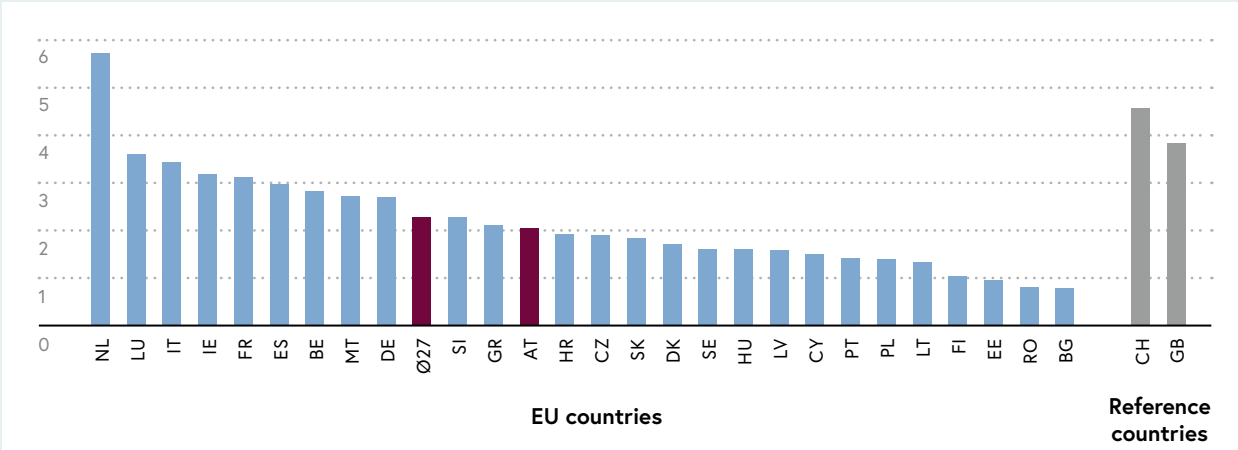
Note: The figures for the United Kingdom refer to 2019.

Source: Eurostat (2022). Graphic: iit.

Another indicator of environmental sustainability is the circular material use rate. This rate is the ratio of the circular use of materials to the total material use. Total material use is measured by the sum of aggregated domestic material consumption and circular use of materials. Circular use of materials is approximated by the amount of waste recycled in domestic recovery facilities minus imported waste destined for recovery and waste destined for export to be recovered abroad.[146] A higher value means that the environmental impact

146 https://ec.europa.eu/eurostat/databrowser/view/SDG_12_41__custom_1315713/bookmark/table?bookmarkId=e4657bd0-03a1-480b-abe3-d122fa0ac4f2

Figure 2-34: Resource productivity, 2021



Note: The figures for Switzerland refer to the year 2020, those for the United Kingdom to the year 2019.

Source: Eurostat (2022). Graphic: iit

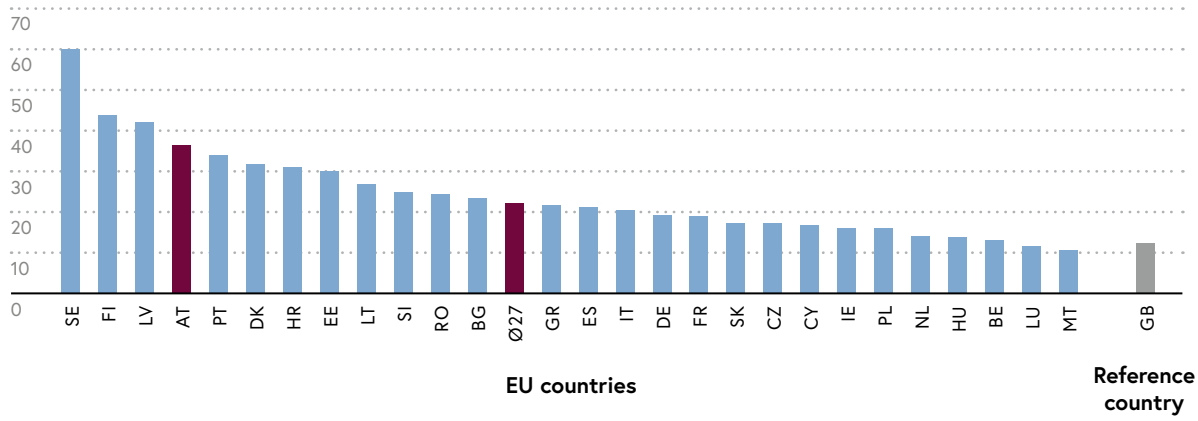
for the extraction of primary material is reduced, as more primary material can be substituted by secondary material. This indicator is also found in a similar form in the Austrian Action Plan for the European Research Area (ERA-NAP) 2022–2025.[147] Here, under "Measure 10.2", the "development of innovative technologies for the recycling of raw materials in industrial processes" is specifically named.[148]

Figure 2-33 shows the circular material use rate in international comparison. In 2021, Austria has a rate of 12.3%, which is above the EU average (11.7%) and ranks 7th.[149] Just ahead of Austria is Germany with 12.7%. Leading the ranking by far are the Netherlands (33.8%), followed by Belgium (20.5%) and France (19.8%). A look at the circular material use rate in 2020 shows that Austria was able to increase by 1.5 percentage points within one year and thus catch up with Germany, as Germany deteriorated slightly by 0.2 percentage points. Austria's development is thus pointing in the right direction.

Figure 2-34 shows resource productivity in 2021. To calculate resource productivity, gross domestic product is divided by domestic material consumption. Resource productivity is therefore an indicator of how efficiently an economy uses its materials, i. e. how much gross domestic product can be generated with the consumption of one unit of materials. Domestic material consumption is defined as the annual quantity of raw materials extracted from the domestic territory of the economy under consideration, plus all physical imports and minus all physical exports.[150] In order to be able to present resource productivity in a country-comparative manner in a given year, the gross domestic product is expressed in units of the purchasing power standard (PPS) for the calculation.[151]

147 See BMBWF (2022).
148 See BMBWF (2022, p. 50 f.).
149 For the year 2021, preliminary figures are given by Eurostat.
150 Eurostat notes that "consumption" refers to apparent consumption and not final consumption. Domestic material consumption does not include upstream flows related to imports and exports of raw materials and products originating outside the economy.
151 The purchasing power standard is a notional monetary unit to account for the distortion due to differences in price levels between different countries.

Figure 2-35: Share of renewable energies in gross final energy consumption, 2020



Note: The figures for the United Kingdom refer to 2019.

Source: Eurostat (2022). Graphic: iit.

Austria occupies a midfield position in this indicator in an EU comparison (12th place) and lies slightly below the EU average. The clear leaders in resource productivity are the Netherlands, followed by Luxembourg and Italy. In an international comparison, Switzerland and the United Kingdom still have high values, but their resource productivity is lower than that of the Netherlands. This indicator shows that Austria should increase its efficiency in domestic material consumption through innovations and new technologies, including in production technologies, in the coming years.

The picture is more positive for the share of renewable energies in gross final energy consumption (Figure 2-35).[152] Here, Austria is in the top group in 4th place in 2020 with a share of 36.55%. Sweden leads the way with a value almost twice as high as Austria's (60.12%), and Finland (43.80%) and Latvia (42.13%) occupy the other top 3 places.

Resilience

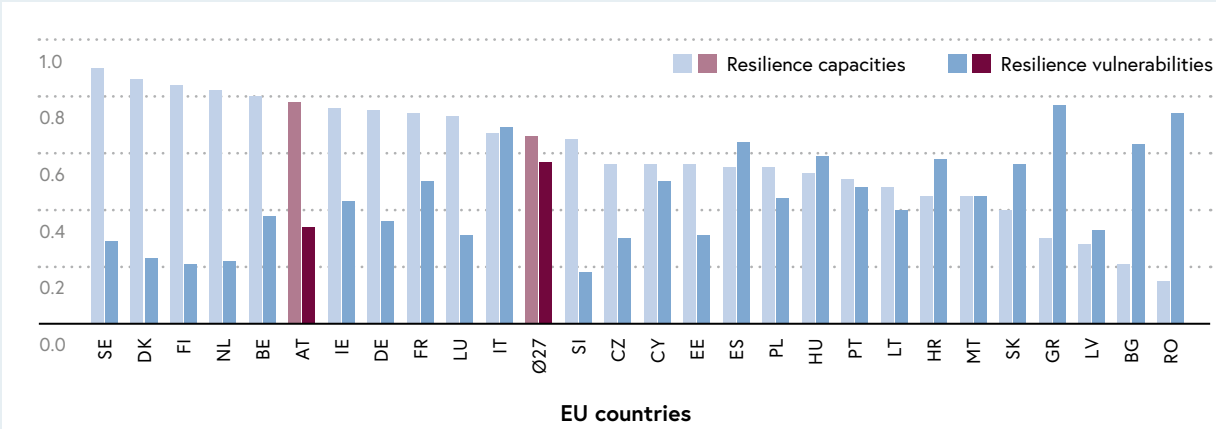
Resilience 2022 (European Commission)

- Social and economic sector: Still "medium-high" resilience capacities, but a deterioration of four places in the resilience vulnerabilities (rank 10)
- "Green Resilience": Again top position in resilience capacities, but also continued medium-high resilience vulnerabilities
- No change in the area of digital resilience capacities ("medium-high") and resilience vulnerabilities ("medium-low")
- Geopolitical resilience: improvement in resilience capacities from 11th to 8th place and improvement in resilience vulnerabilities from 17th to 15th place

Austria's resilience in international comparison is presented for four dimensions, namely (i) the social and economic dimension, (ii) the green dimension, (iii) the digital dimension and (iv) the geopolitical dimension. The resilience indicators, the breakdown into the four dimensions and the associated data are based on the work of the European Commission's Joint Research

152 Gross final energy consumption is the energy consumption of end consumers plus grid losses and own consumption of power plants.

Figure 2-36: Resilience: social and economic dimension, 2022



Source: European Commission (2022j). Graphic: iit.

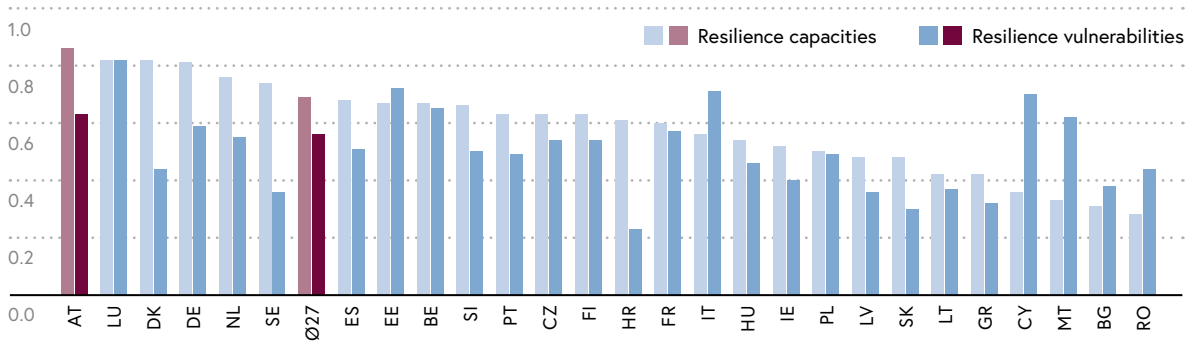
Centre.[153] For each dimension, an index of resilience capacities as well as resilience vulnerabilities is produced. The index of resilience capacities quantifies the structural characteristics of a country that help it to manage transitions and cope with future shocks. The index of resilience vulnerabilities measures a country's structural characteristics that can exacerbate the negative impacts of a changing environment (e. g. challenges related to the digital and green transformation of the economy and society).

Resilience in the social and economic dimension is the capacity to cope with economic shocks and to achieve long-term structural change in a fair and inclusive way. Indicators in this dimension come from the areas of (i) inequalities and social impacts of transitions, (ii) health, education and work, and (iii) economic and financial stability and sustainability. Resilience in the green dimension ("green resilience") reflects a country's capabilities to achieve climate neutrality by 2050. The indicators of the index come from the areas (i) climate change mitigation and adaptation, (ii) sustainable use of resources, and (iii) ecosystems, biodiversity and sustainable agriculture. For the EU Commission, "Digital resilience" means ensuring that human dignity, freedom, equality, security, democracy and other fundamental European rights and values are preserved and strengthened by the way we live, work, learn, interact and think in this digital age.[154] Indicators of this index derive from the four areas of (i) digital for personal space, (ii) digital for industry, (iii) digital for public space and (iv) cybersecurity. By "Geopolitical resilience", the EU Commission describes the ability for Europe to strengthen its "open strategic autonomy and global leadership role".[155] Indicators for this index originate from the areas: (i) raw material and energy supply, (ii) value chains and trade, (iii) financial globalisation, and (iv) security and demography.

Figures 2-36 to 2-39 show the resilience capacities and resilience vulnerabilities in the EU country comparison across all four dimensions for the year

153 See European Commission (2022j).
154 European Commission (2020b, p. 34).
155 European Commission (2020b, p. 16).

Figure 2-37: Resilience: green dimension, 2022



Source: European Commission (2022j). Graphic: iit.

2022.[156] A higher value in the capacity index indicates a higher relative resilience capacity and a higher value in the vulnerability index indicates higher relative resilience vulnerabilities.

In the social and economic dimension, Austria continues to show high resilience capacities and low resilience vulnerabilities. In terms of resilience capacities, Austria once again ranks 6th, but was able to increase its indicator value from 0.75 in 2021 to 0.78 in 2022. A better ranking compared to the previous year was not achieved, as Austria was able to overtake Ireland in the ranking, but was also overtaken by Belgium at the same time. In the resilience vulnerabilities in this dimension, Austria deteriorated from an indicator value of 0.30 to 0.34[157] and thus by four places to 10th place.

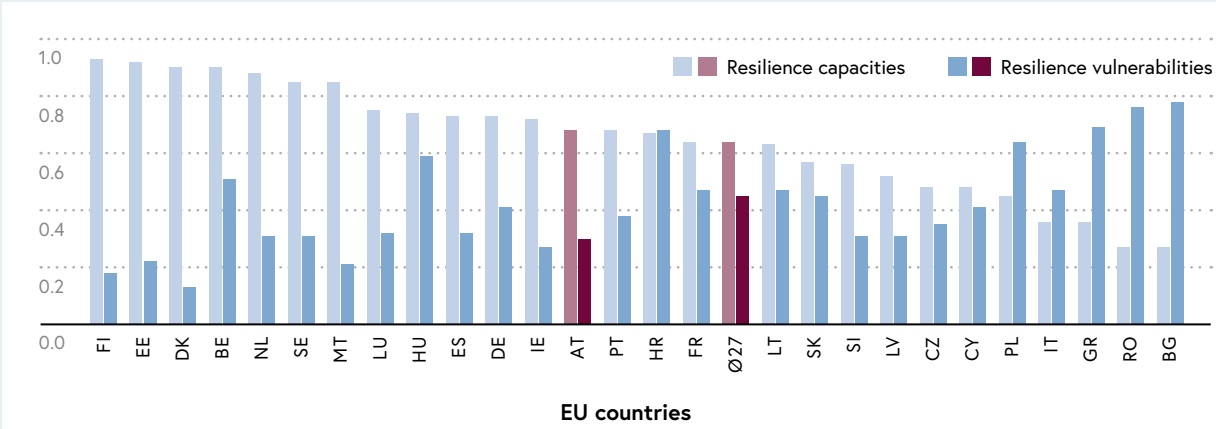
There were no significant changes in the Green Dimension: Austria continues to lead in terms of resilience capacities and again shows a need to catch up in terms of resilience vulnerabilities, with an indicator score below the EU average and rank 22.[158] Overall, resilience capacities and resilience vulnerabilities have improved in the EU Member States. The indicator score for resilience capacities increased from 0.67 in 2021 to 0.69 in 2022, and the indicator score for resilience vulnerabilities improved from 0.57 to 0.42.[159]

There were also no changes for Austria in the digital dimension. The country has average resilience capacities in this dimension (13th place) and low resilience vulnerabilities (6th place). Denmark, Finland and Malta are once again the leading nations in terms of resilience vulnerabilities.

There were major changes in the geopolitical dimension. While Austria ranked below the EU average in both resilience capacities and resilience vulnerabilities in 2021, the country exceeds the EU average in 2022. In particular, Austria was able to increase its indicator value for resilience capacities from 0.55 to 0.61 and its position from 11th to 8th place, while the EU average dropped significantly from 0.61 to 0.52. In the case of resilience vulnerabilities, Austria was able to increase its

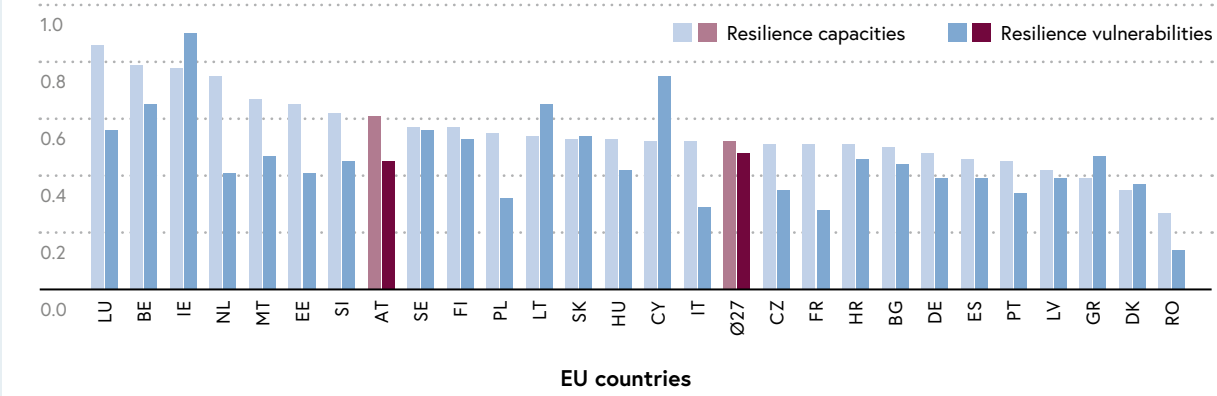
156 The resilience data was updated by the European Commission in May 2022 and an annual update is expected to continue in May each year.
157 For resilience vulnerabilities, a lower indicator score means a better ranking.
158 In terms of resilience vulnerabilities, the country with the lowest score ranks first.
159 For resilience vulnerabilities, a lower value is to be interpreted positively.

Figure 2-38: Resilience: digital dimension, 2022



Source: European Commission (2022j). Graphic: iit.

Figure 2-39: Resilience: geopolitical dimension, 2022



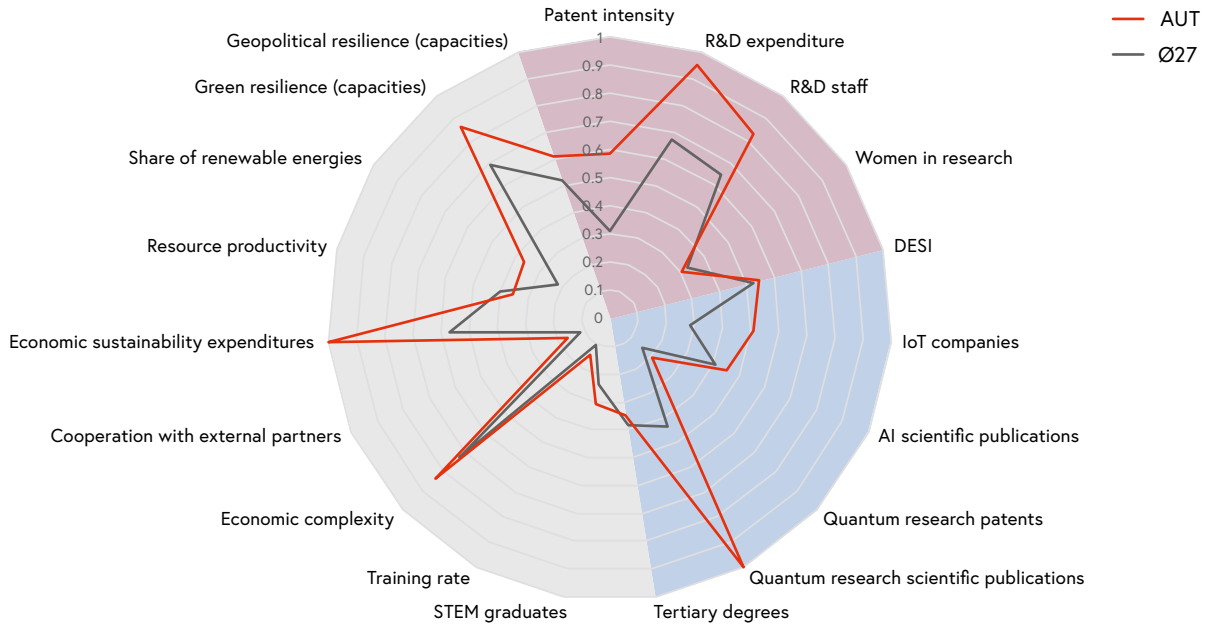
Source: European Commission (2022j), Graphic: iit.

indicator value from 0.55 to 0.61 and its position from 11th to 8th place. In terms of resilience vulnerabilities, Austria's indicator value deteriorated slightly (2021: 0.51; 2022: 0.54), but overall, it improved by two positions to 15th place.

2.2.5 Summary

In this chapter, Austria's performance in research and development, the state of digitalisation, innovation capability as well as ecological sustainability and resilience were analysed on the basis of various indicators, and Austria's positions in international comparisons were presented. Selected key results are summarised as a radar chart in Figure 2-40. The red segment of the figure includes basic indicators of performance in research and development, the blue segment includes indicators of the state of digitalisation and the grey segment shows indicators of innovation capability, ecological sustainability, and resilience. Austria's respective value (red line) is compared to the EU-27 average value (grey line). The various scales were uniformly normalised to values between zero and one.

Figure 2-40: Summary of Austria's position compared to the EU average



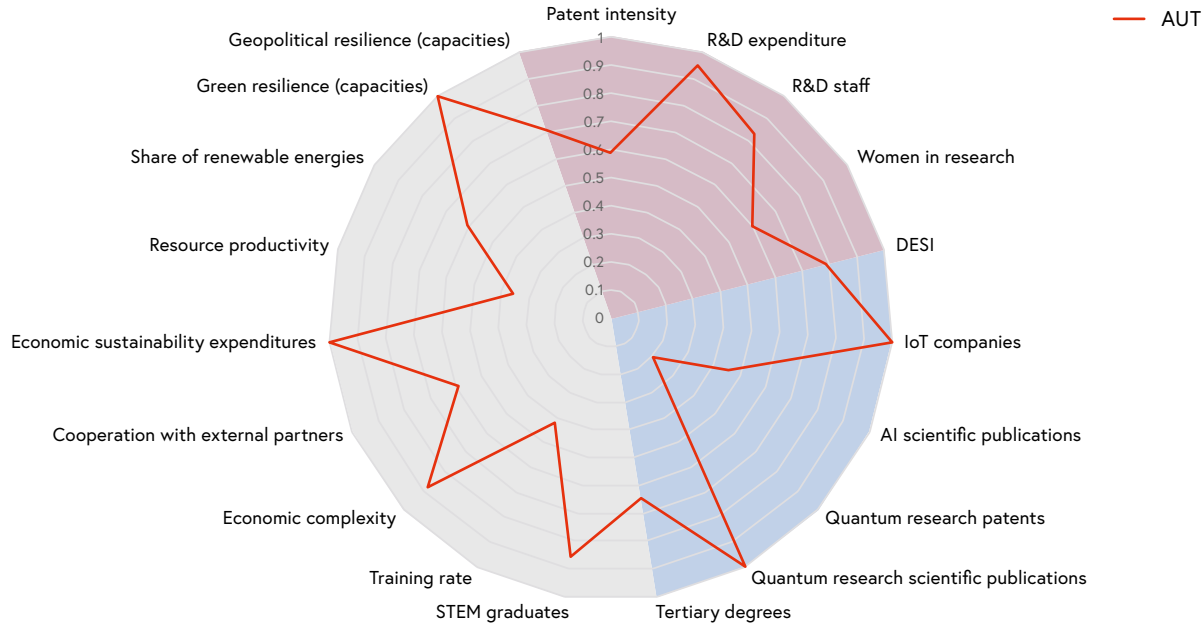
Graphic: iit.

Austria's picture in the area of research and development performance is mixed. The country's position improved in the RTI indicators patent intensity, R&D expenditure and venture capital expenditure. Austria was able to increase the share of R&D employees in the labour force (+0.1 percentage points) but lost a position in the international comparison because Sweden recorded a disproportionate increase. Austria's position worsened slightly by one place in the science indicators "scientific publications" (with an increased absolute number of publications) and "ERC grants"; however, Austria was still able to occupy third place and thus once again achieved the goal formulated in the RTI Strategy 2030 of being among the top 10 nations. In the Times Higher Education World University Rankings, higher education institutions from Austria achieved better rankings. There is a need to close the gap regarding the proportion of women in research; in the global innovation rankings, the country was able to maintain its position (EIS) or improve it slightly (GII, by one rank).

A mixed picture can also be observed in the area of digitalisation. Although Austria was able to maintain its position from the previous year in the DESI, the index value worsened, and Austria also slipped below the EU average in the connectivity sub-index. In the indicators in the areas of artificial intelligence, Internet of Things and quantum technology, Austria ranks above the EU average in each case, but had to accept lower positions than in the previous year in scientific publications on AI and in patent applications in quantum research. However, the country is leading in scientific publications in the field of quantum research and the share of companies that use the Internet of Things.

A differentiated picture also emerges for the indicators of innovation capability. In terms of human capital, tertiary degrees remain only slightly below the

Figure 2-41: Summary of Austria's score compared to the leading scores



Graphic: iit.

EU average, while a very high share of STEM graduates[160] was achieved (second place in the EU). The comparatively low value in tertiary degrees can be explained by the strong dual vocational training system in Austria. There was a drop of one position in the IMD World Talent Ranking, but Austria is still among the top 5 nations. In terms of complexity capital, the country ranks 3rd, as in the previous year, and once again illustrates its excellent abilities to produce complex products. However, it also shows that complexity has decreased compared to the previous year, just like the EU average. In terms of relationship capital, all scores are in the midfield and above the EU average, with the position for public-private co-publications relatively close to the top group at 5th place. Austria's position in the indicators on environmental sustainability is also differentiated. Here, the country leads in national expenditure on environmental protection and narrowly misses third place in the share of renewable energies in gross final energy consumption. On the other hand, Austria has a below-average or average value for resource productivity or the circular material use rate. With regard to resilience capacities, the picture continues to be positive. In the social and economic area as well as in the area of digital resilience capacities, Austria has "medium-high" resilience capacities; in the area of "green resilience", Austria is the front-runner. In the geopolitical area, Austria was able to improve its resilience capacities by three ranks.

Figure 2-41 offers a different perspective on Austria's strengths and weaknesses in an international

160 In Figure 2-40, the proportion of STEM degrees appears comparatively low. This is because this figure shows the comparison to the possible maximum value (100% STEM graduates). In fact, however, Austria has the second highest share of STEM graduates among the EU Member States.

comparison by visualising the gap to the leading nation for each indicator, i. e. what proportion of Austria's value represents of the highest value in the EU. This clearly shows Austria's excellent and, in some cases, leading position in R&D expenditure, R&D staff, use of the Internet of Things in companies, publications on quantum research, STEM graduates, economic complexity, national expenditure on environmental protection and green resilience. In terms of the proportion of women, Austria was slightly below the EU average in the presentation in Figure 2-40 – this indicator also shows a need to catch up with regard to the gap with the leading nation (Figure 2-41). Austria has the largest gap with the highest value in the EU in patents in the field of quantum research. The gap with the leading nation has increased compared to the previous year, as Finland was able to significantly increase the number of patents from three in 2019 to 16 in 2020.

2.3 Austria and European research, technology, and innovation policy

In the following chapter, Austria's performance in Horizon Europe will be discussed for the first time (Chapter 2.3.1) and, in conjunction with this, the process of national implementation of the European RTI missions (Chapter 2.3.2). Furthermore, the most important contents of the Austrian Action Plan for the European Research Area (Chapter 2.3.3) and the goals and the development of the European Digital Innovation Hubs in Austria will be presented (Chapter 2.3.4).

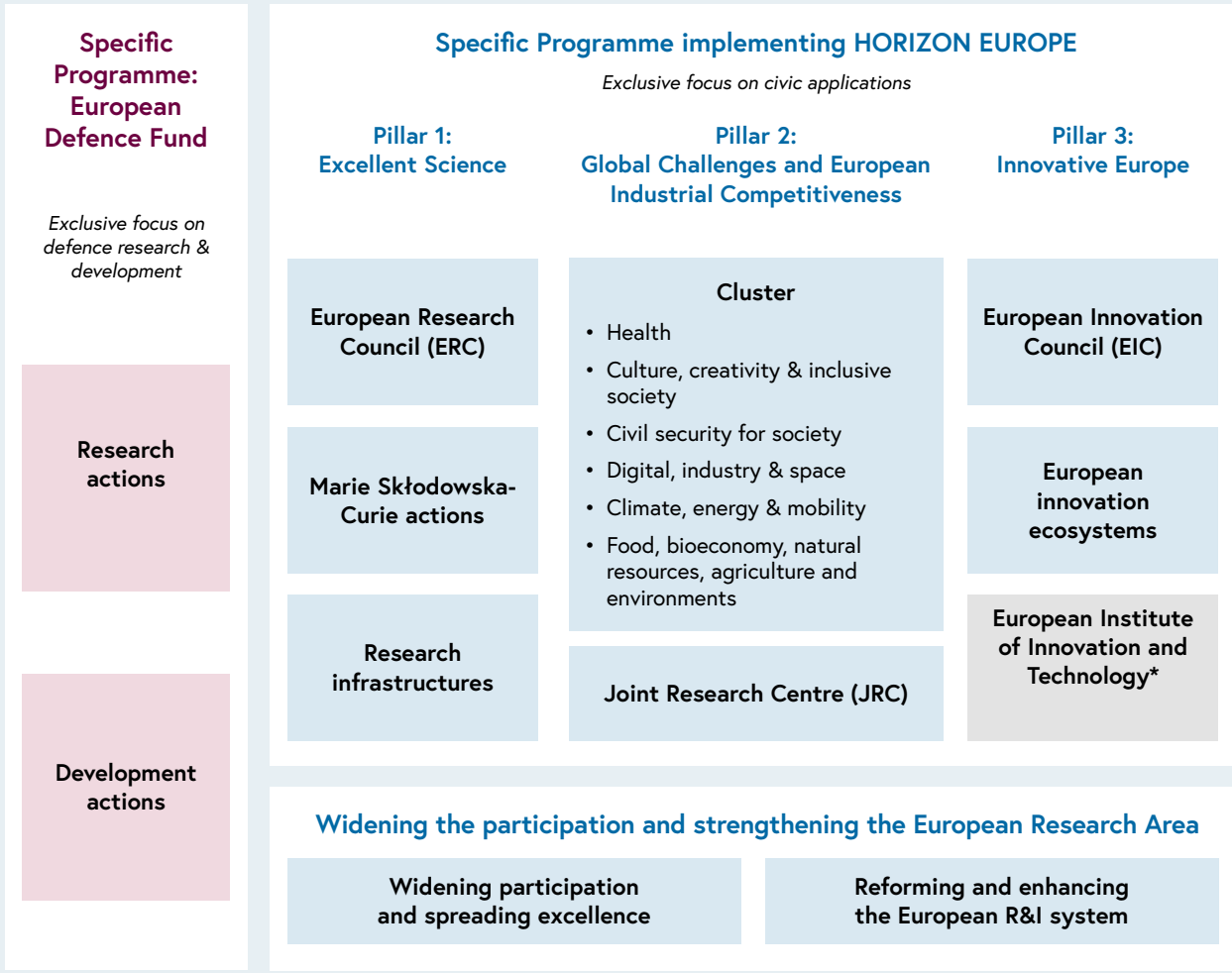
2.3.1 Austria's performance in Horizon Europe

While the European Commission's (EC) eighth research framework programme, Horizon 2020, ended with the last calls in spring 2021, the work programmes of the successor programme Horizon Europe (see Figure 2-42) were published in the same year, some of them already with submission deadlines for project proposals at the beginning of autumn 2021. Others had their first submission deadlines at the beginning of 2022. As of December 2022, a data set on Horizon Europe submissions, approvals and participations is available for the first time that has a sufficiently critical size to make cautious evidence-informed statements. Such participation data are made available periodically by the EC and allow statements on participation patterns. Given the current scarcity of data, an even more recent data release could lead to significant changes.

The following overview of Austria's performance in Horizon Europe is based on contract data, i. e. funding contracts between the European Commission and project recipients (mostly consortia comprising several organisations). Projects on the reserve list or contracts in preparation were not considered for the analysis. The Austrian Research and Technology Reports to follow in the next few years will update and analyse the database on an ongoing basis. The data were retrieved via the European Commission's eCORDA monitoring system in December 2022 and processed by the FFG. They allow a preliminary and cautious assessment of Austria's participation in the start-up phase of Horizon Europe.

The data show a slight improvement in Austrian participation in Horizon Europe compared to Horizon 2020 starting from an already high level, although no trend should be derived from this at this point in time due to the limited number of data points (900 Austrian participations). The data also show that the total amount of approvals, i. e. the funding acquired by Austrian institutions from the EU, was €404 million for Austria as of the reporting date, which corresponds to around 3.4% of the funds distributed by the European Commission. In Horizon 2020, the corresponding value for acquired funding in Austria was 2.9%. The share of Austrian coordinators (152 in absolute numbers) among all coordinators is 3.4%, which is also significantly higher than in Horizon 2020 (2.7%).

Figure 2-42: Overview of Horizon Europe

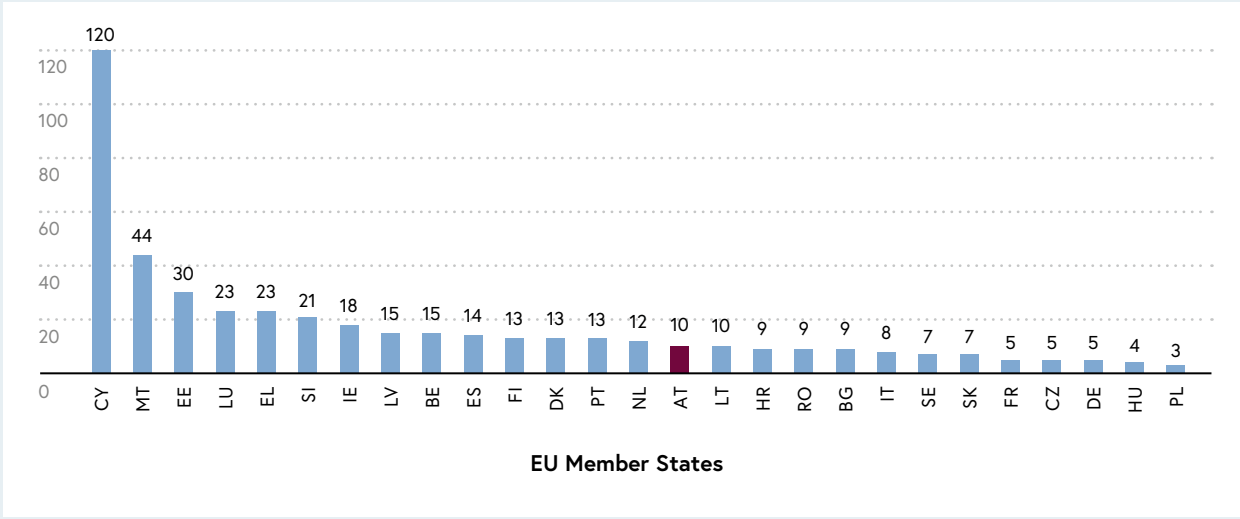


* The EIT is not part of the specific programme.

Source: European Commission

Of the total of 30,890 participations in the funded Horizon Europe projects, 900 are from Austria, which corresponds to a share of 2.9%. With this participation, Austria is in ninth place in a European comparison, clearly behind eighth-ranked Greece (1,404 participations), but ahead of Portugal (876), Sweden (823), Denmark (801), Finland (730) and Switzerland (714). Naturally, the large European countries have the most participations in absolute terms (Germany: 3,492; Spain: 3,461; Italy: 2,928 and France: 2,680). However, if the participations in Horizon Europe are placed in relation to the research potential of the respective countries, which is approximated by the existing research personnel in full-time equivalents, then a completely different pattern emerges (see Figure 2-43): the smaller EU Member States have the best utilisation ratio of Horizon Europe, while the large EU Member States are characterised by a significantly lower utilisation ratio, not least due to their large domestic R&D markets. While Cyprus has 120 Horizon Europe participations per 1,000 researchers (in FTE), Germany has four and Poland only three. The performance of R&D staff in Greece is striking; although the country has roughly the same population as Austria, it is one of the power users of Horizon Europe, with

Figure 2-43: Number of participations in Horizon Europe measured in terms of 1,000 R&D personnel (in FTEs)



Source: Data from the FFG's EU Performance Monitor of 20 February 2023 and R&D staff and researchers in FTEs (2021) from Eurostat (2023). Calculation and graphic: ZSI.

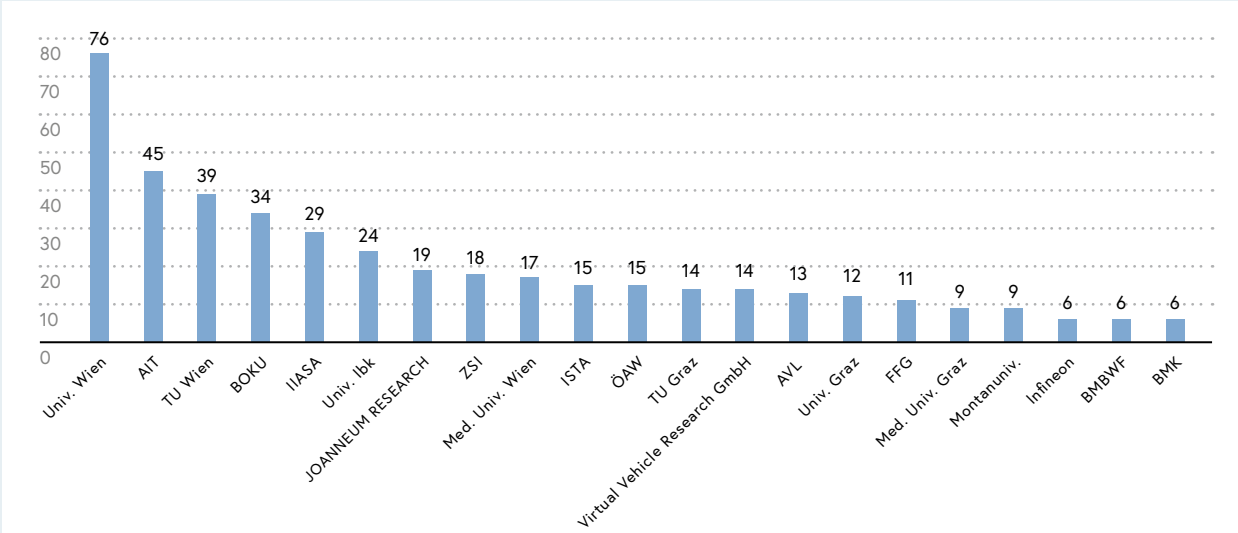
23 participations per 1,000 research staff. In Austria, the figure is 10 participations per 1,000 research staff. At the same time, however, it should be added that Austria has 44% more R&D staff than Greece.

With a success rate of 22.4% at the participation level, Austria is clearly above the Austrian success rate achieved in Horizon 2020 (17.3%), but compared to the top position, which Austria had in Horizon 2020 in terms of success rate, Austria is only in the upper midfield in Horizon Europe, because the average European success rate – in relation to the first Horizon Europe calls analysed here – is 22.0% and thus clearly above the average Horizon 2020 success rate of 15.3%. The highest success rates of the EU Member States in Horizon Europe so far are 26.3% (Belgium) and 25.5% (the Netherlands).

Each participation in an approved project is counted separately. Thus, the participation of two different Austrian institutions in one approved project counts twice for Austria. Likewise, a single Austrian institution can be involved several times in different approved projects, which means that each individual project participation is counted once and added up over the projects. Figure 2-44 shows the most successful Austrian institutions in terms of the number of their project participations at the beginning of Horizon Europe. Mostly the same institutions are active in Horizon Europe that had already performed very well in Horizon 2020. The excellent performance of the University of Vienna at the start of the new European Framework Programme for Research and Innovation is particularly striking.

The participation of Austrian actors in the individual pillars of Horizon Europe and their subdivisions (see Table 2-2) naturally varies greatly. This applies in particular to the sub-programmes within the three major programme areas ("pillars") "Scientific Excellence", "Global Challenges and EU Industrial Competitiveness" and "Innovative Europe" (see Table 2-2). At the beginning of Horizon Europe, Austrian actors attracted most funds from the second pillar "Global Challenges and the Industrial Competitiveness of the EU", amounting to €262.9 million. Pillar 2 is also the pillar with the highest total funding in Horizon Europe. The Austrian share in Pillar 2 corresponds to 3.4% of the funding budgeted in all contracts of this pillar. In Pillar 1 "Scientific Excel-

Figure 2-44: The top 20 Austrian institutions at the start of Horizon Europe in terms of number of participations



Source: Data from the EU Performance Monitor of the FFG (2023a) of 20 February 2023. Graphic: ZSI.

lence", €117.0 million was granted to researchers working in Austria, which corresponds to a share of 3.7% in this pillar. In Pillar 3 "Innovative Europe", €14.1 million has been raised by Austria so far, which corresponds to a funding share of 3.2%. Finally, these three pillars are supplemented by the area "Expanding Participation and Strengthening the European Research Area", which supports European R&I policy implementation. Austrian actors active in this area have so far been able to raise €10.5 million (1.8%). It should be noted here, however, that many of the calls for proposals in this area are explicitly aimed at countries with weaker research and innovation.

With shares of 2.8% of participations and 3.3% of project coordinations, Austrian participations in Pillar 1 "Scientific Excellence" are pretty much in line with the Austrian average across all pillars (2.9% and 3.4%, respectively). It is striking that the share of coordinations from Austria in Pillar 2 "Global Challenges and the Industrial Competitiveness of the EU", at 4.3%, is significantly higher than the general Austrian average of 3.4%. In Pillar 3 "Innovative Europe", the Austrian participations with 2.2% as well as with regard to the coordination of projects with only 1.9% are clearly below the Austrian average values. However, the data set in Pillar 3 is still based on only a few calls for proposals with only 20 Austrian participations, which is why it would be premature to draw hasty conclusions. Austrian participation in the area of "Broadening participation and strengthening the European Research Area" amounts to 2.5%, whereby due to the programme specifications – not surprisingly – the share of coordination of projects from Austria is only 0.7%. In absolute figures, only two projects in this area have so far been coordinated by Austrian actors.

In Pillar 1, "Scientific Excellence", there are above-average participations and funding shares of Austrian applicants in the programme line of the European Research Council (ERC), at 4.1% each. In the Marie Skłodowska-Curie Actions (MSCA) programme line, both the participations (2.7%) and the funding shares (3.1%) are somewhat below the Austrian average in Pillar 1. The Austrian shares are relatively low in terms of participations and funding in the "Research Infrastructures" programme line of Pillar 1.

Table 2-2: Austria's success in Horizon Europe by pillar, project participation, coordination and budget

	Approved Participations (all States)	Approved Austrian participations	Share Austria in % of all participations	Approved Coordinations (all States)	Approved coordinations (Austrian)	Share Austria in % of all Coordinations	EU funding in €m (all States)	EU funding in € million (Austria)	Share Austria in % of all EU funding
Horizon Europe total	30,890	900	2.9%	4,497	152	3.4%	11,830	404	3.4%
Pillar 1 overall: Scientific excellence	8,730	246	2.8%	2,716	90	3.3%	3,154	117	3.7%
thereof ERC	1333	54	4.1%	1,162	47	4.0%	1,968	82	4.1%
Pillar 2 overall: Challenges and competitiveness	19,805	598	3.0%	1,293	56	4.3%	7,657	263	3.4%
thereof cluster 1: Health	2,665	65	2.4%	169	4	2.4%	1,439	37	2.6%
thereof cluster 2: Culture, Creativity, Society	617	23	3.7%	53	2	3.8%	156	7	4.5%
thereof cluster 3: civil security	863	24	2.8%	51	2	3.9%	217	10	4.5%
thereof cluster 4: Digitalisation, Industry, Space	5,997	192	3.2%	444	16	3.6%	2,537	84	3.3%
thereof cluster 5: Climate, energy, mobility	4,508	147	3.3%	296	20	6.8%	1,732	75	4.4%
thereof cluster 6: Bioeconomy, agriculture, natural resources	5,155	147	2.9%	280	12	4.3%	1,577	49	3.1%
Pillar 3: Innovative Europe	899	20	2.2%	215	4	1.9%	442	14	3.2%
Widening participation and strengthening the European Research Area	1,456	36	2.5%	273	2	0.7%	578	11	1.8%

Note: Rounding differences not compensated.

Source: FFG (2022a), adjusted data from eCorda as of 5 December 2022. The slight deviations in the totals for EU funding (all states and Austria) in data row 1 are due to rounding differences compared to the addition of the sub-items.

Note: With regard to Pillar 3, the data from eCorda are incomplete. For example, the equity share benefiting successful companies is not added to the approvals. In addition, the EIC statistics as of the reporting date largely only include EIT Pathfinder projects. More recent data, which were only submitted after the cut-off date and are not included in the table, show that Austrian companies have been very successful in the EIC Accelerator with total funding of around €47 million.

Within Pillar 2 "Global Challenges and EU Industrial Competitiveness", Austrian applicants perform particularly well in Cluster 2 "Culture, Creativity and Inclusive Society". Here, Austria accounts for 3.7% of all participations, 4.5% of the funding acquired and 3.8% of the coordinators. The cluster "Climate, Energy and Mobility" also has a high level of participation (3.3%) and an above-average share of funding acquired (4.4%) by Austrian applicants. Moreover, this cluster also has a very high proportion of coordinators from Austria (6.8%). The cluster "Civil Security for Society" shows a high share of acquired funding (4.5%), but below-average Austrian participation (2.8%). The cluster "Digitalisation, Industry, Space" shows a slightly above-average participation (3.2%) as well as an almost average share of acquired funding (3.3%), measured against the total participation and acquired funding of Austrian actors in Pillar 2. In contrast, the Austrian shares in participation (2.9%) and acquired funding (3.1%) in the cluster "Food, Bioeconomy, Natural Resources, Agriculture and Environment" are slightly below average in Pillar 2, although the share of Austrian coordinators is relatively high. In the "Health" cluster, the key figures of Austrian-based RTI organisations are consistently below the Austrian average for Pillar 2 (2.4% of participations; 2.6% of funding acquired and 2.4% of coordinations).

Within Pillar 3 "Innovative Europe", there are two programme lines in addition to the European Institute of Innovation and Technology (EIT), namely the "European Innovation Council" (EIC) and the "European Innovation Ecosystems" (EIE) programme line. There are, however, currently relatively few funding cases in all programme lines.

With a total budget of approximately €10 billion (2021–2027), the EIC is to be understood as the scale-up element of Horizon Europe. The objective of the EIC is the rapid international market penetration of knowledge- and technology-based innovations, especially by young, highly innovative companies. EIC is composed of three modules: first, the basic research-related EIC Pathfinder (approx. 25% of EIC funds); second, EIC Transition (transition phase, proof-of-concept, approx. 10% of EIC funds) and, third, EIC Accelerator (scale-up funding for young, highly innovative companies, approx. 65% of EIC funds). In Table 2-2, only the EIC Pathfinder and EIC Transition elements (mostly consortium project funding) are included in the evaluations so far. The EIC Accelerator (= single-entity funding for companies) is not included, as this instrument is difficult to represent in the eCorda database of the European Commission due to the three-stage selection process and the coupled funding, consisting of a funding share and equity financing from the EIC Fund funded by Horizon Europe.

The EIE programme part should be seen in the context of the "New European Innovation Agenda",[161] which was published by the European Commission in July 2022 and adopted by the EU Research Council in December 2022. EIE is dedicated to structural projects that aim to build and improve innovation ecosystems. The EIE budget (approximately €530 million in total) also funds the EU share of Eurostars (innovative SME partnerships). In the run-up to the Innovation Agenda, a new Member State body, the EIC Forum Plenary, was established with a focus on innovation ecosystems, in which Austria is represented in a leading role by the BMAW, alternating with the BMK.

The third element in Pillar 3 is the European Institute of Technology (EIT) with total funding of over €3 billion. The EIT is largely independently organised, has its own key performance indicators and is therefore not included in the eCorda statistics. In terms of content, it aims to link education, research and innovation in Europe more systematically and in doing so to contribute to European top-level research. The EIT is organised in several thematic "Knowledge & Innovation Communities" (the so-called KICs). In Horizon 2020,

161 European Commission (2022k).

only a few Austrian actors were represented in the EIT KICs. Recent developments (Austrian co-location centre in the new KIC Manufacturing since 2021; entry of an Austrian co-location centre in the already existing EIT Health at the end of 2022, as well as establishment of a co-location centre in 2023 in the Culture & Creativity KIC, which was recently selected in autumn 2022) have noticeably improved Austria's visibility in the EIT. Co-location Centre participations require national co-financing, which in Austria has so far been provided by the BMBWF, BMAW, BMK and BMSGPK.

Taking into account the data limitations outlined above, Austrian actors in Pillar 3 perform significantly better in relation to the EIC, which is already established in Horizon 2020, with a total of 16 participations (2.5%), while in the EIE there are only four participations to date (1.5%), two of which are in a coordinating role.

In the area of "Widening Participation and Strengthening the European Research Area", Austria performs significantly better in the programme line "Reforming and Enhancing the European R&I System" than in the programme line "Widening Participation and Spreading Excellence". The latter, however, is aimed primarily at those European Member States or countries associated to Horizon Europe whose research and innovation performance is below average.

In terms of the funding acquired, the higher education sector was the most successful in Horizon Europe as of the reporting date with €159 million (this corresponds to a share of 39% of the funding acquired by Austria), followed by the non-university research sector with €130 million (32%) and the business enterprise sector (private for profit) with €77 million in funding acquired (19%). Other institutions in the public sector, such as the BMBWF, the BMK or the large Austrian research funding institutions, especially the FFG, were able to raise €12 million (3%) in funding. €27 million (7%) went to other organisations that cannot be assigned to the aforementioned groups. Of the total of 240 participations by Austrian companies, 52.1% were SMEs. This also corresponds to the overall European share of SMEs among the participating companies, which is 52.0%. In terms of funds raised, the share of Austrian SMEs among all Austrian companies is 46.0%, which is slightly below the overall European average of 50.4%.

In Pillar 1, "Scientific Excellence", the universities and non-university research institutions with strong basic research capabilities, such as the ISTA or the Austrian Academy of Sciences, set the tone, especially with regard to the ERC grants. A similar pattern can be found in the Marie Skłodowska-Curie Actions. The situation is quite different for the funding acquired from the "Research Infrastructures" programme line. Here, non-university research institutions dominate with a share of almost two-thirds. A quarter of the funding in this programme line was acquired by Austrian universities, and a further 8% by companies operating in Austria.

In Pillar 2, "Global Challenges and the Industrial Competitiveness of the EU", which has in total the highest budget, the participations by type of organisation are significantly less concentrated than in Pillar 1. Measured in terms of the funding acquired, the non-university research sector leads in Pillar 2 with a share of 38% (measured in terms of all funding acquired by Austria in Pillar 2). The business enterprise sector holds 25% and the higher education sector 23%. With almost two-thirds of the funds raised, the non-university research institutions stand out in the "Civil Security for Society" cluster. In contrast, the non-university research institutions in the "Health" cluster are only represented with 16% (the universities dominate here). Universities, on the other hand, account for 50% of the funding acquired in the cluster "Culture, Creativity and Inclusive Society". Their share in the "Climate, Energy and Mobility" cluster is relatively low at 13%. The Austrian business enterprise sector is the leading type of organisation in the cluster "Digitisation, Industry, Space" with 40% in terms of funds acquired from Austria in this cluster. The share of the business enterprise sector in the "Climate, Energy and Mobility" cluster is 22% with regard to this indicator. Its share in all the other clusters not yet mentioned amounts to less than 20% and is relatively low at 13%,

Figure 2-45: Overview of the five EU missions and their main objectives

Source: Implementation Framework for Horizon Europe EU Missions in Austria, BMBWF and BMK (2022a).

especially in the "Health" cluster. The cluster "Health" is the cluster in which the respective shares of acquired funding are highest at 13% for the other public institutions and at 16% for the unclassified organisations.

In Pillar 3 "Innovative Europe", the shares are relatively evenly distributed between the organisation types in terms of the funding acquired. Austrian universities hold a share of 36%, followed by the business enterprise sector with 35%. At 20%, the share of non-attributable organisations from Austria in terms of funding acquired in this pillar is also relatively high, which can be explained by the particularly active participation of "multiplier" organisations in the programme line "European Innovation Ecosystems". As mentioned above, due to the limited data availability of eCorda, the corporate share tends to be underestimated.

In the area of "Widening Participation and Strengthening the European Research Area", Austrian non-university research institutions dominate with a share of 85% in the programme line "Reforming and Enhancing the European R&I System" in terms of funding acquired, while in the programme line "Widening Participation and Spreading Excellence" the higher education sector was able to acquire the most funding with 57%, followed by the non-university research sector with 41%.

Although the existing data are only of limited value due to the relatively short monitoring period at the beginning of Horizon Europe, it can be summarised that the research institutions and active researchers based in Austria continue to accept the European Framework Programme for Research and Innovation well and perform well in it. Their success rate is clearly above the European average, although no longer at the absolute top. In relation to the participation figures, the returns to Austria in particular have increased compared to Horizon 2020. Whether and to what extent the relative increase in both participations and return flows in terms of acquired funding has to do with the gradual withdrawal of the United Kingdom cannot be determined here, but neither can it be completely ruled out. As in the previous Framework Programmes for Research and Innovation, it is also evident in Horizon Europe that the different pillars of the Framework Programme are received differently by the different types of organisations (companies, universities, non-university institutions, other public institutions and others), depending on their strategic orientation. This is manifested in particular by a strong representation of basic research-oriented institutions in Pillar 1, a strikingly active use of Pillar 2 by non-university research institutions and an active participation of companies in Pillar 3 as well as in Pillar 2. Within the most highly funded Pillar 2, the clusters "Climate, Energy and Mobility" and "Culture, Creativity and Inclusive Society" in particular can be identified as Austrian areas of strength in comparison with the European average.

2.3.2 National implementation of the European RTI missions

The EU missions implemented under Horizon Europe have already been addressed in the 2020[162] and 2022[163] Austrian Research and Technology Reports. The European RTI missions serve to make a research-led contribution to major societal transformations by mobilising RTI and sectoral actors around five mission areas, all with concrete objectives. Currently, the EU missions are implemented through several calls for proposals in Horizon Europe, for which a budget of €1.9 billion is available in 2021–2023.[164] Figure 2-45 summarises the five EU missions and their core objectives at a glance.

A recent baseline study[165] on the absorption capacity of the five mission themes of Horizon Europe states that Austria is in a good starting position. Austria's RTI actors were already particularly intensively engaged in mission-relevant issues in the themes of "Cities", "Climate" and "Soil" in Horizon 2020 – compared to the overall European environment. Moreover, they are cooperating with key scientific actors all over Europe in all five mission themes. In addition, there are a number of corresponding activities at the national level. These include, for example, the Cancer Research Platform and the developing national clinical cancer registry, as well as the BMK's four transformative missions on "energy transition", "mobility transition", "circular economy" and "climate-neutral city", some of which build on established thematic programmes.

On 10 June 2022, the European Competitiveness Council, which includes the area of research, invited EU Member States to take into account the specific objectives of EU missions in national sectoral programming and to put in place appropriate governance structures. Furthermore, it was pointed out that citizens should be

162 See BMBWF, BMK and BMDW (2020).
163 See BMBWF, BMK and BMDW (2022).
164 To this end, further mission-related activities, including in the Pillar 2 clusters and EU partnerships, will be supported with additional funding in Horizon Europe.
165 See Ploder et al. (2022).

better involved throughout the life cycle of the missions through appropriate measures.[166] In this context, the RTI ministries, together with the relevant sectoral ministries, began to develop a national implementation framework for the EU missions in autumn 2021, taking into account national guidelines.[167] The coherent and holistic use of diverse RTI and sectoral instruments at national as well as European level is understood as the central added value of mission policy, which is why the major research and research funding institutions as well as the thematically affected sectoral ministries were involved in the national process from the very beginning. Under the aegis of the "EU Missions" working group of the Austrian RTI Task Force, a specialist group was set up for each EU mission for the concrete content-related work (so-called "Mission Action Groups"). These five Mission Action Groups gathered a total of about 300 relevant stakeholders from research and application as well as sectoral institutions at federal, state and local level and generated a series of recommendations.

In autumn 2022, under the leadership of the BMBWF and the BMK, these recommendations were cast into a proposal for an implementation framework for the EU missions of Horizon Europe in Austria[168] and adopted by the RTI Task Force on 23 March 2023. The implementation framework is a strategy document with a planning horizon until 2030. In addition to the recommendations for action already mentioned, it summarises the respective contributions of the ministries and the central RTI institutions and provides an outlook on the instruments and processes to be used for implementation. Both existing instruments, such as the BMK "climate-neutral city" programme, which is closely linked to the EU Mission Cities, and additional, targeted research efforts as well as well-coordinated transfer measures from research to sectoral application are needed. Networking platforms are also being set up, such as the National Hub Biodiversity and Water funded by the BMBWF.

The concrete budget planning is not part of the implementation framework, but takes place, as far as ministries and institutions of the Federal Government are concerned, through the budgetary processes. In this regard, the RTI pacts and the Future Austria Fund (FZÖ) are of particular importance in the RTI sector. In addition, a large number of other measures are to make supporting contributions to the realisation of the implementation framework. These include, for example, public procurement that promotes innovation, the use and expansion of existing (data) infrastructures, various networking activities and the creation of experimental spaces such as living labs, as well as regulatory measures.

The implementation framework also contains a concrete governance proposal. The management capacity of the Mission Action Groups is to be strengthened in order to coordinate the implementation of the individual recommendations. For this purpose, a supporting Mission Management Unit is to be established, inter alia, for the cooperation with relevant national research-related and sectoral competence holders, the operational implementation planning of the recommendations and ensuring the link between the European and national levels. In addition, a Mission Facility for Policy Learning, Foresight, Monitoring and Evaluation is to be commissioned with the task of planning and conducting reflexive processes in Austria for the implementation and future development of missions. Finally, the Task Force RTI Working Group EU Missions will take on a supporting role in the implementation phase at the interface between the implementation framework, the RTI Pact and the performance agreements of the central RTI institutions and the sectoral ministries.

166 See Council of the European Union (2022).
167 The Austrian RTI Strategy 2030 sets the goal of enabling RTI actors working in Austria to participate in EU missions in the best possible way. This objective was reaffirmed in the RTI Pacts 2021–2023 and 2024–2026.
168 See BMBWF and BMK (2022a).

2.3.3 Austrian Action Plan for the European Research Area

Since the entry into force of the European Treaty of Lisbon in 2009, the creation of a European Research Area (ERA) has been a central concern of European science, research and innovation policy, which is anchored in EU primary law (Article 179 (1) TFEU). A central motive of the European Research Area is to establish freedom of movement in mobility and research funding for researchers and to freely exchange scientific knowledge and technologies.

The ERA development was continuously adapted to new requirements and was also characterised by different dynamics between the EU Member States, which is why a reorientation of the European Research Area was initiated in 2018 under the Austrian EU Council Presidency. On 26 November 2021, the European Council finally decided on the foundations for a renewed European Research Area under the title "New ERA" by adopting the Pact for Research and Innovation in Europe[169] as well as the conclusions for ERA governance and the so-called ERA Policy Agenda 2022–2024.

The ERA Policy Agenda 2022–2024 contains a catalogue of voluntary measures for the period 2022–2024, which are to contribute to the defined priority areas and which are to be implemented by the European Member States, partly in cooperation with the European Commission. The catalogue includes 20 concrete and in part extensive packages of measures for the further development of the European Research Area. These concern, for example, the creation of the European Cloud for Open Science, a new assessment system for research, the preservation of academic freedom, gender equality, international cooperation, the implementation of European missions, improved accessibility and use of research results, measures to improve the involvement of citizens in research, etc.[170]

Most Member States have already started planning the national implementation of the pacts of measures. In Austria, planning has been done by means of the Austrian National Action Plan for the European Research Area 2022–2025 (ERA-NAP 2022–2025).[171] On 21 December 2022, the Austrian Federal Government adopted and approved the ERA-NAP 2022–2025. This national action plan is accompanied by the creation of a national ERA governance structure to drive implementation forward in close cooperation with stakeholders.

Austria has announced commitments to implement activities related to 15 of the 20 packages of measures. New initiatives and reforms will be launched and the implementation of measures already adopted will also be included. The structure of the ERA-NAP 2022–2025 is based on the national RTI environment and the necessary reform projects and not 1:1 on that of the ERA Policy Agenda 2022–2024. The following Table 2-3 compares the 12 initiatives of the ERA-NAP 2022–2025 with the European ERA Policy Agenda 2022–2024 and shows which national initiatives reference which European ERA packages of measures, whereby some national initiatives refer to several of those. ERA monitoring and the implementation of European missions in Austria function as further horizontally anchored national initiatives. For the latter, a separate implementation plan has been developed due to its complex nature (see Chapter 2.3.2).

The 12 initiatives of the ERA-NAP 2022–2025 each contain the names of the coordinators, a description of the sub-initiatives, their objectives and the main actors and stakeholders addressed, as well as concrete measures with a list of milestones, desired effects and targets or target indicators.

169 https://era.gv.at/era/era-policy-agenda/a-pact-for-research-and-innovation-in-europe/
170 A detailed list of the 20 packages of measures with subdivisions can be found on era.gv.at: https://era.gv.at/era/era-policy-agenda/explanatory-documents/
171 See BMBWF and BMK (2022b).

Table 2-3: The 12 national ERA initiatives and the corresponding "ERA Actions"

ERA-NAP 2022–2025 – 12 initiatives	Corresponding ERA Actions (ERA Policy Agenda 2022–2024)
01_Towards an open science	01_ Enable the open sharing of knowledge and the re-use of research outputs, including through the development of the European Open Science Cloud (EOSC) 02_ Propose a EU copyright and data legislative framework fit for research Measures: • Develop and operate Open Science Austria (OSA) • Use of steering instruments to create incentives for the application of Open Science • Study on the legal and administrative framework for Open Science in Austria
02_Development of the European Open Science Cloud (EOSC)	01_ Enable the open sharing of knowledge and the re-use of research outputs, including through the development of the European Open Science Cloud (EOSC) Measures: • Continuation and expansion of the EOSC Café • Austrian EOSC Support Office • Events and workshops on EOSC by the EOSC Support Office Austria • Active projects related to Open Science/Fair/EOSC, funded by the BMBWF • Expansion of the EOSC principles to applied/industrial research through data management plans and data service ecosystems
03_Strengthen human resources for science and research in Austria	03_ Advance towards the reform of the Assessment System for research, researchers and institutions to improve their quality, performance and impact 04_ Promote attractive and sustainable research careers, a balanced talent circulation and international, transdisciplinary and inter-sectoral mobility across the ERA Measures: • Develop concrete measures for careers in research in Austria • Development of concrete measures to reform the assessment and incentive system for researchers • Further develop Euraxess (Austria) within the framework of the EU project ERA Talent Platform.
04_Set of Measures on Gender equality and inclusion	05_ Promote gender equality and foster inclusiveness, taking note of the Ljubljana Declaration Measures: • Establish a coordination structure for the (further) development and implementation of equality plans at Austrian higher education and research (funding) institutions • Develop guidelines regarding the integration of the gender dimension in research and innovation content as well as in research-led teaching for application, amongst others in the context of research funding • Develop measures on gender-based violence and sexual harassment in higher education and research (funding) institutions, based on a status quo survey • Initiate and promote a cross-sectoral equality dialogue

ERA-NAP 2022–2025 – 12 initiatives	Corresponding ERA Actions (ERA Policy Agenda 2022–2024)
05_Strengthening trust in science through citizen science	14_ Bring science closer to citizens Measures: • Participation in the pilot project as part of Horizon Europe: Plastic Pirates go Europe! • Participation in the Mutual Learning Exercise on Citizen Science (as part of EC Policy Support Facility, funded by Horizon Europe) • National Citizen Science projects as part of Sparkling Science 2.0 • European Citizen Science Association Conference 2024 in Austria
06_EU Partnerships in Austria	10_ Make EU R&I missions and partnerships key contributors to the ERA Measures: • Involvement in European processes and national coordination • Establishment and operation of ongoing monitoring of Austrian participation in European R&I partnerships
07_ Green Hydrogen for Europe	11_ An ERA for green transformation Measures: • Supporting a European innovation ecosystem on green hydrogen • European and international partnerships • Stimulation of the national market through position papers, strategies and platforms (Platform for Hydrogen in Austria H2Austria) or industry initiatives (Hydrogen Cluster Hydrogen Austria) and funding (e. g. RTI Mobility Agenda 2026 and KLIEN)
08_Revise the Strategic Energy Technology Plan (SET-Plan)	11_ An ERA for green transformation Measures: • Participation in European processes to revise the SET Plan • Provision of experts and stakeholders at selected consultations, as well as national position papers • Using a revised SET Plan to increase national energy-related innovation
09_Green and digital transition in industry	12_ Accelerate the green/digital transition of Europe's key industrial ecosystems Measures: • Co-design the Industrial Technology Roadmap for Low Carbon Technologies in Key Industrial Ecosystems and the Industrial Technology Roadmap for Circular Industries • Support in the national implementation of the two roadmaps, including in the context of European processes • Establishment of or more in-depth networking with national expert groups • Participation in Mutual Learning Exercises, conferences, workshops, and expert panels • Involve civil society in regional and national processes to stimulate social change • Co-design transition pathways for the 14 key ecosystems
10_ Austrian Research Infrastructure Action Plan	08_ Strengthen sustainability, accessibility and resilience of research infrastructures in the ERA Measure: • Preparation and implementation of the Austrian Research Infrastructure Action Plan 2030

ERA-NAP 2022–2025 – 12 initiatives	Corresponding ERA Actions (ERA Policy Agenda 2022–2024)
11_ Measures for knowledge valorisation	07_ Upgrade EU guidance for a better knowledge valorisation Measures: • Agreeing effective strategies for the continued development and strengthening of knowledge transfer to the economy and entrepreneurship in performance agreements with universities and research institutions and in finance agreements with research funding institutions • Continued successful operation of the National Contact Point for Knowledge Transfer and Intellectual Property as an inter-ministerial platform • Measures for funding academic spin-offs and start-ups
12_ Measures in the context of international cooperation in research	06_ Deepen the ERA by protecting academic freedom in Europe 09_ Promote a positive environment and level playing field for international cooperation based on reciprocity Measures: • Participation in experience exchange with other EU countries within the framework of a Mutual Learning Exercise on Foreign Interference • Information and dialogue with national stakeholders, in order to raise the necessary awareness of the problem and where necessary develop solutions for the institutions affected • Participation in activities at EU-level in the context of preparing an EU Science Diplomacy Agenda (ERA Forum Sub-Group Global approach to research and innovation) • Setting up a national Science Diplomacy Round-table

Source: BMBWF and BMK (2022b).

With the adoption of the ERA-NAP 2022–2025, a national ERA governance structure will also be established to ensure the implementation of the individual ERA-NAP initiatives, to guarantee exchange at EU level, to organise national networking and to monitor implementation. Within the framework of the national ERA governance, a regular update of the current action plan is also to take place. Essentially, the ERA governance structure consists of the ERA Stakeholder Forum and the ERA-NAP Executive Board. The former is intended to facilitate a broad exchange of all actors and stakeholders affected by ERA issues at least twice a year. The ERA-NAP Executive Board is responsible for coordinating the implementation and monitoring of the ERA-NAP 2022–2025 as well as the preparation of the annual progress report, participation in the annual ERA symposium, participation in the external evaluation, which is to take place in 2024, and the preparation of the following ERA-NAP 2026–2028. The ERA-NAP Executive Board is coordinated by one person each from the BMBWF and the BMK.

At the same time, an ERA monitoring system is being set up at European level, which should be established by the end of 2023. This will consist of the ERA scoreboard, the ERA dashboard, ERA country reports and an online ERA policy platform. In the future, national data and information will also be fed into this European monitoring system.

2.3.4 European Digital Innovation Hubs

To support the digital transformation of SMEs as well as public administration, the European Commission has funded a total of 136 European Digital Innovation Hubs (EDIH) in Europe in 2022. Four of these EDIHs are located in Austria. They were endowed with a total of €16 million. Half of the budget, which in its entirety benefits SMEs and public administration, is financed nationally by the BMAW.

EDIH support companies in improving business and production processes, products or services with the help of digital technologies. They also offer innovation services, such as financing advice, training and skills development, which are key to successful digital transformation. Environmental aspects are also taken into account, especially with regard to the use of digital technologies for sustainability and the circular economy.

One of these four EDIH in Austria is "Applied-CPS". Since autumn 2022, this EDIH has offered more than 230 services for access to cyber-physical systems (CPS) for companies and public administration. SMEs can use these services in an uncomplicated and largely fully subsidised manner. The support services focus on essential technological topics in the context of CPS, namely (i) sensors and embedded systems, (ii) smart system integration, (iii) digital twins and data utilisation, and (iv) blockchain and distributed ledger technology. As both the technological scope and complexity of developing and integrating these systems is immense, they pose a significant barrier to start-ups and SMEs, which is why Applied-CPS aims to provide tailor-made engineering and experimental research, as well as advice at the push of a button. To ensure low-threshold access for SMEs, a three-stage support concept is offered, starting with an initial discussion to clarify basic challenges. This is followed by an analysis of potential and the implementation of tailored measures.

The other three EDIH in Austria are the EDIH "INNOVATE", which specialises in the fields of agriculture and food, wood, forestry and energy, the EDIH "AI5production", which promotes Industry 5.0 production processes by means of artificial intelligence, and the EDIH "Crowd in Motion", which supports crowd technologies and artificial intelligence to analyse movement data in order to accelerate the green and digital transformation of the Alpine tourism and sports industry.

The EDIH network is supported by the Digital Transformation Accelerator (DTA). The DTA supports the European Commission in building a dynamic community of hubs and other actors. To this end, the DTA promotes networking, collaboration and knowledge transfer between EDIH, SMEs, medium-large enterprises, the public sector and other relevant actors and initiatives.

The concept of digital innovation hubs is not new. Many DIHs are based on existing clusters or include organisations that are part of Enterprise Europe Network (EEN) consortia. In Austria, for example, a national programme for the establishment of Digital Innovation Hubs (DIH) was already operationalised in 2018 by means of a call for proposals and continued in 2020 with a second call for proposals. Three hubs were established in each of the two calls,[172] which were funded by the BMAW and the National Foundation for Research, Technology and Development. The national DIHs are basically designed to be open to all sectors and offer the opportunity to learn about digitisation on site, to experience digitisation and to develop and test new ideas for digital projects and to receive further training.

2.4 Supporting the Green Transformation in research and economy

This chapter provides an overview of the areas of the Austrian science system and application-oriented research funding that are relevant to the Green Transformation. The first two subchapters provide an insight into application-oriented research and its effects. Based on the realisation that transformation-oriented RTI policy also requires new RTI approaches, Chapter 2.4.1 presents those innovative approaches and instruments that

172 An overview of the national DIH can be found here: https://www.ffg.at/dih

have supplemented the Austrian RTI portfolio in recent years. Chapter 2.4.2 shows the development of patent applications for technologies relevant to adapting to and reducing the causes of climate change and Austria's performance in international comparison.

Chapter 2.4.3 focuses on the higher education system and presents the status quo of the contribution of Austrian higher education institutions and non-university research institutions to the issue of sustainability, whereby measures concerning the organisation are just as relevant as research activities (and teaching) on the topic, but also activities within the framework of the Third Mission. In addition, Chapter 2.4.4 is dedicated to the question of the relevance of the topic of sustainability in RTI funding instruments for individuals.

2.4.1 New RTI approaches and instruments for the Green Transformation

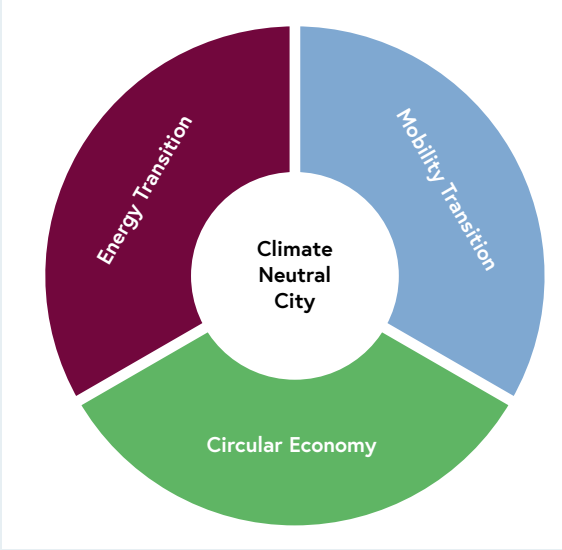
The major societal challenges of our time – especially in the areas of climate protection and resource use – are creating new demands on RTI policy. These demands cannot be addressed adequately with the traditional portfolio of approaches and instruments. To complement open-topic and tax-based research funding, the Federal Government is therefore increasingly relying on a new generation of policy measures that can be summarised under the term "transformative innovation policy".[173] Central features are an expanded understanding of innovation and the formulation of concrete goals for transformation in order to bundle the efforts of different social actors. Transformation is understood here as the change of a socio-technical system (e. g. mobility or energy) to solve challenges such as climate protection and resource use. This goes beyond technological change and includes changes in regulatory frameworks, markets and everyday practices. Transformative innovation policy strengthens the focus and directionality of RTI policy on upcoming transformations, and for this increased effectiveness, coordination with other policy areas and their instruments is a key success factor.[174]

The formulation of transformation-oriented priorities is used as an element of transformative innovation policy aiming to drive forward the Green Transformation in a highly targeted manner.[175] In this approach, societal challenges are addressed through specific focal areas, or even missions, the latter needs to be achievable by a certain date and verifiable through a defined set of indicators. The aim is to mobilise resources, actors and institutions to stimulate innovation around a specific societal challenge for which no timely solution can be found and implemented without a coordinated joint effort.[176] In principle, missions as a structuring element of policy-making are not new and have already been implemented in other contexts, e. g. NASA's Apollo mission in the 1960s. However, the current utilisation requirements for these missions differ due to the broader challenges they are employed for today and the need to consider not only technical aspects but also social ones.[177]

The measures of Austrian innovation policy, which are now increasingly oriented towards transformation, are to be found in the BMK in particular, due to the distribution of responsibilities among the ministries. The ministry has defined four transformation-oriented priorities: Energy Transition, Mobility Transition, Circular Economy and Climate Neutral City. The energy transition, mobility transition, circular economy aim at developing technological and systemic solutions to enable climate neutrality in their respective sectors. Climate Neutral City, on the other hand, aims for a local transformation that is driven across sectors. Overall, the implementation of transformation/mission-oriented innovation policy

173 See Diercks et al. (2019).
174 See Haddad et al. (2022), Schot and Steinmüller (2018).
175 See Janssen et al. (2021), Hekkert et al. (2020).
176 See Janssen et al. (2021), Mazzucato (2018).
177 See Foray et al. (2012).

Figure 2-46: Transformation-oriented priorities of the BMK



Source: FFG (2022b), Pioneer City – Partnership.

requires a transformation of administrative structures and governance processes.

For the implementation of the transformation-oriented priorities, the BMK is therefore implementing some changes within the ministry to simplify coordination of activities across different areas of responsibility. To this end, the funding programme logic was abolished and, from 2024 onwards, eight overarching themes (including the four transformation-oriented priorities) are formed, each with its own budget, which will be managed in part across sections and organisations. This should streamline coordination between RTI and sector policy as well as between external agencies such as the KLIEN and the FFG. Impact pathways were developed to review the specified development direction and ensure that the individual activities are built upon each other. These are based on the implementation plans of the EU missions and form the basis for a coherent implementation of the RTI priority areas.

The BMAW and the BMK are taking the lead in the Federal Government's climate and transformation initiative, which promotes the conversion to a climate-friendly and energy-neutral industry. By 2030, a total of approximately €5.7 billion in funding is available for this purpose. A total of €2.975 billion is available for the conversion to climate-friendly production facilities in industry (conversion of industrial processes and construction of corresponding plant infrastructure), while €1.52 billion will be invested in supporting additional energy efficiency measures by 2030. Both subsidies are secured in the long term through the Environmental Promotion Act. In addition, the funds for climate finance in Austria will again be significantly increased (€600 million until 2026).[178]

IPCEIs (Important Projects of Common European Interest) are also a special focus here. IPCEI are large-scale European projects with volumes of several billion euros each, in which the participation of key Austrian companies is made possible. Since 2021, IPCEIs with Austrian participation have been running very successfully on the topics of batteries (IPCEI Batteries II – European Battery Innovation – EUBatIn) and microelectronics (IPCEI Microelectronics I). Two more IPCEIs on hydrogen and another on microelectronics and communication technologies (IPCEI ME/CT) are in the European approval process or are in the starting phase.

The two IPCEIs Hydrogen (IPCEI Hy2Tech and IPCEI Hy2Use) aim to build a competitive, innovative and sustainable European hydrogen value chain. The focus is on supporting highly innovative projects along the entire hydrogen value chain – from the development and upscaling of new high-efficiency electrolysis processes and fuel cell systems to innovative storage and transport technologies, to the use of renewable hydrogen in industry and hard-to-electrify sectors in the mobility sector (including heavy transport, shipping, and aviation). One project is the construction of a 60 MW

178 https://infothek.bmk.gv.at/klima-transformationsoffensive-plan-fuer-eine-nachhaltige-industrie-praesentiert

hydrogen electrolyser. Approval was granted in July respectively September 2022 with six participating companies. BMK and BMAW are funding these two IPCEIs with €123 million, 100% of which comes from RRF. This funding will trigger total investments of €617 million in Austria during the funding period.

The IPCEI Microelectronics II (IPCEI Microelectronics and Communication Technologies – IPCEI ME/CT) will meaningfully complement the first IPCEI on microelectronics by including the entire ecosystem and addressing current supply bottlenecks. The aim of this IPCEI is to achieve the goals of the twin transition and to strengthen digital sovereignty. The focus of Austria's participation is on packaging, communication technology, high-performance semiconductors, processors, process technology and sensors. The approval will take place in May or June 2023 with six participating Austrian companies. The BMK and BMAW are funding this IPCEI with €173 million, largely from the European Reconstruction Fund (RRF), which will trigger total investments of €1,036 million in Austria during the funding period.

In total, the funding from BMK and BMAW for IPCEI projects amounts to €481 million, triggering total investments of €2,226 million in Austria during the funding periods. The projects are processed by the joint processing agency formed by FFG and aws. BMK and BMAW coordinate and support a well-coordinated implementation in consultation with the European Commission and the participating companies. The aim is to generate maximum benefit beyond the directly involved companies (e. g. through cooperation and spillover activities). It also includes achieving Austrian and European goals, such as those related to the green and digital transition, significant improved competitiveness and a strengthening of strategic autonomy in Europe and Austria.

The BMAW will also provide €600 million from 2023 for the transformation of the research and business location. €550 million of that is specifically allocated for sustainable, technology-open transformation projects (research and technology development funding, location and investment funding as well as qualification measures), and a further €50 million is planned for IPCEI projects in the IPCEI Microelectronics II and Communication Technologies (IPCEI ME/CT).[179] Funding will be provided in three specific areas: in the area of research and technology development funding, applications can already be submitted via the FFG. By 2026, €300 million will be available in this way (for 2023, an additional €55 million). The second funding line concerns qualification measures, for which about €30 million (in the three formats "Skills Vouchers", "Qualification Projects" and "Continuing Education LABs") is available from 2023 to 2026 in addition to the existing programmes of the AMS. For reasons of European law, the third funding line, location and investment funding, has yet to be launched. However, as soon as the legal framework is created, €220 million will be available, between 2023 and 2026.[180]

The BMAW is also involved in numerous other important initiatives to implement a transformative innovation policy. These include, in particular, measures that are downstream of research and development and support investment and market introduction. Furthermore, Public Procurement Promoting Innovation (PPPI) represents a measure of the BMAW and BMK to stimulate demand for climate-neutral solutions. In addition to the transformation to climate neutrality, the ministry is also driving forward the digital transformation. This includes measures such as the implementation of the Digital Innovation Hubs.[181]

Together with the BMK, the BMBWF plays a leading role in the national implementation of the European

179 See BMK and BMAW (2022).
180 See BMAW (2023). Around €40 million is earmarked for qualification measures in the years 2023–2026, of which around €30 million from the Climate and Transformation Initiative and around €10 million from the regular budget.
181 See also chapter 2.3.4.

RTI missions, thereby the European Commission plays a pioneering role in the implementation of transformative innovation policy. The measures taken at the national level are described in Chapter 2.3.2.

Innovative instruments for transformative innovation policy

The existing RTI policy portfolio is being further developed in several directions to increase the effectiveness of research and development projects in terms of addressing societal challenges. The following section introduces three innovative instruments to address specific challenges. These include the establishment of "innovation labs" as long-term learning and experimentation spaces in strategically significant thematic areas, the expansion of innovation-promoting capacities in public institutions through "public-public partnerships", and the facilitation of research and innovation projects outside existing regulatory frameworks through "regulatory sandboxes".

Innovation labs

The formation of inter-organisational cooperation structures is central to achieving missions. Networking and knowledge transfer as well as harnessing synergy effects are essential catalysts for increasing the effectiveness of RTI activities. In this context, the idea of cooperation increasingly goes beyond temporary projects, achieving a new quality through long-term and joint building of competencies. For the implementation of transformative solutions, it is also important to involve users more intensively in development processes. The instrument of "innovation labs" supports these aspects.

With the instrument of "innovation labs", the Federal Government funds projects to build up tangible (e.g. equipment, workshops, etc.) and intangible (databases, personnel, knowhow) infrastructure to create environments for development and experimentation in selected thematic fields. The instrument's funding criteria and conditions can be flexibly adapted to the requirements of specific fields of application in calls for project proposals.[182] The maximum funding period for an innovation lab is ten years; the absolute funding limit is €5 million. Eligibility for funding holds irrespective of whether a lab is installed for commercial or non-commercial purposes. Applicant organisations are encouraged to submit a detailed concept and business plan including the terms of use for the funded infrastructures as well as their financing. Other innovation projects need to be given access to the labs on non-discriminatory and transparent terms.

The instrument of innovation labs has been deployed to fund projects in multiple funding programmes such as in "Stadt der Zukunft", "Mobilität der Zukunft", "Produktion der Zukunft", "Vorzeigeregion Energie" or "Take Off". Existing innovation labs are active in various research areas ranging from sustainable energy solutions (Green Energy Lab), green building (GRÜNSTATTGRAU), bioeconomy and circular economy (BioBase) to testing infrastructure for drones (AirLabs). The flexible design of the instrument makes it possible to create learning and experimentation spaces for various purposes. The innovation labs funded in "Stadt der Zukunft", for example, have developed into central points of contact for R&D projects, policy-makers, and the public in their respective subject areas.[183] Beyond providing infrastructures for research and development, the innovation labs occupy important intermediate positions between the research community and the media, while also contributing their expertise in adapting existing regulations. In the "policy lab" funding via the "Mobilität der Zukunft" programme, the focus is on the development and provision of evidence-based recommendations for local authorities and other decision-makers to support them

182 See FFG (2022c).
183 See Wieser et al. (2023).

in taking future-oriented mobility measures.[184] Through their long-term orientation and the promotion of cooperation, networking, and joint learning, the innovation labs thus make important contributions to the realisation of innovative solutions, from the development of ideas to the creation of suitable policies and regulations.

Public-public partnership

The development of sustainable systems and infrastructures in areas such as energy, mobility, or housing cannot be based on new technologies and business models alone. The public sector is required to take measures to realise a "Green Transformation" both in its administrative function and in its role as a significant market actor. The instrument of public-public partnerships (PPP) offers a framework for building the necessary capacities and governance structures at the level of individual local authorities.

An important application context of the instrument is PPPI. The aim is to leverage public procurement processes to create both impulses for innovation and support modernisation of the public sector. The PPPI service unit run by the Federal Procurement Agency (BBG) offers a broad portfolio of services, which, in addition to demand-side measures such as the PPPI Innovation Marketplace[185] or the PPPI Challenges,[186] includes offers for the qualification and sensitisation of its own institutions. In 2019, public-public partnerships replaced former contract arrangements for the cooperation between the BMK, BMAW, and BBG. The instrument of public-public partnerships allows public authorities to create inter-organisational units without the need to establish new legal entities. By defining a common governance and monitoring framework for cooperation, public authorities can cooperate more efficiently and with better planning security. The instrument thus provides a means for public institutions to reconfigure and innovate internal processes.

Public-public partnerships are also used in the context of transformation-oriented innovation policy. In the RTI-focal area Climate Neutral City, the Federal Government defined the goal of supporting selected "pioneer cities" in the development of climate-neutral districts.[187] To achieve this goal, the Federal Government has for the first time entered into extensive cooperation with municipal administrations in the context of research and development processes. Instead of addressing city administrations exclusively as participants or target groups of funded projects, the idea is to mobilise city administrations for the purposes of the transformation (mission) more directly.

With the instrument of public-public partnership, city administrations of selected "pioneer cities" are funded over a period of five years to both accompany the planning and implementation of climate-neutral city districts and to create suitable learning environments to facilitate knowledge transfer across cities. Beyond their direct sphere of influence, city administrations should build alliances with companies, research institutions, and civil society as well as with municipalities, regional governments, and the Federal Government. Furthermore, city administrations entering public-public partnerships are to initiate and accompany RTI and implementation projects for the design of climate-neutral districts and evaluate their effects. An additional important pillar is the expansion of (personnel) capacities in the city administrations themselves. Public-public partnerships aim to foster "administrative innovations" in municipal

184 https://www.policylab.at/

185 At the PPPI Marketplace Innovation – the showcase of the PPPI Innovation Platform – innovative companies can present novel products and services – suitable for administration and tested by a jury.

186 Within the framework of a PPPI Challenge, public clients (PPPI Challenge sponsors) initiate a market exploration in search of innovative solutions and suppliers on specific topics. The most interesting of the submitted solutions for the sponsors are awarded as PPPI Challenge winners.

187 https://www.ffg.at/pionierstadt

governance and organisational structures to create the long-term conditions for effective and efficient innovation policy at the local level.

The instrument of public-public partnerships allows a stronger orientation towards the needs of cities in innovation policy, while addressing some of the central challenges that urban administrations face today. In addition to budget constraints, these include governance structures that inhibit innovation and a lack of knowhow with regard to the realisation of ambitious innovation projects. The instrument provides for both funding and extensive accompanying processes organised at national level to support the transfer of knowledge and experience.

Regulatory Sandboxes

Complementary to traditional RTI funding, real-world laboratories are increasingly being established in Austrian RTI policy to test innovations in the environments of users at an early stage. Real-world laboratories (sometimes also referred to as spaces for experimentation and innovation or "living labs") should also promote experimental settings or "regulatory sandboxes" that allow innovative solutions, technologies, products, services, and business models to be developed and tested in practice for a certain period of time and in a controlled environment. To make this possible, RTI policy strives to establish temporary exemptions from legal or regulatory provisions that act as obstacles for innovation and cooperate more closely with legislative bodies to anchor innovative approaches more quickly in regulatory frameworks.[188]

Some Member States of the European Union have already introduced regulatory sandboxes several years ago, including Denmark, Lithuania, the Netherlands, Germany, and the United Kingdom.[189] In Austria, the government programme 2017–2022 articulated plans to establish regulatory sandboxes for innovative companies with new technologies. Further steps were taken with the new §23a FMABG, which established a regulatory sandbox for Fintech start-ups.[190] Since its establishment on 1 September 2020, the Austrian Financial Market Authority (FMA) has included eight FinTechs in its regulatory sandbox, thus offering them the opportunity to develop their innovative solutions in a protected environment. In addition to start-ups, already established and licensed providers use the regulatory sandbox to develop innovative business models.[191] The first sandbox participant has already been granted a securities licence for the operation of a digital trading platform for transferable securities at the beginning of 2022. Furthermore, a service company in relation to virtual currencies and a crowdfunding company have already submitted registration and licensing applications. The remaining participants are coordinating closely with the FMA to develop the requirements for obtaining a licence.[192]

Regulatory sandboxes are also of great importance in the context of climate and energy policy objectives as instruments of transformative RTI policy. In Austria, the BMK has created the possibility of using regulatory sandboxes for the implementation of innovative projects in the area of the energy transition through the "Energie.Frei.Raum" programme since October 2021. This allows important challenges of the energy transition to be addressed, especially for the system integration of different energy technologies. The basis for the implementation of "Energie.Frei.Raum" is the legal regulation in the Renewable Energy Expansion Act (EAG). This Act enables the regulatory authority E-Control to grant temporary and local exemptions from system utilisation fees for research and demonstration projects. A total of

188 See BMK (2020a).
189 See BMK (2019).
190 https://www.parlament.gv.at/dokument/XXVI/ME/142/fname_749374.pdf
191 See, among others, https://www.fma.gv.at/kontaktstelle-fintech-sandbox/fma-sandbox/
192 https://www.ots.at/presseaussendung/OTS_20230102_OTS0027/regulatory-sandbox-der-fma-legt-positive-bilanz-vor

around €5 million was available for the programme. In the course of the second call for proposals, nine projects were supported in the areas of system integration of storage technologies, enhancement of system flexibility, optimal use and integration of seasonal electricity storage or design options for grid usage fees, among others. The third call for proposals ran until March 2023, for which an additional €2 million was made available.[193]

Outlook

The Federal Government is implementing new approaches in RTI policy to solve key societal challenges. A transformative and mission-oriented innovation policy requires an adaptation of organisational structures and instruments. One important area is the expansion of data and information management to improve the coordination of activities and to be able to advance transformation processes in a targeted manner. To this end, the FFG has already expanded the review process and the existing monitoring activities in order to monitor the contributions of projects to the Sustainable Development Goals (SDGs) of the United Nations. Furthermore, a stronger linkage of supply-side (e. g. research and innovation promotion) and demand-side (e. g. procurement, regulation) measures is planned. In addition, through participation in the global "Mission Innovation" initiative and the national implementation of EU missions, the Federal Government collaborates with other countries to share experiences with transformation and mission-oriented innovation policies and builds capacities for further policy development.

2.4.2 The development of climate-relevant patents in international comparison

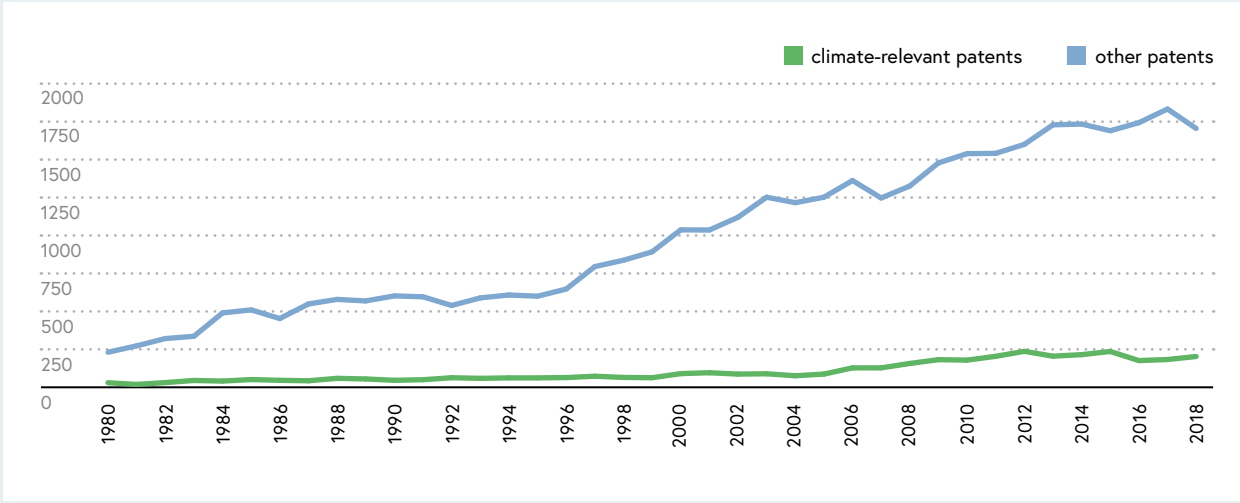
The transformation towards climate neutrality requires not only social innovations but also the development and implementation of green technologies. Green technologies contribute to reducing greenhouse gas emissions, improving air and water quality and adapting to climate change.[194] In addition to climate-relevant effects, investments in green technologies also bring economic benefits. They can strengthen a country's competitiveness and reduce dependence on fossil fuels through efficiency gains and the creation of new business areas.[195] Furthermore, due to their high degree of complexity, green technologies have a major impact on follow-on innovations and thus complimentarily influence future innovation activities.[196]

Patent applications are analysed to illustrate the innovation activities in Austria in the field of green technologies. Patent applications provide information on the knowledge and technology base and are therefore a relatively good indicator of innovation activities in the technology-oriented sectors of a country. They could also be compared well across countries for benchmarking purposes. Furthermore, a high number of patent applications in certain technology areas indicates specialisations and technological fields of competence.

The analysis of climate-relevant patent applications in Austria in comparison to other countries provides insights into existing areas of strength and opportunities for further expansion. However, the use of patent applications as an innovation indicator is also associated with some limitations. Not all patent applications lead to successful patents or are successful in practice. In addition, not all innovations are patented or can be patented.[197]

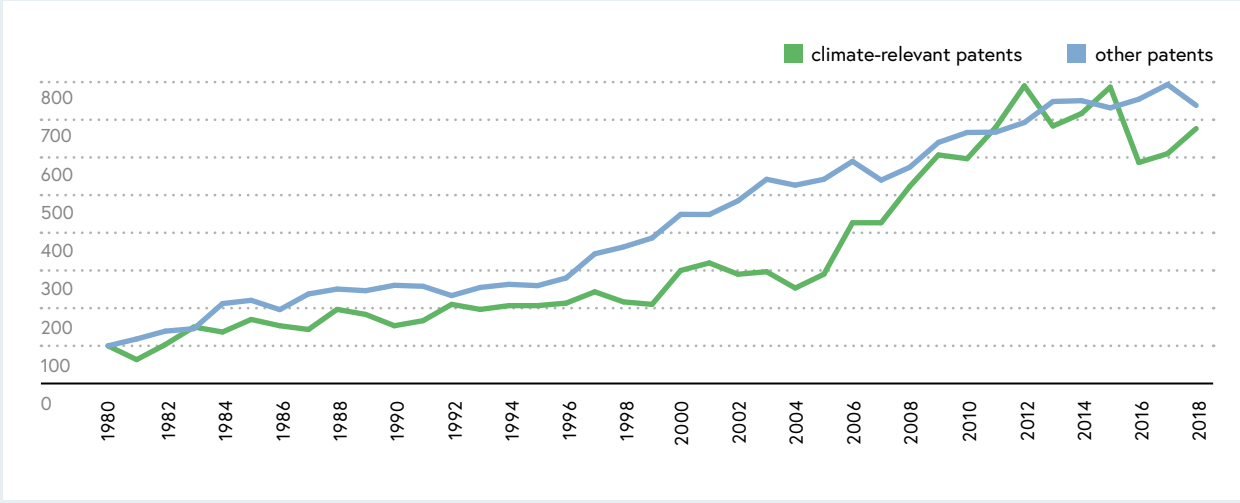
193 https://www.bmk.gv.at/themen/klima_umwelt/energiewende/energiefreiraum.html
194 See Haščič and Migotto (2015).
195 See OECD (2011).
196 See Barbieri et al. (2020).
197 We use patent applications instead of patents already granted. The reason for this is that patent applications often give a better overview of innovation activities in a country (see Nagaoka et al., 2010).

Figure 2-47: Austrian patent applications



Source: OECD (2022e). Calculations: Austrian Institute for SME Research.

Figure 2-48: Austrian patent applications, indexed, 1980 = 100

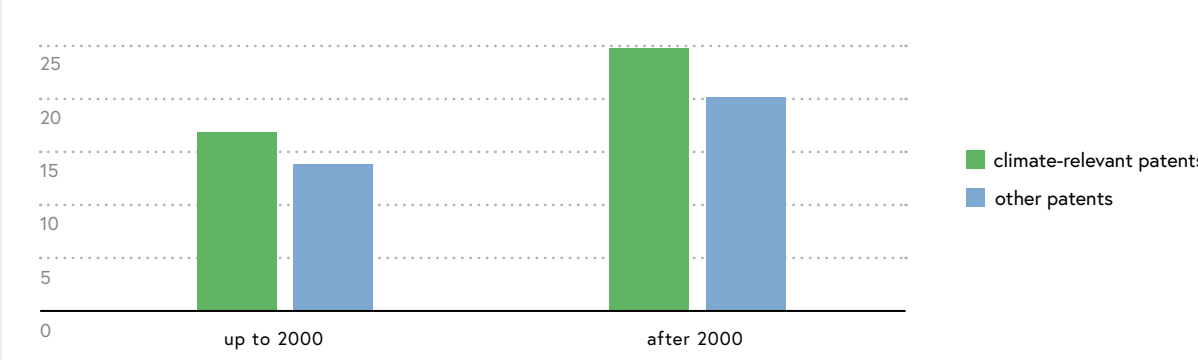


Source: OECD (2022e). Calculations: Austrian Institute for SME Research.

This report focuses on the OECD's REGPAT database, which contains patent applications filed within the European Patent Office. The Cooperative Patent Classification (CPC), administered by the European Patent Office (EPO) in cooperation with the United States Patent and Trademark Office (USPTO), is used to define climate-relevant patent applications. Climate-related patent applications identify by the presence of green technologies in the patent. It comprises nine sections divided into classes and subclasses. Class "Y02" contains all technologies relevant to climate change adaptation and mitigation, i. e. so-called green technologies.[198]

198 https://worldwide.espacenet.com/classification?locale=de_EP#!/CPC=Y02

Figure 2-49: Austrian patent applications with an international team of inventors (share in %)



Source: OECD (2022e). Calculations: Austrian Institute for SME Research.

Firstly, the chapter deals with a comparison of climate-relevant patent applications in Austria, with other patent applications outside of Austria, followed by an international comparison of climate-relevant patent applications. Finally, the level of detail is increased and climate-relevant patent applications are analysed according to subclasses.

Comparison of climate-relevant and non-climate-relevant patent applications in Austria

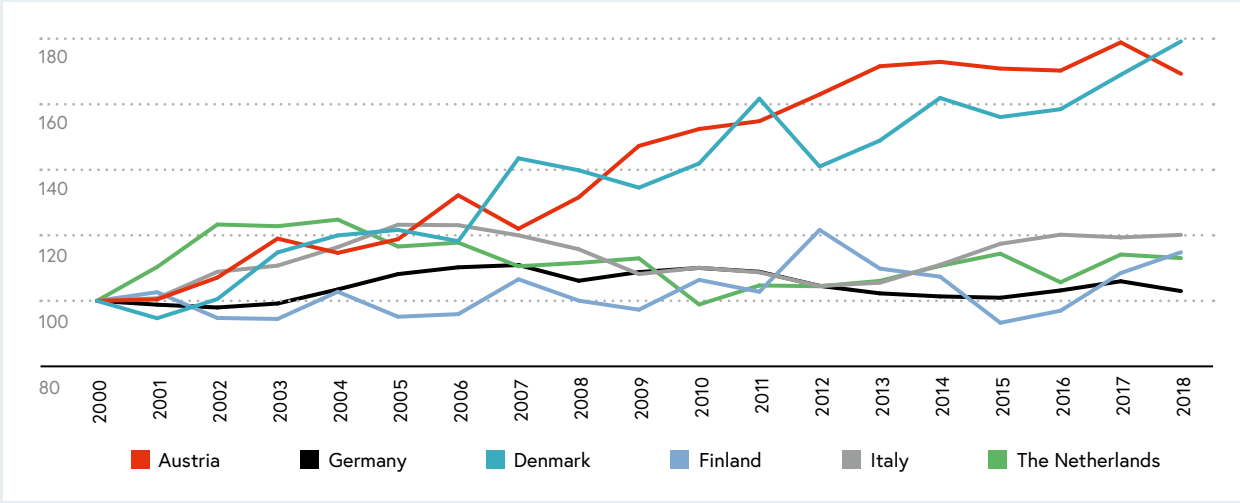
In the period 1980 to 2018, there was a total of 42,441 Austrian patent applications at the EPO. Of these, 3,985 applications are relevant to climate change adaptation and mitigation. Figure 2-47 and Figure 2-48 show their individual development over time. The number of patent applications per year has steadily increased for both climate-relevant and non-climate-relevant patent applications. Figure 2-47 further shows that climate-relevant patents account for only a fraction of all patent applications. However, indexing[199] of patent applications (Figure 2-48) shows that climate-relevant patent applications have increased significantly between 2004 and 2012.

International cooperation is an important factor for innovation systems when it comes to success. Through access to new technologies, markets and expertise, innovation frequency increases. This could equally support the formation of networks and partnerships, which are crucial for the development and successful implementation of innovative projects. International cooperation can also help increase funding for research and development, also reduce the risks of investing in innovative projects. This is particularly important for the development of highly complex new technologies, such as green technologies.[200] Figure 2-49 shows the percentage of Austrian patent applications with international inventor teams, i. e. at least one inventor is not based in Austria. In total, there are 940 climate-relevant patent applications in the period 1980–2018. Compared to non-climate-relevant patent applications, climate-relevant patent applications are more international. In particular, since 2000, the gap has been increasing: After 2000, climate-relevant patent applications have on average 25% of their team made up of international inventors, which

199 An index shows the development of a number over time and enables the comparison of indicators with different dimensions. The index reflects the change of a number from a point in time to the reference point in time (here 1980 is the base year). For simplicity, the reference value is equated with the number 100. E. g. an index value of 110 corresponds to an increase of 10% compared to the reference value.

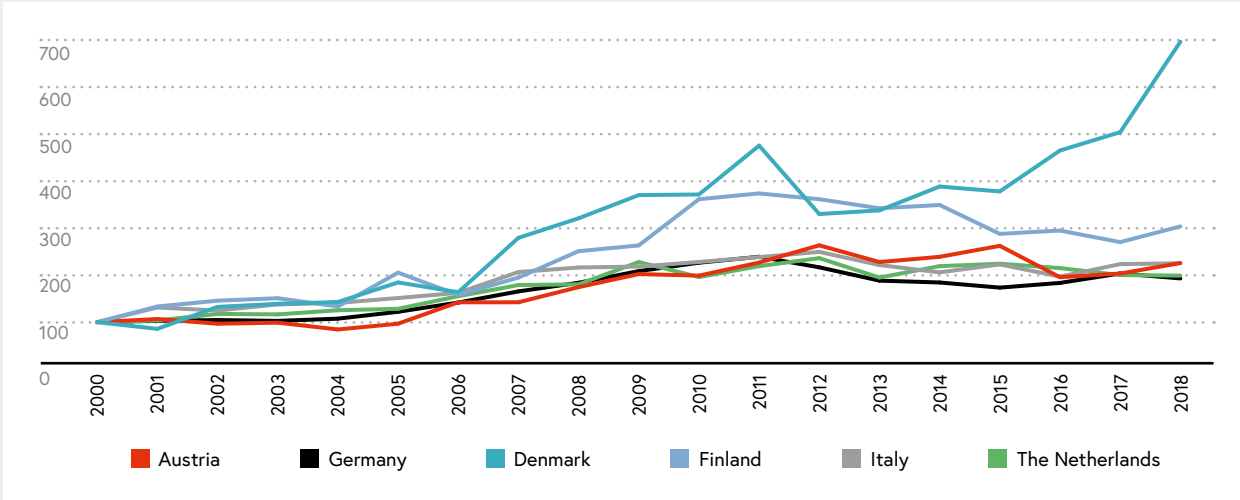
200 See Haščič et al. (2012) and Shapiro (2014).

Figure 2-50: All patent applications in European comparison, indexed, 2000 = 100



Source: OECD (2022e). Calculations: Austrian Institute for SME Research.

Figure 2-51: Climate-relevant patent applications in European comparison, indexed, 2000 = 100



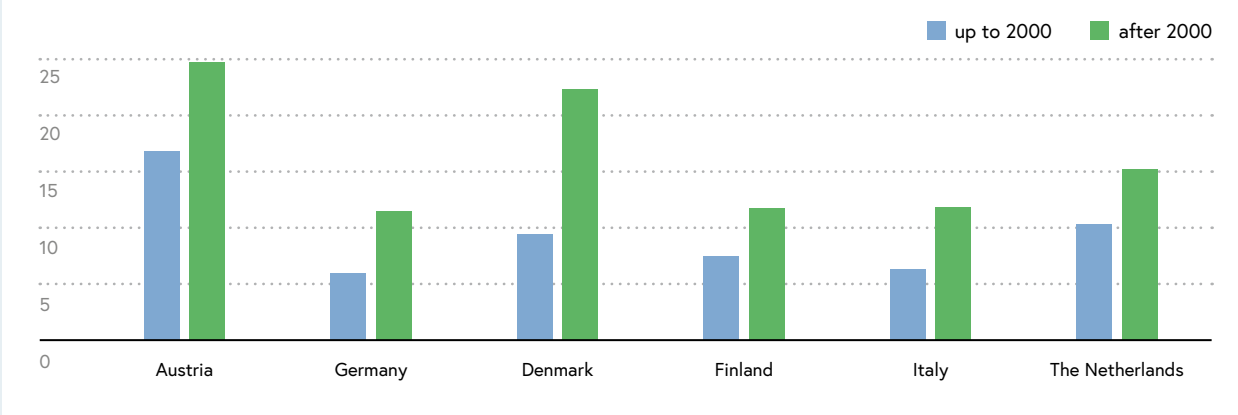
Source: OECD (2022e). Calculations: Austrian Institute for SME Research.

is 5 percentage points more than other patent applications. Before 2000, this difference was 3%. Overall, the higher share of international inventor teams in climate-relevant patent applications underscores the pronounced international cooperation culture in these future-oriented technologies. The five most important countries of cooperation for Austria in climate-relevant patent applications are Germany, USA, Switzerland, South Korea, and Japan.

International comparison of climate-relevant patent applications

The international comparison shows that the annual amount of patent applications develops differently in the

Figure 2-52: Climate-relevant patent applications with international inventors in European comparison (share in %)



Source: OECD (2022e). Calculations: Austrian Institute for SME Research.

countries examined. Figure 2-50 shows this for Austria, Germany, Denmark, Finland, Italy and the Netherlands.[201] Austria and Denmark stand out in this group of countries with a particularly strong development. In 2000, there were 1,127 patent applications in Austria, while in 2018 there were already over 1,900 applications. Figure 2-51 now refers exclusively to climate-relevant patent applications. The increase in climate-relevant patent applications is particularly strong in Denmark and in Finland, while Austria shows a very similar development to Germany and the Netherlands. The international comparison indicates that Austria demonstrates a strong positive correlation in the trend of patent applications. However, there is room for improvement in climate-relevant patents if Austria wants to keep up with the leaders in these future-oriented technologies and markets.

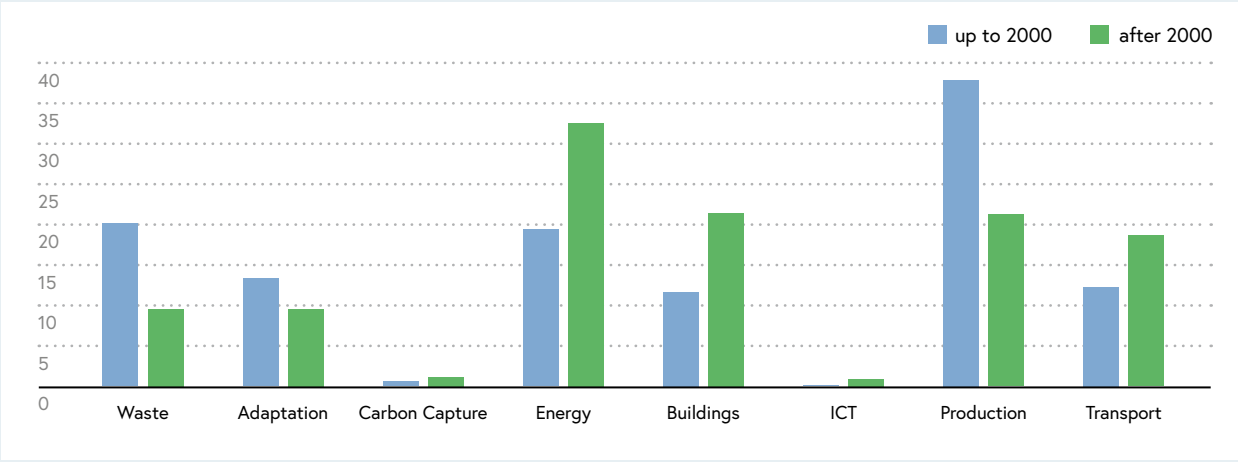
In an EU comparison, Austria ranks among the top countries in terms of the internationality of climate-relevant patents (Figure 2-52). Before 2000, an average of 16.9% of all Austrian climate-relevant patent applications featured an international team of inventors; between 2000 and 2018, this share rose to almost 25%. In comparison, in the other, somewhat smaller countries such as the Netherlands, 15% and in Denmark 22% of all climate-relevant patent applications were part of an international team of inventors (2000–2018).

Climate-relevant patent applications in the subclasses of green technology

Climate-relevant patent applications can be divided into eight subclasses for green technologies according to the CPC classification. Figure 2-53 shows the share of climate-relevant patent applications from Austria by subclass and compares the period before and after the year 2000. Before the year 2000, most patent applications (37.8%) were in the production subclass,

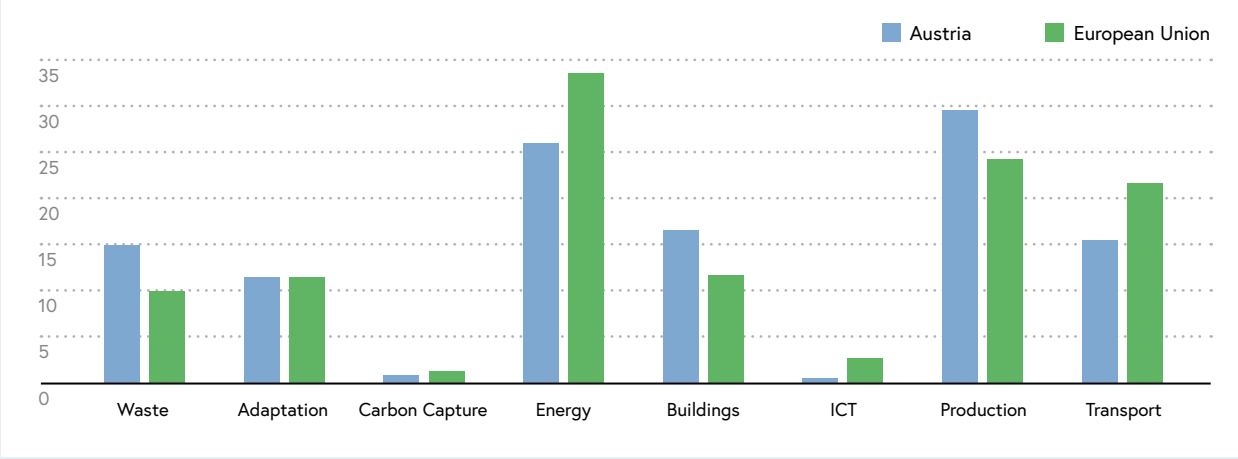
201 The selection for the presentation of the comparative countries is based on an empirical analysis of all European countries and the desire for a clear presentation with great diversity at the same time. Denmark and Finland are European leaders in green technology innovation. Germany and the Netherlands have similar innovation structures, and Italy was included as a southern European analogue country.

Figure 2-53: Austrian climate-relevant patent applications per technology subclass (share in %)



Source: OECD (2022e). Calculations: Austrian Institute for SME Research.

Figure 2-54: Austrian climate-relevant patent applications by technology subclass compared to the EU average (share in %)



Note: European Union refers to EU-27 excluding Austria.

Source: OECD (2022e). Calculations: Austrian Institute for SME Research.

i.e. technologies that enable more climate-friendly production of material goods.[202] After 2000, energy was the most important subclass, accounting for 32.5% of all patent applications. Compared to the EU average (Figure 2-54), Austria shows a focus on the production subclass in the period 1980–2018: 29.6% of Austrian climate-relevant patents fall into this category, while the EU average is 24.3%. Further specialisations of Austria

202 In brackets the name for the illustrations: technologies for waste management (waste), technologies for adaptation to climate change (adaptation), carbon capture technologies, for the capture and storage of CO_2 (carbon capture), technologies for renewable energy (energy), technologies for climate-friendly buildings (buildings), information and communication technologies with climate relevance (ICT), technologies for climate-friendly material goods production (production), technologies for climate-friendly transport (transport).

can be seen in the subclasses waste with 14.9% of climate-relevant patents (EU average 9.9%) and buildings (16.5% in Austria, 11.3% in the EU average). Austrian patent applications are less present especially in the subclasses ICT and transport.

The analysis of climate-relevant patent applications in Austria shows that innovations in the field of green technologies are becoming increasingly important. Especially after the year 2000, climate-relevant patent applications have increased strongly compared to other patent applications. Areas of specialisation of Austrian green innovation are in the fields of technologies for waste management, technologies for climate-friendly buildings and technologies for more climate-friendly production. Compared to other European countries, the increase in climate-relevant patent applications in Austria has been more moderate. The share of climate-relevant patent applications in all patent applications has also stagnated in Austria, while other countries have been able to specialise more strongly in green technologies. On the other hand, a higher proportion of inventor teams in Austria have an international composition than in other European countries, indicating a stronger international orientation of technological cooperation.

2.4.3 Sustainability and transformation at the Austrian higher education institutions and non-university research institutions

The contribution of higher education and non-university research institutions to sustainability takes place at two levels. On the one hand, there are measures that affect the institution internally, such as strategies, infrastructure, etc. with the goal of becoming a sustainable, climate-neutral organisation. On the other hand, the research institutions set sustainability priorities in their research activities and, in the case of higher education institutions, in their teaching, thus building the basis for corresponding innovations in the economy and society.

Universities

The strategic basis for the universities is the Austrian University Plan (HOP)[203] and the Austrian National Development Plan for Public Universities (GUEP) 2025–2030.[204] The Vision 2050 in the HOP contains a commitment of the Austrian universities to sustainable action, which includes the appreciation of nature, careful budgeting and sustainable action in dealing with limited natural resources. One of five qualitative development lines is "teaching, research, and development and exploration of the arts (EEK) in the context of societal challenges", where one of the three addressed thematic areas is sustainability. The fields of action in the thematic area are interdisciplinarity in teaching and research as well as the obligatory integration of corresponding teaching and research content, the promotion of dialogue to address contradictions and conflicting goals and the teaching of factual and process competence to lead such a discourse, as well as university-owned sustainability strategies. The vision of the GUEP identifies universities as essential partners in achieving the SDGs and defines social responsibility as a framework for action, calling in particular for the "conscious integration of the principle of sustainability into university development and profile building".

Sustainability is a topic area in which Austrian universities cooperate and build alliances for a long time already. Particularly noteworthy is the Alliance of Sustainable Universities in Austria,[205] which has existed since 2012 and in which 19 universities are now represented. The mission is to jointly anchor and promote the understanding of sustainability in teaching and research, in social commitment and in the

203 https://www.bmbwf.gv.at/Themen/HS-Uni/Hochschulgovernance/Steuerungsinstrumente/hochschulplan.html; see also Chapter 1.3.
204 https://www.bmbwf.gv.at/Themen/HS-Uni/Hochschulgovernance/Steuerungsinstrumente/GUEP.html; see also chapter 1.3.
205 https://nachhaltigeuniversitaeten.at

management of universities. In doing so, the members want to take over a pioneering role in society for sustainable development and find the best possible solutions in cooperation with civil society. In various working groups, for example, the topics of CO_2-neutral universities, sustainable mobility initiatives, sustainable procurement, education for sustainable development and sustainable buildings are dealt with. In addition to the strategic further development of the Alliance itself, the focus of the working group "strategies" is on the exchange and consultation with regard to the creation of university-specific sustainability strategies, whereby a manual for the creation of sustainability concepts has been developed.

Most of the Alliance universities are also active in the UniNEtZ project (Universities and Sustainable Development Goals).[206] The inter-university and interdisciplinary project consisting of 18 universities, the Climate Change Centre Austria (CCCA), GeoSphere Austria and the student association forum aim, among other things, to anchor the SDGs at universities in teaching, research, responsible science, continuing education and university management, and to contribute to the socio-ecological transformation of society. As part of UniNEtZ I (2019–2021), more than 300 scientists, artists and students worked together to produce an options report on the implementation of the SDGs in Austria.[207] This report contains around 150 options and 950 concrete measures and was handed over to the Federal Government in March 2022. Building on the expertise bundled in the options report, UniNEtZ II (2022–2024) focuses, among other things, on the implementation of the identified measures and an intensified dialogue between science, society and politics.

In the performance agreements of the Federal Ministry of Education, Science and Research (BMBWF) for the current period 2022–2024, individual sustainability targets and projects were agreed with all universities, taking into account the heterogeneous starting positions of the organisations. The projects must be implemented by the end of 2024, thus some of the projects have not yet been completed. One focus is the creation of university sustainability strategies along the lines of the Alliance. For the current period of the performance agreement, the University of Vienna, the University of Innsbruck, the University of Salzburg, the Medical University of Innsbruck, the Mozarteum University Salzburg, the University of Music and Performing Arts Graz and the University of Continuing Education Krems plan to develop a sustainability strategy. The Academy of Fine Arts Vienna has set itself the task of drawing up a "Strategy on Sustainability and Ecology", the Graz University of Technology (TU) a comprehensive strategy "Climate Neutral TU Graz 2023" and the University of Music and Performing Arts Vienna is working on a roadmap to balance greenhouse gas emissions by 2030. The University of Continuing Education Krems has a sustainability concept,[208] the University of Natural Resources and Life Sciences Vienna (BOKU) has a sustainability strategy[209] and is developing a BOKU climate neutrality strategy. The same holds for the University of Graz, which can already point to an "Environmental Statement" concept[210] and aims to achieve almost greenhouse gas emission-free university operations by testing the Institutional Carbon Management[211] and other climate protection measures.

In addition to the development of strategies, the performance agreements provide for a number of

206 https://www.uninetz.at/
207 https://www.uninetz.at/optionenbericht
208 https://www.donau-uni.ac.at/dam/jcr:3b49f44a-5fe5-4f88-9ac3-c82d5c381505/Konzept_Nachhaltigkeit_DU_April_2020.pdf
209 https://boku.ac.at/fileadmin/data/H99000/H99100/nachhaltigkeit/NH-Strategie2.0/Ergebnisse_Entw_NH-Strategie_final.pdf
210 https://static.uni-graz.at/fileadmin/projekte/umweltmanagement/Umwelterklaerung/Umwelterklaerung_2020.pdf
211 https://wegcenter.uni-graz.at/de/forschen/forschungsgruppe-arsclisys/projekte/icm-unigraz/

other measures at the individual university level. In order to anchor sustainability more firmly in the institutions, BOKU, for example, has expanded the course evaluations with sustainability aspects. At the University of Graz, an advisory board for climate protection measures has been established, the University of Music and Performing Arts Graz has set up a sustainability committee, and the Mozarteum University Salzburg has established an organisational unit for sustainability with expertise in environmental technology and research in the context of art, communication and awareness raising. The Vienna University of Economics and Business (WU) has established the Sustainability Transformation and Responsibility (STaR) Competence Centre,[212] which serves as a platform for networking, knowledge exchange, curriculum development and outreach on topics related to environmental, social and economic sustainability and the SDGs. With regard to sustainable building, the University of Innsbruck uses energy efficiency and sustainability standards for buildings to reduce energy demand, and the Medical University of Vienna uses the "Green University" concept to analyse and develop measures to demonstrate and improve sustainability in processes, buildings, etc. in the areas of research, teaching and administration.

With regard to the (further) development of new research priorities, examples include the University of Vienna, which has established a new development field "Environment & Climate", the University of Graz with the expansion of research in the profile-forming field "Climate Change Graz",[213] the University of Innsbruck with the FSP "Alpine Space",[214] the University of Leoben with the expansion of the interdisciplinary research field "Hydrogen and Carbon". BOKU Vienna is developing the competence fields "Climate Consequences, Environment and Natural Hazards" and "Social, Ecological and Geo-oriented Long-term Research". WU Vienna has several institutes with a focus on sustainability, such as Ecological Economics[215] and Sustainability Management.[216]

The anchoring of the sustainability topic in teaching takes place through the creation of new study programmes or increased anchoring of the topic in the curricula. Examples of this are the Master's programme Climate Change and Transformation Science[217] and the interdisciplinary Master's module "Climate Change and Sustainable Transformation"[218] at the University of Graz or the university course "The UN Agenda 2030: Shaping Change Sustainably" at BOKU Vienna.[219] The International Joint Study Programme within the framework of EURECA-PRO[220] European University (= European University Alliance) in the field of Responsible Consumption and Responsible Production[221] at the University of Leoben and the Master's programme "Socio-Ecological Economics and Policy" (SEEP)[222] at the Vienna University of Economics and Business (WU). Starting in the winter semester 2023/24, students will also be able to choose the "Economy – Environment – Politics"[223] specialisation as part of the WU Bachelor's programme in Economics and Social Sciences. At Graz University of Technology

212 https://www.wu.ac.at/en/star/
213 https://climate-change.uni-graz.at/de/
214 https://www.uibk.ac.at/alpinerraum/index.html.de
215 https://www.wu.ac.at/en/ecolecon/institute/
216 https://www.wu.ac.at/sustainability/
217 https://www.uni-graz.at/de/studium/masterstudien/environmental-systems-sciences-climate-change-and-transformation-science/
218 https://www.uni-graz.at/de/studium/rund-ums-studium/masterstudium-plus/klimawandel-und-nachhaltige-transformation/
219 https://boku.ac.at/weiterbildungsakademie/universitaetslehrgaenge/die-un-agenda-2030-den-wandel-nachhaltig-gestalten
220 https://www.eurecapro.eu/
221 https://www.unileoben.ac.at/studium/bachelor/responsible-consumption-and-production/responsible-consumption-and-production/
222 https://www.wu.ac.at/en/programs/masters-programs/socio-ecological-economics-and-policy/overview/
223 https://www.wu.ac.at/studium/bachelor/wirtschafts-und-sozialwissenschaften/studienzweige/wirtschaft-umwelt-politik/

(TU Graz), the project "Sustainable TU Graz" integrates technology assessment as well as social, ethical and legal aspects of technology development into research and teaching (in existing Bachelor's and Master's degree programmes, certificate: STS – Science, Technology and Society[224] with the aim of covering them in all fields of study. The University of Vienna focuses on embedding sustainability in teacher training curricula, the University of Klagenfurt is developing courses for teachers on sustainable development, as well as relevant courses for students in all disciplines. The University of Music and Performing Arts Vienna is expanding its range of teaching and training courses on the SDGs.

In the area of the Third Mission, the universities also assume their social responsibility with regard to sustainability. At TU Wien, for example, a series of lectures is being developed and carried out with view to specific basic knowledge, particularly in the context of the SDGs. There are events on the contributions of the University of Veterinary Medicine Vienna to the SDGs under the motto "VetmedTalk: Understanding today. Change tomorrow" for different target groups. WU Vienna is expanding the successful model of the Sustainability Challenge[225] to nationwide activities. In the Service Learning Track, interdisciplinary student teams, in cooperation with service learning partners (companies, ministries, NGOs), work on concrete problems from social and entrepreneurial practice. In the Start-up Track, up to ten start-ups are founded each year under the banner of the SDGs. Increased interaction with society and the interested public, including SDG 3 Health and Well-being, is on the agenda of the Medical University of Vienna. The Academy of Fine Arts is sharpening its knowledge transfer profile in relation to sustainability agendas and SDGs and developing measures on the impact of the arts.

Furthermore, Austrian universities participate in relevant international research networks. The University of Leoben, for example, is involved in the European Excellence Hub and the development and expansion of the interdisciplinary research and education agenda "EURECA-PRO – The European University Alliance on Responsible Consumption and Production"[226] within the framework of the European University Alliances.[227] The Medical University of Innsbruck and GeoSphere Austria with Sonnblick Observatory operate Central Facilities within the framework of "ACTRIS ERIC", a Europe-wide research infrastructure that provides high-quality data and information on atmospheric processes. BOKU Vienna is part of the GLORIA research programme,[228] an international network for recording and analysing the effects of climate change on biodiversity and vegetation patterns in high mountains. The universities also contribute to national and international climate reports (e.g. Austrian Assessment Report on Climate Change 2024,[229] participation in the review process of the APCC (Austrian Panel on Climate Change) Special Report "Structures for Climate-Friendly Living).[230]

Universities of Applied Sciences (FH)

The Alliance for Sustainable Universities[231] has been implemented in October 2021. To date, 13 Universities of Applied Sciences (Fachhochschulen: FH BFI Vienna, FH Burgenland, FH CAMPUS 02, FH Campus Wien, FH JOANNEUM, FH Kärnten, FH Kufstein Tirol, FH Oberösterreich, FH St. Pölten, FH Technikum Wien, FH Vorarlberg, IMC FH Krems and MCI) participate in the network. The aim of the alliance is to contribute to the

224 https://www.tugraz.at/arbeitsgruppen/sts/lehre/sts-zertifikat
225 https://www.wu.ac.at/star/teaching-co-learning-resources/sustainability-challenge/
226 https://erasmus-plus.ec.europa.eu/projects/search/details/101004049
227 https://erasmusplus.at/de/hochschulbildung/european-university-alliances
228 https://boku.ac.at/news/newsitem/19002
229 https://ccca.ac.at/wissenstransfer/apcc/aar2
230 https://ccca.ac.at/wissenstransfer/apcc/special-reports/srstrukturen
231 https://www.nachhaltige-hochschulen.at/ueber-uns/

achievement of the SDGs in a holistic manner. The levers for this are teaching, research, university management and cooperation. In addition, the aim is to raise awareness of the topic of sustainability among students, teachers, staff and other stakeholders. The network has three working groups for teaching, research, and business, in which various sustainability actions are developed.

Universities of Applied Sciences have established numerous technical and economic Bachelor's and Master's degree programmes with a focus on the environment and sustainability. These range, for example, from renewable energies (FH Technikum),[232] energy informatics (FH Oberösterreich)[233] and regenerative energy systems & technical energy management (FH Wiener Neustadt) to green building (FH Wiener Neustadt), technical energy management (FH Wiener Neustadt),[234] architecture – green building (FH Campus Wien),[235] smart building (FH Salzburg),[236] environment and technology (FH Vorarlberg),[237] environmental, process and energy technology (MCI),[238] bio- and environmental engineering (FH Upper Austria)[239] up to energy and environmental management (FH Burgenland),[240] energy and sustainability management (FH Kufstein),[241] energy, mobility and environmental management (FH Joanneum),[242] to environmental and sustainability management (FH Krems).[243]

Universities of Applied Sciences are also committed to sustainable management. This is documented in sustainability strategies, reports or similar (e.g. the sustainability report of the FH Krems,[244] the environmental statement of the FH Kärnten,[245] the sustainability strategy of the FH Burgenland Group)[246] or can be found as part of the strategic goals. For example, one of the five visions of the FH Campus Wien[247] is dedicated to global challenges and sustainable development with a commitment to the SDGs and concrete strategic goals. Committees have been set up at individual FHs (e.g. the Sustainability Advisory Board at FH Campus Graz)[248] and institutes have been established (e.g. the Institute for Sustainability at FH Wiener Neustadt).[249]

Non-university research institutions

The **Institute of Science and Technology Austria (ISTA)** aims to institutionalise activities in the field of sustainability, which is also reflected in a commitment to the SDGs in the performance agreement 2021–2023. The basis for all existing activities and future options for

232 https://www.technikum-wien.at/studiengaenge/bachelor-erneuerbare-energien/
233 https://www.fh-ooe.at/campus-hagenberg/studiengaenge/master/energy-informatics/
234 https://wieselburg.fhwn.ac.at/studiengang/master-regenerative-energiesysteme-und-technisches-energiemanagement?gclid=EAIaIQobChMI7czrx6OX_QIVlJBoCR0magVaEAAYASAAEgKjFPD_BwE
235 https://www.fh-campuswien.ac.at/studium-weiterbildung/studien-und-lehrgangsangebot/architektur-green-building-master.html
236 https://www.fh-salzburg.ac.at/studium/ed/smart-building-bachelor
237 https://www.fhv.at/studium/technik/umwelt-und-technik-bsc/
238 https://www.mci.edu/de/studium/master/umwelt-verfahrens-energietechnik
239 https://www.fh-ooe.at/campus-wels/studiengaenge/bachelor/bio-und-umwelttechnik/
240 https://www.fh-burgenland.at/studieren/master-studiengaenge/ma-energie-und-umweltmanagement/
241 https://www.fh-kufstein.ac.at/Studieren/bachelor/energie-nachhaltigkeitsmanagement-vz
242 https://www.fh-joanneum.at/energie-mobilitaets-und-umweltmanagement/bachelor/
243 https://www.fh-krems.ac.at/studium/master/berufsbegleitend/umwelt-und-nachhaltigkeitsmanagement/
244 https://www.fh-krems.ac.at/fileadmin/public/downloads/allgemein/imc-nachhaltigkeitsbericht-2020.pdf
245 https://www.fh-kaernten.at/fileadmin/documents/servicebereiche/nachhaltigkeit/_EMAS_Umwelterklaerung_FHK_2021_final.pdf
246 https://www.fh-burgenland.at/fileadmin/user_upload/Dokumente/Nachhaltigkeit/Nachhaltigkeitsstrategie_2021_Abstract.pdf
247 https://www.fh-campuswien.ac.at/die-fh/werte/strategie.html
248 https://www.campus02.at/unsere-hochschule/nachhaltigkeit/
249 https://www.fhwn.ac.at/hochschule/institute/nachhaltigkeit

action is a concept drawn up in 2021 for the documentation, observation and discussion of goals and initiatives in this area. The measures include the areas of campus and operations, governance and organisation, teaching and research, and awareness raising and public relations.[250]

In the area of campus and operations, the Institute has the advantage that the campus consists mainly of new buildings with energy efficiency and modern control systems (EMS – Energy Management System and GLT – Building Management System). In addition, the campus is supplied with electricity from renewable sources via a biomass heating plant and photovoltaic systems. In 2023/24, the focus is on the area of mobility. A campus-wide mobility study will be undertaken, including the existing shuttle bus service to reduce car use. An evaluation of travel policies is also planned with a view to reducing short-haul flights and encouraging the use of rail.

With regard to governance and organisation, a full-time sustainability manager is to be appointed in 2023. Furthermore, there is a sustainability working group in which professors from various departments as well as students are represented.

The topic of sustainability is addressed in teaching in the context of various research topics. A pilot course is currently underway in which students deal with current topics such as the resource consumption of online activities (e.g. bitcoins or video streaming) or energy consumption in agriculture. The annual "Young Scientist Symposium" organised by students and postdocs deals with sustainability topics and took place in 2022 under the title "Energy Challenges in the Modern World".[251] Various measures to reduce energy consumption are implemented in the laboratories. Various research groups are members of the Green Labs initiative.[252]

Earth Sciences is a new research area at ISTA. Here, a research group deals with atmospheric and ocean dynamics,[253] and a glacier research group will start in 2023. Other research groups are working on sustainability issues (e.g. materials group on more efficient batteries, thermoelectric materials, waste heat recovery; cryptology group on more sustainable cryptocurrencies; evolutionary biology and plant biology group on the impact of climate change on plant evolution). In addition, the ISTA communication team is currently working on a sustainability campaign for internal and external communication channels. In the area of science education,[254] projects (e.g. for school classes) are being developed and a new programme was launched in March 2023 to support excellent science journalism.[255]

For decades, the **Austrian Academy of Sciences (OeAW)** has been making an important contribution to the SDGs with its research. For example, the OeAW Institute for Interdisciplinary Mountain Research (IGF)[256] researches effects of climate change and globalisation, for example in the framework of the long-term project GLORIA,[257] a globally unique monitoring programme on biodiversity in the high mountains based on permanent observation plots.

The GMI – Gregor Mendel Institute for Molecular Plant Biology GmbH[258] is a world-leading plant research institute that aims to understand plant growth, development and interactions with the environment at the genetic and molecular level, which in turn has relevance for addressing climate change, sustainable food and energy management.

250 https://ist.ac.at/de/nachhaltigkeit/
251 https://ist.ac.at/en/news-events/event/?eid=3897
252 https://greenlabsaustria.at/
253 https://ist.ac.at/en/research/muller-group/
254 https://ist.ac.at/en/education/ista-for-kids/
255 https://ist.ac.at/en/news/first-journalists-in-residence/
256 https://www.oeaw.ac.at/igf/institut
257 https://www.oeaw.ac.at/igf/forschung/gloria
258 https://www.oeaw.ac.at/gmi/home

The research focus of the Vienna Institute of Demography (VID)[259] is the international analysis and forecasting of fertility, mortality, migration and human capital and their impact on society, the economy and the environment. The topic of the annual conference in 2022 of the Wittgenstein Centre for Demography and Global Human Capital,[260] a research cooperation of the University of Vienna, IIASA and OeAW/VID, was Population and Climate Change.

The Institute of Technology Assessment (ITA)[261] of the Austrian Academy of Sciences (until recently together with the AIT) regularly produces topic-specific studies for the National Council as well as a semi-annual monitoring report on socio-technical developments. Topics include digitalisation and climate change, CO_2-neutral aircraft, phosphorus recycling, space debris, zero waste delivery, sustainable streaming.

The Erich Schmid Institute for Materials Science (ESI)[262] is dedicated to energy efficiency in various projects.

Earth System Sciences (ESS)[263] is a unique programme run by the Austrian Academy of Sciences. Three national committees ("Man and the Biosphere", "Geo/Hydro Science" and "Global Change") network the Austrian scientific landscape and the Republic of Austria's membership in international associations such as UNESCO, as well as representation in numerous international research programmes, cooperations and networks such as LTER (Long Term Ecosystem Research). The National Committees also participate in the relevant transdisciplinary research calls, which are administered by the Austrian Academy of Sciences. In 2022, eleven projects were funded with a total of €5.2 million in the resilience of mountain regions call.

The Austrian Academy of Sciences makes further contributions to sustainability through its mandated memberships. For example, it is involved in the International Ocean Discovery Program (IODP)[264] and the International Continental Scientific Drilling Program (ICDP).[265] The OeAW is also a member of the Sonnblick Observatory,[266] which provides a framework for long-term monitoring programmes and supports interdisciplinary research activities at the interface of atmosphere, cryosphere and biosphere.

Some commissions of the OeAW deal with the effects of climate change on humans and the environment. The Commission for Interdisciplinary Ecological Studies (KIÖS)[267] supports the recording and documentation of Austria's biodiversity and long-term ecological research in the terrestrial realm. The publication series "Interdisciplinary Perspectives" is dedicated to the interactions between social processes and complex ecosystems. The Commission on Climate and Air Quality (KKL)[268] deals with human influences on the atmosphere and their effects on humans and ecosystems (e.g. project "the green city"). The Austrian Academy of Sciences represents the Republic of Austria in IIASA through the Commission Austrian IIASA Council.[269] The Commission for Earth Sciences[270] is concerned with the expected global warming in the course of climate change and the associated increase in natural hazards, but also with the increasing scarcity of resources and rapidly growing urbanisation.

259 https://www.oeaw.ac.at/vid/home
260 https://www.oeaw.ac.at/vid/wittgenstein-centre
261 https://www.oeaw.ac.at/ita/home
262 https://www.oeaw.ac.at/esi/erich-schmid-institute
263 https://www.oeaw.ac.at/ess
264 https://www.iodp.org/
265 https://www.icdp-online.org/
266 https://www.sonnblick.net/de/
267 https://www.oeaw.ac.at/kioes/home
268 https://www.oeaw.ac.at/kkl/home
269 https://www.oeaw.ac.at/iiasa-rat/home
270 https://www.oeaw.ac.at/geok/home

With regard to the Third Mission, at least 25 events on the topic of sustainability in 2022 could be mentioned. In 2021, the thematic platform "sustainability sciences: sustainable human wellbeing" was established at the OeAW. It draws on the broad range of expertise of the OeAW institutes (e.g. the Institute for Comparative Media and Communication Research (CMC), the Institute for Interdisciplinary Mountain Research (IGF)) and members to identify research gaps in the field of sustainability sciences. Furthermore, they examine options for a future Centre for Sustainability Sciences as well as strengthen interdisciplinary exchange on sustainability topics and promote cooperation between OeAW research institutions and OeAW specialist societies on/in this research area. The thematic platform also sees itself as a hub on sustainability topics at the OeAW. Within the framework of the "joint academy days" initiated by the Austrian Academy of Sciences, science academies worldwide contribute to tackling urgent societal problems through regular exchange across national borders – together with the interested public. In 2021, for example, the Austrian Academy of Sciences joined forces with the Royal Society of Canada to engage in a multidisciplinary exchange on global challenges.[271] Topics discussed included interdisciplinary approaches to global challenges such as food insecurity, poverty and environmental change, or environmental change in the Alps and the Arctic.

Internal measures at the OeAW include the energetic refurbishment of the sites and the optimisation of waste management and ecological cleaning. The OeAW is also committed to sustainable procurement.

GeoSphere Austria (GSA)[272] makes a significant contribution to sustainably increasing the resilience of the environment and society in Austria by operating the national geological, meteorological, climatological and geophysical service and through innovative research activities. For example, GeoSphere Austria operates national survey and measurement infrastructures for monitoring weather patterns and key climate change issues and provides national and international reference data for research and decision-makers. With its forecasts and warnings, GeoSphere Austria supports civil protection as well as national and European crisis and disaster management (SCM)[273] and contributes to reducing the impact and damage of weather extremes and air pollutants. To better meet the requirements and challenges of our time, GeoSphere Austria focuses on the topics of security of supply, energy transition and climate change.

The raw material geological exploration of the Austrian federal territory is one of the central statutory tasks of the organisation, with basic information on raw material deposits and raw material potentials in Austria being made publicly available online via the IRIS portal. This contributes to the security of supply.

With regard to the energy transition, GeoSphere Austria is proving to be an essential competence provider in questions of the use and potential of solar energy, wind power and geothermal energy. Current projects include work on metre-scale solar atlases and a geothermal atlas for Austria. Furthermore, contributions are being made to the accounting and verification of official Austrian greenhouse gas emissions using satellite data. The update of the national reference climate scenarios ÖKS15, which form the basis for a consistent assessment of future climate development in Austria, was initiated and led by GeoSphere Austria. Future work will focus on groundwater protection and sustainable groundwater management in times of climate change, as well as hydrogeological issues with meteorological relevance.

In addition, GeoSphere Austria contributes to raising public awareness through active public relations

271 https://www.oeaw.ac.at/joint-academy-day-2021
272 https://www.geosphere.at/
273 https://www.bmi.gv.at/204/SKKM/start.aspx

work, including the operation of several knowledge dissemination centres and numerous appearances, expert lectures and national and international committee work. Representatives of GeoSphere Austria are involved in the implementation of the EU Horizon Europe missions at the Austrian level in the thematic fields of Climate, Cities, Waters and Soil and are involved, for example, in the UniNEtZ project. In terms of internal processes, the green IT and digitalisation strategy supports resource-optimised management within the company.

The basic values of sustainability are anchored in the self-perception of the **Austrian Institute of Technology (AIT)**.[274] These include the responsible resource management as well correspondingly focused corporate leadership. Building on the current AIT strategy "Research and Innovation for a Sustainable and Competitive Position in the Digital Age", sustainability and corporate social responsibility are established in all phases of the AIT's service provision.

On the one hand, research is consistently oriented towards sustainability, which is reflected in many research projects that address the topics of the European Green Deal and EU missions and which the AIT carries out together with national and international partners. For example, innovative applications of heat pumps are being researched in the area of climate protection and energy transition. This makes it possible to utilise previously unused waste heat at a very high heat level in industrial companies.[275] In the household sector, heat pump systems are currently being developed that can replace gas boilers in the future.[276] The City Intelligence Lab[277] focuses on the planning and development of climate-neutral and resilient cities and regions, in which complex interrelationships of urbanisation and climate change are visualised with methods of virtual reality and artificial intelligence and prepared for a co-creative process together with stakeholders and citizens. Another example is research into the microbiome – the totality of all microorganisms at a location – and its interactions with plants, which will make it possible to make crop plants more resistant to climate change and reduce the use of fertilisers and pesticides.

On the other hand, sustainability is an integrated component in all corporate areas, such as human capital management, gender & diversity and compliance, as well as in supporting processes and measures. Among other things, sustainable procurement is carried out in accordance with the relevant BMK guidelines. In the area of building and laboratory infrastructure, a cross-organisational planning process was developed that comprehensibly takes up the idea of sustainable building development as well as in energy and renovation issues. The AIT's mobility management includes travel guidelines, fleet management (electric vehicles with charging options at the locations) and advice for employees on their choice of mobility options. In addition, optimised land use, the best possible avoidance of land sealing and the greening of green spaces are of great importance at all AIT locations. At the Seibersdorf site, eight hectares of green space at AIT were converted into natural meadows in 2022.

The activities of **JOANNEUM RESEARCH Forschungsgesellschaft mbH (JOANNEUM RESEARCH)** are based on a new corporate strategy for the next five years that is oriented towards the missions of the European Union. In addition to mobility, the focus is on the areas of health and care, digitalisation and, in particular, green transformation.

With regard to internal sustainability measures, reference can be made to the preparation of the climate balance 2020 by the team from LIFE, the Institute for Climate, Energy Systems and Society. The greenhouse

274 https://www.ait.ac.at/media/ait-issues/lets-think-sustainable
275 https://www.ait.ac.at/blog/waermepumpen-energiequelle-der-zukunft?no_cache=1
276 https://projekte.ffg.at/projekt/4121993
277 https://www.ait.ac.at/loesungen/digital-resilient-cities-and-regions/city-intelligence-lab

gas emissions of Joanneum Research were determined based on electricity and heat consumption at 14 locations, mobility – business trips and commuting – as well as operating materials such as paper, IT equipment and laboratory materials. A very low contribution of electricity consumption to the carbon footprint was demonstrated. This is due to the 100% use of green electricity, which seems particularly important due to the high energy demand of the laboratories. The research facility is certified company-wide to EN ISO 14001: Environmental Management Systems and complies with the requirements of this international standard to improve its own environmental performance, meet legal and other obligations and reduce its environmental impact. In addition, company-wide behavioural adjustments have been called for with regard to saving energy in the sense of the Federal Government's "Mission 11".

Among the research activities is the Institute for Digital Technologies (DIGITAL), where researchers are working on projects in the field of the circular economy, e.g. to provide technological support for the green transformation on intelligent sensor technology for sorting residual waste. There are projects with regional and national business partners in the residual waste management sector, but also in the metal processing sector, where efforts are already being made to reduce waste in production. LIFE experts have been developing the methodology for life cycle analysis of products and services for years.[278] The MATERIALS team is developing sustainable solar cells that are up to 50% more efficient than conventional solar cells.[279] The EU project FlexFunction2Sustain is working on the development of biodegradable UV-curable embossing varnishes and sustainable stamping tools for the nanostructuring of films. The aim is to significantly improve the sustainable production of a plastic product, as well as its recycling or biodegradability at the end of its life cycle.[280]

Research at **Silicon Austria Labs (SAL)** also contributes to climate protection and the EU's sustainability goals by exploring key technologies for trends such as local production, e-mobility, clean energy and edge computing. Research in the area of e-mobility aims to make components smaller, more efficient and energy-saving, such as optimising the power density and efficiency of on-board chargers in the "Tiny Power Box" project.[281] In the field of clean energy, SAL is working on optimising the operational management of photovoltaic modules or the sustainable recycling or repair of defective PV modules in the "Sustainable Photovoltaics – PVRe^2" project.[282]

For the organisation itself, reference should be made to the SAL travel policy, which gives priority to sustainable business travel. For each business trip, rail should be considered as the first choice mode of transport. SAL achieved a saving of 38.6 tonnes of CO_2 emissions in 2022 (compared to 15.4 tonnes in 2021). Infrastructure measures include, for example, the conversion of the Villach site to 100% renewable energy from mid-2023. There is also a strong focus on green procurement. Examples include the switch to nitrogen green at the Villach site and the CO_2 offsetting option for laptop orders, which has already compensated more than 68 tonnes of CO_2 emissions. The naBe criteria (naBe = Action Plan for Sustainable Public Procurement) were taken into account in tenders, e.g. for cleaning services (Villach) and office furniture (Graz and Villach).

ACR – Austrian Cooperative Research, a network of 19 private, non-profit research institutes that conduct research and development directly and

278 https://www.joanneum.at/life/produkteloesungen/life-cycle-analysis
279 https://www.joanneum.at/fileadmin/presse/presseaussendungen/2019/Presseinformation_SiTaSol_Neue_Solarzellen.pdf
280 https://www.joanneum.at/fileadmin/presse/presseaussendungen/2020/20201217_Plastik_neu_gedacht_Pressetext_final.pdf
281 https://silicon-austria-labs.com/forschung/projekte/details/tiny-power-box
282 https://silicon-austria-labs.com/forschung/projekte/details/pvre2

indirectly for the benefit of companies, bundles its broad research expertise in several thematic focus areas, including sustainable construction, environmental technology and renewable energies, food safety, materials and digitalisation. Across all disciplines, but particularly in the areas of sustainable construction and environmental technology and renewable energies, the ACR institutes work together with small and medium-sized enterprises in Austria to advance the issues of sustainability and green technologies. They focus on application-oriented, realistic solutions that can be implemented by SMEs. To address the challenges of climate change, the ACR institutes focus on their expertise and experience in areas such as energy and resource efficiency in production processes and in the building sector, the development of energy storage technologies and biofuels, and the recycling of building materials, materials and food packaging. In addition to ecological and technological aspects, the focus is always on safety and quality of use for people.

In the research project "PVRe^2 – Sustainable Photovoltaics",[283] for example, the ACR Institute OFI – Austrian Research Institute for Chemistry and Technology and KIOTO Photovoltaics GmbH, together with seven other research partners, have developed methods to recycle and repair photovoltaic modules more efficiently. In addition, the "eco-design" focus area has explored new materials and connection technologies to make modules more sustainable and reliable. The InnoUp project[284] focuses on energy efficiency and material optimisation. The ACR Institute ÖGI – Austrian Foundry Research Institute, together with 18 corporate partners, has completely rethought the production of components for rail vehicles. The cast components are digitally supported and designed in such a way that they require less material while maintaining the same safety and functionality, are lighter and therefore consume less energy both during production and in use over their entire service life.

Research infrastructures, platforms and other research initiatives

The BMBWF supports the development of research infrastructures (FI) as a central basis for successful research to a large extent within the framework of the performance agreements with the research institutions. With regard to the topic of sustainability, the research infrastructures that are part of the European research infrastructure landscape (ESFRI Roadmap)[285] should be mentioned here. In the area of the environment, these are EPOS – the European Plate Observing System,[286] ACTRIS (FI for observing and measuring the composition of the atmosphere),[287] eLTER-RI (FI for long-term ecosystem research).[288] In addition, participation in the Danubius-RI[289] and DISCCO[290] projects is in preparation.

Funding is also provided for platforms that support the networking and communication of science relevant to the Green Deal and cooperation between science and society. This includes the Austria-wide and internationally networked large-scale scientific project ABOL (Austrian Barcode of Life),[291] in which the genetic diversity of Austrian biodiversity (animals, plants, fungi) is recorded using DNA barcoding.

283 https://www.acr.ac.at/awards/innovationspreis/ofi-nachhaltige-photovoltaik/
284 https://www.acr.ac.at/awards/innovationspreis-2021/oegi-stahlguss-in-3d-schont-ressourcen/
285 https://www.lter-europe.net/elter-esfri
286 https://www.epos-eu.org/
287 https://www.actris.eu/
288 https://elter-ri.eu/
289 https://www.danubius-ri.eu/
290 https://www.dissco.eu/
291 https://www.abol.ac.at/

At the national level, the BMBWF supports in the framework of the global budgeting of institutions the Climate Change Centre Austria (CCCA),[292] which has given Austrian climate research a high international visibility. In this context, the international networking platform JPI Climate[293] is also funded and provides effective support services in terms of science and research policy to best position Austria in the European climate research scene. At national level, CCCA works closely with the Alliance of Sustainable Universities, UniNEtZ and GeoSphere Austria.

The BMBWF also supports the National Hub for Biodiversity and Water,[294] which has been established at the University of Applied Sciences Krems since autumn 2022. This hub supports Austria's participation in relevant Horizon Europe instruments (such as EU missions and Horizon Europe partnerships).

The Austrian Polar Research Institute (APRI)[295] is a research consortium that promotes and coordinates research and training in the field of polar sciences in 17 research groups (University of Vienna, University of Innsbruck, University of Graz, Central Institute for Meteorology and Geodynamics and b.geos).

The StartClim research programme,[296] which is implemented by the Federal Environment Agency and financed by the BMK, BMBWF, the province of Upper Austria and the KLIEN Fund, promotes innovative projects that address current climate change issues and provide new impetus.

2.4.4 Sustainability in RTI funding instruments for individuals

The following chapter focuses not on the organisational level, but rather on how the topic of sustainability is addressed in RTI funding instruments for individuals. These instruments can be divided into excellence-oriented funding without thematic restrictions on the one hand, and funding that also aims to increase the diversity of the individuals conducting the research on the other hand (e.g. regarding gender, age or other types of actors such as students or citizens who (co-)design or implement research activities). Currently, the topic of sustainability is frequently taken up in the design and/or in the results achieved by existing measures.

The Federal Government's current RTI strategy addresses both the aspect of sustainability and the excellence- and diversity-oriented support of individuals (especially "Field of activity for Objective 2: Promote excellence basic research" and "Field of activity to for Objective 3: Develop and promote human resources"). The RTI strategy is implemented through the Federal Government's RTI Pacts.[297] Both the current (2021–2023) and the future RTI Pacts (2024–2026) provide for various measures to anchor the topic of sustainability in personal RTI funding.

The goal of promoting excellence and effectiveness includes the targeted use of open innovation and Citizen Science methods to identify socially relevant research questions, as well as the realisation or implementation of the "excellent=austria" funding initiative by the FWF. Overall, topics such as sustainability, climate and environmental protection should be increasingly taken into account as evaluation criteria in relevant RTI funding programmes.

Under the objective "Focus on knowledge, talents and skills", young people as well as junior researchers are named as target groups in the dimensions of gender and diversity. At the level of measures, the main aim is to raise awareness on topics such as climate change and overcoming societal challenges

292 https://ccca.ac.at/startseite
293 https://jpi-climate.eu/
294 https://www.donau-uni.ac.at/de/aktuelles/news/2023/neuer-national-hub-fuer-biodiversitaet-und-wasser.html
295 https://www.polarresearch.at/
296 https://www.startclim.at/startseite
297 See also chapter 1.1.

Table 2-4: FWF approved project funding in the area of climate, sustainability and Green Deal, total and share of total approved funding, 2018–2022

	2018	2019	2020	2021	2022	Total
Approved funding in the area of climate, sustainability and Green Deal in € million	6.4	2.7	3.6	6.6	6.2	25.5
Share of total FWF funding in %	2.8%	1.1%	1.5%	2.6%	2.3%	2.1%

Source: FWF (2023).

as early as possible and thus to build capacities for developing solutions to achieve the climate goals, among other things.

Excellence-oriented funding for individuals

With regard to excellence-oriented funding,[298] the Austrian Science Fund (FWF) is the most important source of funding in Austria. Other relevant funding activities are implemented for example by the Austrian Research Promotion Agency (FFG) or via the Christian Doppler Research Association (CDG).

Excellence-oriented individual funding and sustainability in the FWF

As an institution, the FWF is committed to the topic of sustainability and transformation at various levels. This includes, for example, participation in various international funding networks of relevance, which have been conducting various calls for proposals for several years and thus support excellent, thematic research. These are the following networks:

- European Partnership Water4All[299] on Water Resources Management: Resilience, Adaptation and Mitigation of Extreme Hydroclimatic Events and Governance Instruments
- European Partnership Biodiversa+[300] on improved, transnational monitoring of biodiversity and ecosystem change for science and society as well as on support for the protection of biodiversity and ecosystems on land and at sea
- The Belmont Forum[301] on integrated approaches to human migration and mobility in a time of rapid global change
- The ERA-Net Chanse,[302] which focuses on the theme of transformation and social and cultural dynamics in the digital age

In addition, an analysis of the research projects funded by the FWF in recent years shows that research on sustainability issues is also frequently implemented in the FWF's thematically open programmes.

In the years 2018–2022, the FWF has funded a total of approximately €25.5 million in research projects on the topics of "sustainability", "climate" and "green deal".[303] This corresponds to approximately 2.1% of all FWF funding in this period. The comparison period shows fluctuations both in the amount of funding awarded and in the share of the FWF's total funding volume. In 2021 and 2022, corresponding projects were funded with more than €6 million.

298 This includes funding that is administered via research institutions (according to the PROFI principle – project funding via research institutes).
299 https://www.water4all-partnership.eu/
300 https://www.biodiversa.eu/
301 https://www.belmontforum.org/
302 https://chanse.org/
303 For this purpose, the FWF conducted a keyword search among the funded projects using the keywords "climate", "sustainable" and "green deal".

In this context, the programmes "#ConnectingMinds", "Zukunftskollegs" and the "1000-Ideen-Programme" should be highlighted, also because a comparatively high proportion of relevant projects have been funded here in recent years. In the "#ConnectingMinds programme",[304] for example, transdisciplinary research projects are supported that are implemented by several scientists and individuals from other societal areas (administration, NGOs, companies, etc.) in order to support the joint research for solutions to complex current issues and to promote social engagement and collective learning. With the "Zukunftskollegs", in cooperation with the Austrian Academy of Sciences, internationally outstanding, interdisciplinary teams of junior researchers were funded to address interdisciplinary, innovative topics. Finally, the FWF's "1000-Ideen-Programme" funds particularly novel, bold or original research ideas with high scientific and transformative potential that are implemented by qualified researchers.

Moreover, one of the five recently selected clusters of excellence of the Austrian excellence initiative "excellent=austria", which promotes excellent basic research with exceptionally large funding sums (for Austria), contributes directly to a more sustainable society. From summer 2023, the Cluster of Excellence "Materials for Energy Conversion and Storage. Discovering new materials for an emission-free future" will launch under the leadership of TU Wien and is supported by ISTA, the University of Vienna and the University of Innsbruck. The cluster is funded with €20.6 million and aims to contribute to the creation of new technologies for efficient energy conversion and storage in order to make fossil fuels obsolete. The storage of renewable energies in recyclable energy carriers, for which an interdisciplinary team is developing nanocatalysts to design corresponding reactions quickly and reliably, is crucial for this.[305]

In addition to research funding, the FWF implements various measures to reduce the climate impact of research and research funding activities. These include, for example, the possibility for funded research projects to carry out CO_2 compensation for travel activities. In addition to various measures in the area of sustainability, a sustainability officer was established for the FWF's office and committees. At the European level, there is an exchange with sister organisations (German Research Foundation, Swiss National Science Foundation and Science Europe) in the area of sustainability.

Other excellence-oriented individual funding

In addition to the measures funded by the FWF, there are other funding activities that provide excellence-oriented funding for individuals with a focus on sustainability. These include the endowed professorships for which the BMK is responsible and the activities of the Christian Doppler Research Association financed by the BMAW.

The endowed professorships operated by FFG were last launched in 2021. The purpose of this instrument is to motivate outstanding researchers to take up professorships at public Austrian universities, where they can establish new topics in the Austrian research landscape and work on them for at least five years.[306] The funding is supplemented by the university's own resources and cash contributions from co-financing partners. The fifth call had a specific focus on the topics of climate protection and dealing with climate change. The result is three new endowed professorships on the topics of active mobility (University of Innsbruck), acoustics and noise development research (Graz University of Technology) and dynamic systems (Vienna University of Economics and Business).[307]

304 https://www.fwf.ac.at/de/forschungsfoerderung/fwf-programme/connectingminds
305 https://www.fwf.ac.at/de/news-presse/news/nachricht/nid/20230313-2850
306 https://www.ffg.at/stiftungsprofessur
307 https://www.ffg.at/presse/45-mio-euro-fuer-neue-stiftungsprofessuren-innsbruck-graz-und-wien

The Christian Doppler Research Association also carries out various research activities related to sustainability. At least six CD Laboratories and five JR Centres deal specifically with sustainability, and others might become relevant in the future. Examples are the CD laboratories on the dynamics of meta-ecosystems in regulated river landscapes, on the design and evaluation of an efficient, recycling-based circular economy, or the JR centre for the production of powdered activated carbon from municipal residues, which is investigating how activated carbon as a by-product of the recycling of waste and residual wood in wood gas power plants can also be used, for example, for previously unsolved problems in wastewater treatment.[308]

Diversity-oriented funding for individuals

Diversity-oriented funding for individuals supports high-quality science while at the same time setting other priorities, e.g. the promotion of women, the promotion of junior researchers or the integration of other actors in research.

An example of the latter are various Citizen Science activities, for which the BMBWF is responsible in Austria and which are implemented by the OeAD through Sparkling Science 2.0 and by the FWF through the Top Citizen Science programme. Both programmes focus among others on sustainability. In the first thematically open call for proposals for Sparkling Science 2.0, 34 outstanding Citizen Science projects were funded with a total funding volume of €11.5 million. The projects started in September 2022.[309] Thirteen of the projects are assigned to the natural sciences and deal, for example, with topics such as biodiversity and ecology of freshwater bacteria (Aquirufa project) or CO_2 conversion or the distribution and impact of microplastics in sensitive high alpine habitats (PLASTIC. ALPS).[310] Projects from other research disciplines are also related to sustainability, e.g. the social science projects "Snow2School" to record changes in snow in Greenland and Austria or "EAT+CHANGE" on nutrition as an everyday transformation.[311]

One programme in the area of promoting junior researchers is the "industry-related dissertations" financed by the BMK. Here, a doctoral candidate who is employed in a company or a non-university research institution and is scientifically supervised at a university works on scientific/technical research questions. In the seventh call for proposals (2021), one of the objectives of the call was that the dissertation project should contribute to sustainable development or future of Austria. From 2021 onwards, sustainability was taken into account in the evaluation criteria. For 2023, the call for dissertations "Dissertantinnen für Zukunftsthemen der Wirtschaft 2023"[312] is planned, which will explicitly address the focus areas of energy transition, mobility transition and circular economy.

In the area of the promotion of women, the "Talente" programmes also cover sustainability topics. With these programmes, the BMK pursues the goals of inspiring young people for research and development, connecting researchers with the business community and ensuring equal opportunities in this area. In 2021, for example, the call for FEMtech research projects focused on climate and the environment.[313] Accordingly, projects on topics such as "DraussenDaheim: Förderung klimaneutraler Mobilität durch digital unterstützte Szenarien gendergerechter urbaner öffentlicher Freiräume"[314] were funded. But research in this

308 https://www.cdg.ac.at/forschungseinheiten/labor/produktion-von-pulveraktivkohle-aus-kommunalen-reststoffen
309 https://www.sparklingscience.at/
310 https://www.sparklingscience.at/de/Projekte/ueberblick/naturwissenschaften.html
311 https://www.sparklingscience.at/de/Projekte/ueberblick/sozialwissenschaften.html
312 https://www.ffg.at/industrienahe-dissertationen
313 https://www.ffg.at/femtech-forschungsprojekte
314 https://www.ffg.at/projektdetail?pid=4088467

area is also supported by other FEMtech programme lines, such as "Talente Regional", for example in the project "COBS: CO_2le Bäume und Sensoren – klimaregulierende Ökosystemleistungen erforschen und analysieren".[315]

Another relevant instrument is the "Qualifizierungsoffensive",[316] which is handled by the FFG and for which the BMAW is responsible, and which aims to systematically develop and expand the research and innovation competences of companies and their employees and also supports the transfer of knowledge and cooperation between science and business. The focus is on digitalisation topics, but projects with a strong sustainability focus are also funded. One example is the Digital Pro Bootcamp "BSAIO – Boosting Sustainability with Artificial Intelligence and Optimisation".[317]

2.5 RTI evaluation culture and practice

For more than 25 years, research, technology and innovation policy in Austria has been characterised by an evaluation culture that focuses on quality and transparency. Programmes, and increasingly also institutions and instruments, are regularly evaluated with regard to goal achievement, impact and efficiency. Most evaluation reports are available to the public and can be accessed in the online in the repository of the Austrian Platform for Research and Technology Policy Evaluation (fteval). This platform brings together representatives of institutions that commission, conduct or are themselves subject of evaluations. To ensure an open approach to geographical, methodical and thematic focus, fteval is connected with related initiatives such as DeGEval – Gesellschaft für Evaluation, the Platform for Register Research and the Vienna Evaluation Network (VEN). Core activities include the development and publication of evaluation standards (latest version dated 2019), and the publication of the fteval journal, where key findings from evaluations are discussed from both academic and practice-oriented perspectives. Another focus is on events, with the international conference held every three years making Austria the centre of reflection on methods, challenges, and the role of evaluation in the RTI sector.

2.5.1 Current trends

Increased attention to societal challenges, and in particular to environmental goals, means that RTI policy measures are also increasingly expected to contribute to these goals. A fteval working group brought together representatives from the Austrian Institute for SME Research, IWI, ZSI, FFG, aws, BMK, AIT, the RFTE and WPZ Research to address the challenges and approaches for evaluation practice in connection with the environmental impacts of RTI policy measures.[318] It recommends the promotion of an ongoing exchange between RTI and environmentally relevant stakeholders. Furthermore, environment-related RTI policy measures should be included in the terms of reference of evaluations in a standardised manner, intervention logics should take into account direct, indirect and unintended side effects, along with this further developing environment-related indicator systems. The working group also recommends that evaluators be involved in the design of funding instruments. In this sense, the BMK has commissioned a study on impact monitoring for the management of mission oriented RTI programmes for the "Mobility of the Future" programme in order to create a conceptual basis for comparable RTI programmes.[319]

315 https://www.ffg.at/projektdetail?pid=3759720
316 https://www.ffg.at/qualifizierungsoffensive
317 https://www.ffg.at/projektdetail?pid=3725900
318 https://repository.fteval.at/id/eprint/576/1/fteval_J52_10.22163_fteval.2021.517.pdf
319 KMU Forschung Austria (ongoing).

Since the end of 2021, the BMK is engaged in a broad process in the sense of transformative governance. The basis for this is 14 impact and evaluation plans (IEP), which were developed in 2022 in all (priority) themes of the BMK (climate-neutral city, mobility transition, energy transition, circular economy, digital technologies, production, space, aviation, cooperation structures, innovation, competitiveness and internationalisation, IPCEI, people in RTI). In winter/spring 2022/23, a follow-up project was launched to further develop the impact-oriented monitoring and evaluation of RTI policy measures. According to the newly developed system, it should be possible to link new and existing information in a uniform, centrally organised and target-oriented manner, to support ongoing strategic knowledge building and to compensate for existing information deficits.

From 5 to 6 May 2022, the international conference of fteval took place under the title "REvaluation 2021|22" (COVID-19 postponed by half a year) in presence as well as online, financed by BMK, BMBWF, BMAW, WWTF, FWF and FFG. The conference was dedicated to the themes of transformation-resilience-anticipation.

2.5.2 Selected evaluations

The RTI evaluations completed or published since the publication of the Research and Technology Report 2022 are presented briefly below. The original evaluation reports which are much more comprehensive can be accessed and read online.[320] The evaluations presented here again cover a wide range of initiatives and programmes: two evaluations deal with sustainability and energy, namely the evaluation of the "Stadt der Zukunft" programme and the evaluation of the "research cooperation with the International Energy Agency (IEA)". In addition, the "interministerial cooperation in the field of Public Procurement Promoting Innovation" (PPPI) was evaluated, the added value of the BMBWF scholarship programmes was analysed, and "JumpStart", a pilot funding programme for incubators, was evaluated. In addition, an evaluation of the achievement of objectives of the pilot line "Social Crowdfunding" of the FFG programme "Impact Innovation" and an evaluation of the "BMBWF research infrastructure database" are now available.

Evaluation of the "Stadt der Zukunft" programme

With the "Stadt der Zukunft" programme, the BMK supported R&D projects for innovative building, neighbourhood and energy solutions in an urban context between 2013 and 2022. The implementation of the programme was supported by comprehensive accompanying measures on the part of the Austrian Society for Environment and Technology (ÖGUT) and involved not only the FFG but also the aws. The evaluation[321] carried out by Austrian Institute for SME Research on behalf of the BMK considered all activities and projects initiated since the beginning of the programme. It is based on the experiences and feedback of more than 500 funding recipients and stakeholders as well as members of the programme management, which were obtained through interviews and surveys and workshops. It assesses the quality of the programme design and implementation, the significance of the impacts achieved, and the efficiency of the resources used.

The evaluation shows that the programme was able to differentiate itself from other funding initiatives by addressing timely and relevant issues, and was thus an important addition to the existing funding portfolio. The programme attracted new beneficiaries and stimulated a high number of new collaborations between research institutions, companies and regional authorities. The surveyed grantees were overall very satisfied with the accompanying measures offered by ÖGUT. Participation in the programme proved to be an effective way to increase the quality and effectiveness

320 https://repository.fteval.at
321 https://nachhaltigwirtschaften.at/de/sdz/projekte/programmevaluierung-stadt-der-zukunft-2013-2021.php

of R&D projects in the view of many beneficiaries. By ensuring a high degree of coherence between the development objectives at project level and the objectives of the programme, the funded projects were able to make measurable impact contributions to all operational and strategic objectives, both in the form of new products and services with lower energy and resource consumption, and in the areas of urban planning, standardisation, and legislation.

Despite the frequent involvement of companies and local authorities in the funded projects, few private investments were made to finance follow-up activities, such as the marketing and scaling up of the developed technologies. The majority of follow-on projects were financed by further public funding. Furthermore, the programme's ambition to promote systemic solutions for implementation at the neighbourhood level (i.e. beyond individual buildings) could only be realised to a very limited extent. For the design of the new RTI priority "Climate Neutral City", in which the activities of "Stadt der Zukunft" will be embedded from 2023 onwards, the evaluation recommends a stronger focus of research funding on projects for the development of urban system innovations that take into account both technological and social aspects in an integrative manner. Furthermore, in line with the EU mission "100 Climate Neutral and Smart Cities by 2030", it is recommended to involve cities more in innovation processes and to make appropriate adjustments towards a more flexible funding system. Accompanying measures should continue and focus more on networking and exchange formats to build a cross-sectoral community of experts and stakeholders.

Evaluation of the IEA Research Cooperation 2011–2021

Technopolis Austria was commissioned in December 2021 to evaluate the national programme "Forschungskooperation Internationale Energieagentur" (in short: IEA Research Cooperation)[322] financed by the BMK and the Climate and Energy Fund (KLIEN). The IEA Research Cooperation for the period 2011–2021 was assessed with regard to the effectiveness of the programme, the programme design and the accompanying processes.

Since joining the IEA in 1975, Austria has participated in internationally organised research activities. At the time of the evaluation, Austria was participating in 21 of the 38 "Technology Collaboration Programmes" (TCP), which are the sub-units of the funding programme. The national programme is administered by FFG. The BMK and KLIEN are responsible for the selection of the annually announced activities ("tasks" and "annexes") and thus for the thematic design of the programme.

The evaluation is based on interviews, document analyses, online surveys of programme participants and representatives in the bodies of the IEA Research Cooperation, as well as evaluations of FFG funding data and various data sets on the website.

The IEA Research Cooperation is a comparatively small programme with about €2.7 million per year (€2.3 million from the BMK and €0.4 million from KLIEN). The greatest benefit of the programme lies in (i) the international networking of researchers, which has an impact beyond the IEA Research Cooperation network, e.g. through the creation of follow-up projects with international partners, and (ii) the strategic function of positioning Austrian priorities and activities in energy research at the international level.

It is therefore recommended that the programme be continued with a significantly increased budget, possibly with a second call per year, and with a focus on funding topics of strategic importance. The BMK should ensure that the thematic priorities are monitored. Strategic objectives and the involvement of new actors should be kept in mind. To make better use of knowledge on strategic issues and programme

322 See Technopolis (2022).

management questions, it is recommended to structure the exchange between representatives in the committees and those responsible for the programme. Online communication and networking meetings are assessed positively and should be continued or extended.

Evaluation of the cooperation in the field of PPPI between BMAW, BMK and BBG

Public Procurement Promoting Innovation (PPPI) is a demand-side instrument of innovation policy – with the aim of triggering innovation impulses at the Austrian business location. The implementation of the PPPI Action Plan has been carried out jointly by the Federal Ministry of Labour and Economy (BMAW) and the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) since 2013; the PPPI service unit has been established in the Austrian Federal Procurement Agency (BBG) since 2013 and has been organised as a public-public partnership (PuP) since 2019. On behalf of the BMAW and the BMK, the Institute of Industrial Sciences and Pöchhacker Innovation Consulting GmbH conducted an ex-post evaluation[323] of the newly regulated PPPI cooperation in the period 2019–2022 from February to June 2022. The evaluation focuses on the effectiveness of the measures taken and the appropriateness of the operational implementation. Methodologically, the evaluation comprises a document analysis, an online survey (n = 154) among clients of the PPPI service unit, qualitative reflection talks with the cooperation partners, 15 in-depth interviews with selected target groups as well as a perspectives workshop with employees of the PPPI service unit.

The evaluation confirms that the activities carried out within the framework of the PPPI cooperation are an important stimulus and catalyst for innovative public procurement in Austria and build broad networks in the key target groups: "The various information, communication and qualification measures reach hundreds of procurers in public organisations every year, which supports the innovation orientation in these institutions and contributes to questioning purchasing practices that have been cultivated for decades and to breaking new innovative ground. And by bringing buyers and suppliers together through the PPPI Innovation Marketplace or the PPPI Challenges, innovative solutions and technologies are highlighted, which can be the first step towards a future business relationship for innovative – often young – companies."[324]

It is recommended to continue the cooperation in the form of a public-public partnership and to further strengthen it by increasing resources and visibility. It serves as a role model for other public sector Action Communities, in particular the established governance and monitoring structures are exemplary.

Added value of the BMBWF's scholarship and research cooperation programmes

The BMBWF's "scholarship and research cooperation programmes" include the five special guidelines for the promotion of the mobility of students, teachers, researchers and administrative staff at higher education and research institutions in Austria and abroad, which are known as foreign selection programmes, INCOMING scholarship programmes, OUTGOING scholarship programmes, programme scholarships and internationalisation measures. WPZ Research was commissioned by the BMBWF to examine the added value of these scholarships for the years 2016 to 2021, especially in the context of European programmes.[325] The amount of funding in 2020 was €16.84 million.

A mixed-methods research approach was chosen for the evaluation. 1,147 beneficiaries were invited to participate in an online survey and 50 in-depth interviews were conducted in a second sub-step.

323 See Industrial Science Institute (2022).
324 Ibid., p. 19.
325 See WPZ Research (2022).

The programmes, which are aimed at students, teachers, researchers, and higher education institutions administrators, were rated very positively overall. The added value of the BMBWF funding programmes lies in particular in the great flexibility with regard to the selection of host institutions and the high degree of inclusiveness with regard to age and country of origin. The INCOMING programmes offer researchers from developing countries a good opportunity to carry out parts of their research in Europe. For most participants, the programmes have had a positive impact on their further academic or professional development, and all interviewees considered it a great personal enrichment. The majority of interviewees emphasised the important competence gains in their disciplines as well as the knowledge transfer from which their home university also benefited. Among the BMBWF funding programmes, the Franz Werfel Fellowship was the most highly regarded by the respondents.

Recommendations for further development include stronger promotion of the programmes, a revision of the application process with a focus on scientific excellence and a better fit for researchers, as well as better funding and thus an adjustment of the fellowship amount, the project budget, and the travel allowances. As follow-up support has a high impact, it is suggested that positive experiences be applied to other fellowship programmes.

Ex-post evaluation of the pilot funding for incubators JumpStart Phase 1 and Phase 2

Since 2015, the BMAW's pilot funding programme "JumpStart" has supported incubators/accelerators and non-academic spin-off start-ups. The aws is responsible for managing the programme. The support is divided into two modules. Module 1 supports the development of innovative incubation concepts and offers by incubators and accelerators with up to €150,000 for a project duration of two years. The objectives of Module 1 are to develop innovative concepts, to trigger transfer effects to non-funded incubators, to enable the economic independence of funded incubators and accelerators, to promote cooperation between start-ups, scientific institutions, and experts and to develop new open innovation concepts. Module 2 supports innovation and growth activities of three to five start-ups per funded incubator with a funding amount of up to €22,500 per start-up per year. The aim of Module 2 is to stimulate growth potential, bundle incubated start-ups in one location, reduce risk and increase the attractiveness for private financing. The AIT was commissioned by the BMAW to carry out an ex-post evaluation of the outputs, outcomes and impacts of the first four calls for proposals, which funded 20 incubators.

For the evaluation,[326] 25 interviews were conducted with the management of funded incubators, incubated start-ups and other stakeholders. In addition, an online survey was carried out among the start-ups that used the programme and the results were compared with a control group based on the Austrian Startup Monitor (ASM).

The evaluation concludes that Module 1 contributed to the development of innovative concepts of the incubators/accelerators, to the dynamisation of the incubated start-ups, to the strengthening of the economic independence of the incubators/accelerators and to the strengthening of the cooperation between scientific institutions and start-ups. Transfer effects of the funded incubators to other incubators and the development of new concepts in the field of open innovation were only partially achieved. This is because knowledge about the concrete services offered and the exchange of information between individual incubators is limited. Overall, there was still too little demand from start-ups for open innovation services.

326 https://repository.fteval.at/id/eprint/618/

The study did not find evidence of risk reduction for start-ups in the sense of a higher probability of survival. Compared to start-ups in non-funded incubators, start-ups incubated in JumpStart incubators or accelerators developed disproportionately well. In addition, incubators with a thematic focus contributed to location-based clustering.

The study sees no immediate need to continue the programme in its current form through new calls. However, it is recommended to support community building among incubator leaders. It is also suggested that intermediaries targeting social and green start-ups should receive more support.

Assessment of the achievement of objectives of the pilot line "Social Crowdfunding" of the FFG programme "Impact Innovation".

As part of the "Social Crowdfunding" pilot phase, the FFG has been supporting projects since 2020 that focus on social innovation by setting up and successfully implementing a crowdfunding campaign to raise the necessary co-financing. A total of seven projects were supported in the period under review. On behalf of the FFG, ZSI prepared an assessment[327] in 2022 to evaluate the impact and process design of the pilot phase and to gather input on the design of the funding and financing options. The focus was on the potential of social innovations and the experiences of the submitting companies. The assessment also took into account the data from the "Impact Innovation programme" (160 projects) between 2019 and 2021.

The "Social Crowdfunding" pilot phase was part of "Impact Innovation", a programme run by the Austrian Research Promotion Agency (FFG) which funds the development of innovative ideas and solutions at 50% of the total costs of up to €150,000 (max. €75,000) per project.[328] The target group of the pilot phase are mainly social enterprises that can only raise the self-financing part with the help of alternative financing, such as crowdfunding. The projects submitted dealt with solutions to social problems, including in the areas of environment, education, and integration. The FFG's support included know-how and tools, specifically learning materials, coaching from the consulting agency "Crowdstrudel", a professional video shoot for the platform and networking of the crowdfunding campaigns via the FFG's partner platform "Startnext".

The evaluation was based on a characterisation of the pilot applicants in comparison to other "Impact Innovation" projects, interviews with applicants who used social crowdfunding and with applicants who did not use social crowdfunding. In addition, experts in the field of social entrepreneurship and crowdfunding were interviewed and an online survey was conducted among social enterprises that had not applied to the FFG funding programme. The report presents the experiences of the first funding projects in detail, and concludes that there exist some challenges in the crowdfunding process, but is also some potential: while the crowdfunding campaigns did not make a decisive contribution to the provision of the self-financing share – which is mainly explained by the early phase of the innovation projects, but also by the lack of an active community supporting the project – there are clearly positive effects on the quality of the projects. However, there is a clear positive impact on the social innovation projects thanks to the early development of marketing and communication strategies. Overall, the project teams are satisfied with the process design and the exchange with the FFG. In general, the Social Crowdfunding pilot phase, like the Impact Innovation programme, is seen as an essential building block in the Austrian funding landscape, without which many socially innovative ideas could hardly be realised.

327 https://repository.fteval.at/id/eprint/618/
328 https://www.ffg.at/ausschreibung/emergencycall-covid-19

Evaluation of the emergency call for research into COVID-19 in the wake of the SARS-CoV-2 outbreak

From March to May 2020, the FFG carried out a call for proposals entitled "Emergency Call for Research on COVID-19 in the Course of the Sars-CoV-2 Outbreak",[329] for which €26 million was available from funds of the BMAW and the BMK. The goal was to react quickly to the threats posed by the consequences of COVID-19 and to contribute to ensuring the supply of the population in crisis situations, to maintain the existing pharmaceutical production in Austria, and to reduce the dependence of the Austrian health system in medically relevant areas by developing alternative and innovative production strategies. Funding was provided for individual R&D projects in experimental development as well as clinical studies by Austrian companies; the FFG's Basic Programmes Division was responsible for handling the projects.

The evaluation,[330] by inspire research, should assess whether the call for proposals and the way in which it was implemented were suitable for achieving the objectives under the specific framework conditions and to what extent it was possible to develop products and services that contribute to overcoming the threats posed by COVID-19 and its consequences. To this end, a total of 42 interviews were conducted in spring 2022 with representatives of funded and non-funded companies, FFG and ministries. In addition, five comparable measures and programmes abroad were examined and included in the analysis.

The results underline that the FFG's call was an important signal for research-active Austrian companies to quickly address problem solutions in connection with the COVID-19 crisis and to push ahead with short-term development projects. In retrospect, given the initially underestimated duration of the crisis, a thematically open call with a focus on transformation processes to ensure the future viability of companies would have been appropriate. However, the format (direct funding of R&D projects by enterprises), the implementation and the thematic specifications were considered appropriate and correct for achieving the objectives. The intended project duration of 12 months could not always be met, especially in the field of clinical trials, mainly due to pandemic management measures such as access restrictions or supply bottlenecks. The shorter duration of the procedure (less consultation, shorter review period, "structured quick check") was well managed by FFG and well received by the companies. In the majority of cases, the projects produced positive results, and in about a quarter of the cases, these were already being used and exploited at the time of the evaluation. The evaluation concludes with recommendations that underline the positive experience with a thematic call for proposals for the basic programmes and the short application evaluation.

BMBWF Research Infrastructure Database: Evaluation Study 2022

The coordinated and documented procurement and use of cooperative and competitive research infrastructures is the fundamental guideline of the "BMBWF research infrastructure database".

Since 2011, the BMBWF research infrastructure database has included an internal inventory list of large-scale research infrastructures of the Ministry of Science and Research. The research infrastructure database includes the inventory of research infrastructures with cumulative acquisition costs over €100,000.

In 2016, the BMBWF, in cooperation with the WKÖ and the BMAW, further developed the existing research infrastructure database into a public database. The public research infrastructure database now provides an information platform on cooperative

329 https://www.ffg.at/ausschreibung/emergencycall-covid-19
330 https://repository.fteval.at/id/eprint/650/1/Bericht_FFG_COVID_200619.pdf

research infrastructures (Open for Collaboration) in Austria as part of the RTI Working Group on Research Infrastructures accompanying the RTI Strategy 2030 and in cooperation with WKÖ, BMAW and BMK. The main objective is to support scientific cooperation and the cooperative use of research infrastructures in science, research, and companies as well as with industry.

On behalf of the BMBWF, the certified expert, Horst Eidenberger, in cooperation with WPZ Research, carried out the evaluation of the research infrastructure database in the period from summer 2022 to spring 2023.[331] A mix of methods including a monitoring data analysis, focus groups, in-depth interviews and international benchmarking was chosen for the evaluation.

The core result of the evaluation is that the BMBWF has successfully developed the content and technology of the research infrastructure database in recent years. The research infrastructure database also plays a pioneering role in international comparison and offers both science and industry the added value of up-to-date information on cooperative research infrastructures. To further improve the centrally organised, publicly accessible database in the future, it is recommended to focus on target groups, to increase user-friendliness by reducing the number of accounting figures, to improve the symbolism of openness to cooperation, including the presentation of use cases, and to increase publicity.

331 See Eidenberger et al. (2023).

3 Monitoring in accordance with the Research Financing Act (FoFinaG)

Central research and research funding institutions

This chapter presents the monitoring of the central research and research funding institutions in accordance with Section 8 of the Research Financing Act (FoFinaG).

The GeoSphere Austria Establishment Act of April 2022[332] merged the the existing research institutes Zentralanstalt für Meteorologie and Geodynamik (ZAMG) and the Geologische Bundesanstalt (GBA) to form GeoSphere Austria (GSA), increasing the number of research institutions stipulated in the FoFinaG to six. Article 4 of the GeoSphere Austria Establishment Act defines the corresponding chantotal Although the GSA did not become operational until 2023, it was possible to integrate a section in the Austrian Research and Technology Report 2023 that describes the GSA and essentially shows the data of the two predecessor organisations.

This means that the central **research institutions** are:

1. Austrian Institute of Technology GmbH (AIT)
2. Institute of Science and Technology Austria (ISTA)
3. Austrian Academy of Sciences (OeAW)
4. Silicon Austria Labs GmbH (SAL)
5. Ludwig Boltzmann Gesellschaft – Austrian Association for the Promotion of Scientific Research (LBG)
6. GeoSphere Austria – Federal Agency of Geology, Geophysics, Climatology (GSA)

The central **research funding institutions** remain the same:

7. Austria Wirtschaftsservice mbH (aws)
8. Christian Doppler Research Association (CDG)
9. Austrian Science Fund (FWF)
10. OeAD-GmbH – Agency for Education and Internationalisation (OeAD)
11. Austrian Research Promotion Agency (FFG)

The present Austrian Research and Technology Report 2023 builds on the scheme developed over the last two years and contains the following further developments:

- Target values refer to 2023 or, in the case of three-year values, to 2021–2023.
- The foundation funds ("Stiftungsmittel") from 2022 relate to the Future Austria Fund, but in 2021 there are still funds from the National Foundation for Research, Technology and Development (NFTE) and from the Österreich-Fonds (Ö-Fonds). This is explained in the definitions. The foundation funds are public funds, but not federal funds.
- Indicator 2 is now called "evaluation systems" and refers exclusively to evaluations of thematic and strategic orientation.
- Indicator 7 (communication and interaction with society) is designed as a narrative and without target values; only the OeAD reports participants in projects with target values.

332 https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2022_I_60/BGBLA_2022_I_60.html

In addition, the following changes were made to the research institutions:

- The target value for indicator 1 (funding, including third-party funding) refers to the third-party funding ratio 2021–2023 (third-party funding/total income, for OeAW third-party funding/(funds from the performance agreement + third-party funding), excluding other income).
- For indicator 3 (human capital and qualifications), some institutions (AIT, OeAW and ISTA) report on early career researchers (PhD students and postdocs according to defined career stages) and provide the junior researchers rate as target values accordingly.
- For indicator 4 (output, innovation and excellence), no indices (Web of Science or Scopus) or target values were given for scientific publications, as the number of publications is not a measure of the quality of a publication and a purely quantitative growth strategy would send the wrong signal here. The survey of grants in ERC and FWF excellence programmes was carried out centrally by the FFG (EU Performance Monitor) and the FWF. The FWF's clusters of excellence are shown below the table, as the approvals were not made until 2023. A new section is the presentation of investments in research infrastructures. This refers to plant, equipment, facilities or other resources that are at one location or distributed across multiple locations or virtual. The institutions report their most important investments and refer to the link in the research infrastructure database (FID). The definitions include an explanation and references to important sources.
- For indicator 5 (internationalisation), new participations in the EU Framework Programmes in 2022 refer to Horizon Europe, and in 2021 still to Horizon 2020. The institutions' data were checked for the first time against the FFG figures (EU Performance Monitor). Analogous to the ERCs, only new projects from the years 2021 and 2022 are reported, with the date of contract signature applying. The approvals only include EU funds (no own contributions, no national co-funding).
- Indicator 8 (gender and promotion of gender equality) shows the Glass Ceiling Index (GCI) as the target value for some institutions (ISTA, OeAW and LBG), and the proportion of women in management positions for others (AIT and SAL).

At the research funding institutions

- In indicator 3 (human capital and qualification), three qualification and management levels were uniformly shown: assistance, experts, management level;
- For indicator 4 (output, innovation and excellence), the scientific publications at the FWF and CDG are surveyed in the same way as at the research institutions; target values are shown for consultations, patents (FFG and aws) and SME shares (FFG and aws);
- Indicator 5 (internationalisation) reports the share of projects with international partners as percentage of all projects without a target value (with the exception of the FWF); the descriptive presentation of central memberships is omitted.

The table offers an overview of the reported target values. It should be noted that GSA does not yet define target values.

Table 3-1: Overview of target values

Research institutions		
Indicator	**Target values**	**Facilities**
Funding, including third-party funding	Third-party funding ratio 2021–2023	AIT, OeAW, ISTA, SAL, LBG
Human capital and qualification	Young talent quota 2023 Completed dissertations 2023	AIT, OeAW, ISTA, SAL AIT, ISTA, SAL, LBG
Internationalisation	Cumulative number of Horizon Europe applications 2021–2023	OeAW
Gender and promotion of equality	Glass Ceiling Index 2023 Proportion of women in leadership positions 2023	OeAW, ISTA, LBG AIT, SAL
Research funding institutions		
Indicator	**Target values**	**Facilities**
Output, innovation and excellence	Share of SMEs in all companies 2023	aws, FFG
	Number of consultations 2023	aws, OeAD (also advice on foreign law), FFG (national and international)
	Patents applied for, patent advice 2023	aws, FFG
Internationalisation	Share of projects with international partners 2023	FWF
Communication and interaction with society	Participants in interactive formats 2023	OeAD
Gender and equality promotion	Project Manager 2023 Women on evaluation panels 2023 Reviews conducted by women 2023 Difference in the approval rate 2023	FWF, CDG, FFG aws, CDG FFG FWF

Overall, it can be seen that most institutions are growing, partly also due to the resources from the Future Austria Fund that have been available since 2022. The OeAD is even growing quite significantly due to the assumption of new tasks, while the LBG is recording declining revenues due to the closure of two research groups in 2022. In the Excellence Programmes, ISTA and the Austrian Academy of Sciences are the main successes, but the participations in the Framework Programmes have increased significantly at all research institutions in 2022.

Likewise, all research institutions show noticeable increases in the proportion of women in leadership positions; GeoSphere Austria is currently still an exception here. The proportion of female project leaders and the presence of women in selection decisions are also increasing at the research funding institutions.

It should be noted that the values given for the individual facilities may contain rounding errors.

3.1 Austrian Institute of Technology (AIT)

3.1.1 Profile and key figures

Profile of the organisation

The Austrian Institute of Technology (AIT) holds a leading position in innovation in Austria and plays a key role at European level as the research and technology institution that addresses the key infrastructure issues of the future. The research and technological developments of the AIT realise fundamental innovations for the next generation of infrastructure technologies in the areas of Energy, Low-Emission Transport, Health & Bioresources, Digital Safety & Security, Vision, Automation & Control and Technology Experience. These scientific research areas are complemented by expertise in the field of Innovation Systems & Policy. As a national and international hub at the interface between science and industry, the AIT makes innovation possible thanks to its scientific and technological expertise, experience in the markets, close customer ties and an outstanding research infrastructure.

Key figures 2021 and 2022

	2021	2022
Total income in €1,000	179,059	190,926

Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	916	415	1,331	935	461	1,396
Full time equivalents (rounded)	835	343	1,178	859	382	1,241

Source: AIT.

3.1.2 Development of indicators

Indicator 1: Funding, including third-party funding

In contrast to the "central key figures", all indicators in Chapter 3.1.2 refer to AIT without Seibersdorf Labor GmbH and Nuclear Engineering Seibersdorf GmbH.

	2021 in €1,000	2022 in €1,000	Target value 2021–2023 in %**
Total operational income	135,985	144,737	
of which shareholder contributions	50,801	53,713	
of which third-party funding	85,184	91,024	
of which non-EU countries and global organisations	1,694	2,633	
of which public	284	212	
of which private	1,410	2,421	
of which from the EU and European countries or organisations	26,901	27,927	
of which public	18,877	21,606	
of which private	8,024	6,321	
of which national and regional organisations	56,589	60,464	
of which public	32,106	34,146	
of which private	24,483	26,317	
Third-party funding ratio* in %	62.6%	62.9%	63%

* Share of third-party funding in total income in %. ** Due to fluctuations in third-party funding disbursements between individual years, average values over three years are given here. Source: AIT.

Indicator 2: Evaluation systems

Evaluations of the thematic and strategic orientation

In addition to compliance with legal and normative requirements, AIT's regulations are based on economic aspects, social aspects, safety and environmental factors. The management formulates the quality policy and objectives and thus bears the highest responsibility. The employees act according to defined QM documents and strive for continuous improvements to achieve excellence and customer satisfaction. Compliance with the regulations is monitored through internal and external audits.

The AIT has a Strategic Research Advisory Board consisting of internationally recognised personalities from science and research, whose main tasks include commenting on and making recommendations on the strategic orientation and the research programme, as well as making recommendations on the programme to the Supervisory Board. In addition, an evaluation for the current strategy period is carried out in a three-year cycle. An international evaluation panel is set up for each centre to assess the scientific quality, the impact of the research results, the international positioning and the application relevance of the activities and to issue an opinion on the strategic development.

Indicator 3: Human capital and qualification

Number of employees (including LKR Leichtmetallkompetenzzentrum Ranshofen GmbH (Competence Unit "Light Metals Technologies Ranshofen"))	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	765	337	1,102	784	371	1,155
of which at management level (department head, division head, general management, head of staff unit)	31	8	39	34	9	43
Full time equivalents (rounded)	835	343	1,178	859	382	1,241
of which at management level	29	8	37	32	9	41

Source: AIT.

Number of PhD students	2021	2022	2022
Number of theses completed	38	18	30
Employees (= headcount)	182	157	
of which employed at the AIT	136	122	
of which in structured education (doctoral schools or similar)	46	35	

Junior researchers*	2021	2022	2022
Employees (= headcount)	182	200	
Share of (scientific) employees**	24.4%	25.7%	25%

* AIT definition: all juniors in the Science and Research Engineer/Expert Advice career models and all PhD students with AIT contracts/permanent positions. ** Number of all PhD students with AIT contracts and all students in the Science and Research Engineer/Expert Advice career model, as of 31 December for 2021 and 2022

Source: AIT.

The following staff development measures were implemented in 2021 and 2022:

- **Recruiting & employer branding:** expansion of external presence (career talks, social media campaigns), "gender initiative": female scientissts as role models, Divörsity action days, cooperation with SHEtech; re-evaluation of onboarding app and onboarding process
- **Qualification:** Continuation of the AIT qualification programmes; gender & diversity training for managers; focus: seminar for managers on leadership in times of (New) Work; seminar for employees "Reflection and self-motivation for the present and future".
- **Career development:** evaluation of the PhD programme according to the new mode; first AIT Female Leadership Development Programme (graduation)
- **Organisational development:** Conducting the 2022 employee survey with a focus on new work and diversity

Indicator 4: Output, innovation and excellence

Scientific publications	2021	2022
Monographs and editions	12	15
Articles/contributions in scientific journals, edited volumes and proceedings	603	571

Source: AIT.

Grants in ERC and FWF Excellence Programmes

In the reporting period 2021–2022, there were no approvals in the FWF START and FWF Wittgenstein programmes. There were also no ERC grants with AIT researchers as lead principal investigators, although the AIT is a partner in an ERC Advanced Grant approved in 2022.

In the FWF Clusters of Excellence approved in March 2023, the AIT is involved in the "Microbiome as a driver of planetary health" cluster with a project share of 3%; the grant amounts to €629,000 (FWF funds only).

Investments in research infrastructures 2021 and 2022:

The AIT operates a unique research infrastructure, which was strengthened in 2021 and 2022 with investments of €19.94 million in future-oriented research areas. This research infrastructure and its further development form the foundation for AIT's innovative capacity and are in line with the underlying corporate strategy. The most important infrastructure investments include a new laboratory for optoelectronics and high frequency, the LKR casting-forming simulation testing technology, a laboratory for energy system components with test benches for high current tests, the acoustics and dynamics laboratory and the SmartEST laboratory. In 2022, the existing battery laboratory for research on conventional lithium-ion battery cells was also expanded to include the solid-state laboratory, which enables research on manufacturing processes for a new generation of batteries.

Three important Core Facilities* 2021 and 2022

Designation	Research focus	Web link to the research infrastructure database
SmartEST lab	Testing of components and systems with simulated grids and primary energy sources	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/smart-electricity-system-and-technology-laboratory-smartest-lab_3826
Power System Components Lab (PSC Lab)	Testing and validation of power current systems	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/power-electronic-lab_3863
LKR Foundry Technology Laboratory	Testing equipment for small-scale casting tests and experimental modifications to alloys	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/giessereitechnik-labor_4899

* All research infrastructures that were newly acquired in the reporting period and have an acquisition value (cumulative) of more than €100,000 (incl. VAT) as of 31 December and are located at the institution. An explanation of investments or acquisition costs for research infrastructures can be found in the definitions.

Source: AIT.

Indicator 5: Internationalisation

	2021	2022
Share of international co-publications in all publications	60%	63.8%
Number of newly approved participations in Horizon 2020 and Horizon Europe programmes and initiatives	20	64
Total funding approved* in €1,000	9,413	38,327

* Only EU funds are shown, no own contributions or national co-financing. The year in which the contract was signed applies.

Source: AIT, FFG EU Performance Monitor.

Indicator 6: Knowledge and technology transfer

	2021	2022
Share of co-publications with industry and practice partners in all publications listed in WoS	37%	39%

Patents & Exploitation Activities*	**2021**	**2022**
Patent applications	42	36
of which national	8	8
of which EU/EPC	12	10
of which non-EU countries	22	18
Issued patents	64	73
of which national	9	14
of which EU/EPC	37	51
of which non-EU countries	18	8
Exploitation spin-offs	1	1

* A new IP database was implemented at the AIT in 2021, so the evaluations for 2021 have now also been updated to the new level of detail.

Source: AIT.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

Formats for communicating and imparting knowledge:

- Long Night of Research
- European Researchers' Night
- Discussion round at Berlin Science Week
- GirlsTechup! Day of the Austrian Association for Electrical Engineering
- Positioning of female experts at SHEtech
- Performance at Airpower
- Exhibition at Ars Electronica
- International trade fair appearances

- AIT blog
- Digital and social media channels, APA OTS
- AIT experts in print media, radio, TV
- Media cooperation on research topics
- Lectures at (inter)national research institutions

Project examples:

- In the TechEthos project,[333] citizens contribute their values and attitudes to emerging technologies and thus play a role in shaping the future in the EU. Their anonymous voices are taken into account in regulatory efforts of technology development processes.
- The digital stress coach mHealthINX, developed under the coordination of AIT, helps to prevent burnout among older people
- The DraussenDaheim project uses innovative, digital approaches to open up new possibilities for evaluating urban open spaces, developing them in a participatory manner and designing them in a gender-responsive way.
- In the SEED project, safety aspects for e-scooters are investigated and preventive measures for increasing road safety are derived

Indicator 8: Gender and promotion of equality

Proportion of women in management positions by management level	2021	2022	Target value 2023
Managing Directors	0	0	
Head of Centre/Head of Administrative Area	20%	20%	
Principal Scientist	14%	20%	
Glass Ceiling Index based on management levels*.	1.49	1.53	
Percentage of women in project leader functions**	48%	38%	50%

* Calculated as the share of women in all employees/share of women in management positions. The explanation of the glass ceiling index can be found in the definitions. Management positions are defined as: Managing Directors, Head of Centre, Head of Administrative Area, Principal Scientist ** This figure refers to the percentage of female project leaders in relation to all female employees in the Science and Research Engineer/Expert Advice career paths. It does not include employees in other career paths. Due to the above-average success in recruiting young female scientists, the proportion fell in 2022. Source: AIT.

The following activities to promote equality were implemented in 2021 and 2022:

- **Recruiting & employer branding:** Participation in women-specific programmes to position AIT and its female experts as well as participation in events with a gender focus (Divörsity Action Days, cooperations: SHEtech, FEMpowermint Hagenberg, FIT Info Days); ongoing internal information formats on gender activities; events of the AIT Women's Network. Thanks to these activities, it has been possible to significantly increase the number of

333 https://www.techethos.eu/

female researchers, who will increasingly take on project management functions in the coming years in order to reach the target value of 50% with an increased total number of female scientists.

- **Qualification and ongoing training:** Access to the company's training offer for all employees regardless of gender and employment level, mandatory further training for different target groups and specific further training measures for women in the organisation: Implementation of the AIT Female Leadership Development Programme.
- **Reconciliation of work and family:** Supporting employees in designing their personal work-life balance with special attention to flexible working hours and teleworking, holiday care for children.
- **Structural measures:** Gender information area on the intranet for AIT employees, discussion forums for both women and management at AIT; AIT gender monitor.

3.1.3 Special events in 2022 and outlook

Special events 2022

In 2022, there were numerous highlights at the AIT in the course of implementing the Strategy 2021+, some of which are listed below. At the end of March 2022, the Austrian Gaia-X Hub was launched by the Federal Ministries BMF and BMK, with the AIT appointed as its coordinating body. In 2022, the AIT was recognised by the IAEA as the first and currently only official Collaboration Centre for Information and Computer Security for Nuclear Security. The newly founded Battery Technologies Competence Unit deals with the materials of future battery technology, transfers these to processability for (semi-)industrial scales and places a research focus on the development of solid-state batteries. The innovative, preventive AIT Mobility Observation Box, whose automated and objective traffic conflict analyses enable an increase in road safety especially for non-motorised road users, was awarded the Ö3 Traffic Award in 2022. Across all centres, the AIT was able to demonstrate its successful positioning in the international environment this year, especially with the acquisition of new projects within the framework of Horizon Europe.

Outlook

With its expertise in concrete applications and technologies as well as cross-sectoral system competence, the AIT supports its customers and partners in current challenges and transformation processes, especially with regard to decarbonisation and digitalisation. Innovative solutions are often developed across centres and with industry.[334]

334 For more information, see the AIT annual financial statements. The most recent annual financial statements can be found at https://www.ait.ac.at/en/media/annual-financial-statement.

3.2 Institute of Science and Technology Austria (ISTA)

3.2.1 Profile and key figures

Profile of the organisation

The Institute of Science and Technology Austria (ISTA) was established in 2006 by the Austrian Federal Government and the Government of Lower Austria. Its Klosterneuburg campus was opened in 2009. It serves cutting-edge research in the field of basic research in the natural sciences. ISTA's goals are to open up new fields of research and to ensure high-quality postgraduate education in the form of interdisciplinary PhD and postdoctoral programmes. Research, training and the selection of personnel are internationally oriented; the working and teaching language is English. By 2036, there will be about 150 research groups and a total of more than 2,000 employees on campus.

Key figures 2021 and 2022

	2021	2022
Total income in €1,000	84,802	78,518

Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	520	415	935	548	451	999
Full time equivalents (rounded)	512	390	902	535	414	949

Source: ISTA.

3.2.2 Development of indicators

Indicator 1: Funding, including third-party funding

	2021 in €1,000	2022 in €1,000	Target value 2021–2023 in €1,000*
Total income	84,802	78,518	
of which public basic funding from the Federal Government	52,906**	36,829	
of which cash-in obtained from eligible third-party funds	21,638	23,727	> 22,000
of which funding from the federal state of Lower Austria	2,822	3,924	
of which other sales revenues and other operating income	10,349	12,590	
of which from the release of investment grants	8,951	10,588	
of which third-party funding	18,725	25,174	
of which non-EU countries and global organisations	2,926	4,570	
of which from EU and European countries or organisations	10,783	11,462	
of which national and regional organisations	5,016	9,142	

* Due to fluctuations in third-party funding disbursements between individual years, average values over three years are given here. ** The value for basic public funding in 2021 corresponds to the audited annual financial statements now available and differs from the provisional value reported in the previous year.

Source: ISTA.

Indicator 2: Evaluation systems

Evaluations of the thematic and strategic orientation

ISTA is subject to the governance of a number of bodies that take on precisely defined tasks. The Board of Trustees and the Executive Committee oversee the development and strategic direction of the Institute, and the Scientific Council prepares proposals for scientific direction and for ensuring high scientific performance. As stated in the Federal Act Establishing the Institute of Science and Technology Austria §5 (2), the development of the Institute is regularly evaluated. So far, one economic evaluation (2014–2015) and three scientific evaluations (2011, 2015, 2019) have taken place, in which an excellent development of the Institute was noted.

Indicator 3: Human capital and qualification

Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	520	415	935	548	451	999
of which at management level (faculty (professors and assistant professors), executive board, division heads, unit heads)	67	21	88	68	23	91
Full time equivalents (rounded)	512	390	902	535	414	949
of which at management level	67	20	87	66	23	89

Source: ISTA.

Number of PhD students	2021	2022	Target value 2023
Number of theses completed*	23	23	> 22
Employees (= headcount)	280	309	
of which employed at ISTA	280	309	
Of which women	121	134	
of which in structured education (doctoral schools or similar)	280	309	
Junior researchers (as defined in the performance agreement)**	323	352	> 228

* PhDs according to the definition in the LV, target value according to the definition LV ** Training of junior researchers according to the definition in the LV, target value according to the definition LV 2021–2023: The Institute's target is that if x professors (including assistant professors) are employed at the Institute on 31 December of a year, two years later 3.5 x students (PhD students, combined MS+PhD students and Scientific Interns) will be trained in ISTA's Graduate School. Source: ISTA.

The following staff development measures were implemented in 2021 and 2022:

- The Career Development Office offers a range of target group-specific training for the academic sector: these include training in the areas of academic skills, technical skills, career development (both academic and intersectoral career planning), grant proposal training and training on standards of good scientific practice.
- The staff of the administration and the Scientific Service Units have access to a comprehensive further education and training programme as well as specific training on the topic of leadership.
- The Employee Assistance Programme (EAP) – a professional psychological counselling service – is available to all employees free of charge.

Indicator 4: Output, innovation and excellence

Number of scientific publications	2021	2022	Target value 2023
Monographs and editions	25	23	
Articles/contributions in scientific journals, edited volumes and proceedings	434	403	
Percentage of publications with at least one co-author with another affiliation	90.3%	90.2%	≥ 75%

Source: ISTA

Grants in ERC and FWF Excellence Programmes		2021	2022
ERC	Number	3	8
	Total funding approved in €1,000	6,145	14,699
FWF Wittgenstein Prize	Number	0	0
	Total funding approved in €1,000	-	-
FWF Start Programme	Number	0	0
	Total funding approved in €1,000	-	-

For the ERC, Starting Grants, Consolidator Grants and Advanced Grants are counted; other grants and co-beneficiaries can be specified in free text. The year in which the contract was concluded applies. Source: FWF, FFG EU Performance Monitor.

In addition to the projects listed in the table, ISTA received an ERC Proof of Concept (PoC) Grant (contract signed in 2022) and an ERC Synergy Grant as coordinator (contract signed in 2023).

Project components acquired in the FWF 2023 Cluster of Excellence Programme	Share	Grant amount* in €1,000
ISTA total	**0.22**	**4,589**
Cluster: Materials for energy conversion and storage	0.08	1,649
Cluster: Microbiomes as drivers of planetary health	0.03	630
Cluster: Quantum Science Austria	0.11	2,310

* Only FWF funds without own contributions. Source: FWF.

Investments in research infrastructures 2021 and 2022:

Strategically, the Core Facilities (organised at ISTA in the Scientific Service Units) are an essential success factor for the Institute, on the one hand in faculty recruitment, but also in the cost-efficient operation of high-end equipment with the broadest possible user base. The organisation of the Core Facilities allows all ISTA research groups access to the equipment on equal terms. This is a major advantage, especially for young group leaders. Experts in the Core Facilities support the research groups in their experimental work and thus secure long-term knowledge about methods and applications.

Infrastructure investments 2021 and 2022

- Three spectrometers (600 Mhz, 700 Mhz, 800 MHz) with various probe heads
- Ultra High Vacuum Sputtering
- Two spinning disk microscopes
- Physical Property measurement System

Three important Core Facilities* 2021 and 2022		
Designation	**Research focus**	**Web link to the research infrastructure database**
Electron Microscopy Facility	Biological and material science sample preparation and imaging with different EM technologies for structure elucidation, spectroscopy and nanostructuring	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/electron-microscopy-facility_2404
Imaging Facility	Light/laser microscopy and flow cytometry to support cell biologists, neuroscientists but also physicists, chemists and biochemists.	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/imaging-facility_2421
Nanofabrication Facility	Micro- and nanofabrication processes to develop new processes or develop new nanostructures. Exploring quantum phenomena.	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/nanofabrication-facility_3644

* All research infrastructures that were newly acquired in the reporting period and have an acquisition value (cumulative) of more than €100,000 (incl. VAT) as of 31 December and are located at the institution. An explanation of investments or acquisition costs for research infrastructures can be found in the definitions. Source: ISTA.

Indicator 5: Internationalisation

	2021	2022
Share of international co-publications in all publications in the reporting year	79.2%	81.6%
Number of newly approved participations in Horizon 2020 and Horizon Europe programmes and initiatives (including ERC)	6	15
Total funding approved * in €1,000	11,091	16,694

* Only EU funds are shown, no own contributions or national co-financing. The year of contract signature applies.
Source: ISTA, FFG EU Performance Monitor.

Indicator 6: Knowledge and technology transfer

Patents & Exploitation Activities	2021	2022
Number of patent applications	7	9
Issued patents	0	2
Exploitation spin-offs	0	0

Source: ISTA.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

- Public ISTA Lectures (internationally recognised top researchers present their work in generally understandable terms)
- Science-Industry Talk (together with the Federation of Austrian Industry)
- ISTA Science Talks Public lectures by ISTA researchers in German.

- TWIST Talk (lecture series to promote exchange between industry, start-ups and the research community)
- Long Night of Research (May 2022)
- Science Education Day: Annual event for teaching staff and researchers to teach science
- Zoom a Scientist: Bringing school classes into conversation with scientists
- Science Communication Day (September 2022): An initiative to counteract lack of trust in science and the spread of disinformation. Over a hundred participants discussed problems (and solutions) with an international panel of experts.
- Open Campus: The largest science festival in Klosterneuburg took place in June 2022
- Summer Campus 2022: Targeted camps for primary school children, as well as for middle and high school students

Indicator 8: Gender and promotion of equality

Share of women in management positions by management level	2021	2022	Target value 2023
Management	0%	0%	
Division heads/unit heads	43.5%	45.5%	
Faculty (professors and assistant professors)	17.0%	19.7%	
Glass Ceiling Index on the basis of management levels*.	1.86	1.79	1.75

* Calculated as the share of women in all employees/share of women in management positions. The explanation of the Glass Ceiling Index can be found in the definitions. Source: ISTA.

The following activities to promote equality were implemented in 2021 and 2022:

Increasing the proportion of women is a key strategic focus for ISTA. ISTA relies on various measures to achieve this:

- Targeted scouting of female postdocs: own recruitment committee for female professors, which specifically searches for suitable candidates and actively invites them to apply; half of the newly appointed faculty members in 2022 were women.
- Bias awareness training for professors and managers of the administration and scientific service units.
- Expansion of the dual career concept in order to be able to take greater account of partners' careers in future.
- Ongoing implementation of the gender equality concept developed in 2022.
- WoMen in Science: Change the World! has been a focus since 2021 with different activities (e. g. the WoMen in Science Day, Men and Women in Science panel event November 2022).
- STEM fatale lecture series: Successful women from the STEM disciplines (mathematics, computer science, natural sciences, technology) present their career paths and how they have overcome challenges in their professional careers so far

3.2.3 Special events in 2022 and outlook

Exemplary research findings 2022

- Research by the Friml Group in 2022 clarified one of the oldest controversies about signal transduction within plants. It concerns the important plant hormone auxin. The group confirmed the potential of the binding protein ABP1 as an auxin receptor, which had been doubted since its discovery 50 years ago.
- It took fifty years for Erdős conjecture to be solved. Prof. Kwan was able to present the proof that proves the existence of so-called Steiner triplets with a high waist width.
- Majoranas are theoretically predicted, previously undiscovered quantum particles that promise advances in quantum computers. The Katsaros group was able to debunk previous discovery reports as false measurements and explain what the confusion was.
- Researchers in the Novarino group used brain organoids – miniature models of the organ – to elucidate how mutations in a high-risk gene for autism disrupt brain development.

Outlook:

- On 1 January 2023, ISTA will have a new president in the person of Prof. Martin Hetzer. Prof. Martin Hetzer was most recently Senior Vice President and Chief Science Officer at the Salk Institute in La Jolla, California.
- In order to achieve the goal of establishing 150 research groups on campus by 2036, the successful recruitment of top international scientists continues to be the focus of ISTA's activities.
- The areas of science education and technology transfer are being continuously expanded.
- The Institute's sustainability concept is implemented on an ongoing basis.[335]

335 For more information, see the ISTA Annual Report. The latest annual report can be found at: https://ist.ac.at/de/institut/dokumente/#Jahresberichte

3.3 Austrian Academy of Sciences (OeAW)

3.3.1 Profile and key data

Profile of the organisation

"To promote science in all respects" is the statutory mission of the Austrian Academy of Sciences (OeAW), Austria's largest and most diverse non-university institution for basic research.

As a research institution of 26 institutes in the humanities, social and cultural sciences ("GSK"), as well as in natural, life and technical sciences, the Austrian Academy of Sciences takes up forward-looking research topics – often interdisciplinary –, acts in an open-minded manner, and preserves cultural heritage.

As a research funding body, the OeAW supports promising scientific talent, both intramurally through an attractive career model and throughout the Austrian research area by awarding fellowships and prizes.

As a national academy of sciences, the Austrian Academy of Sciences is a learned society and a mediator of knowledge and – from a multidisciplinary perspective – contributes the latest scientific findings to the public discourse.

The interaction of these areas under a common roof creates synergies, dynamics and innovation potential for the benefit of science and society.

Key figures 2021 and 2022

OeAW total	2021	2022
Total income in €1,000*	205,233	210,245

Number of staff employed by the OeAW (incl. 100% subsidiaries); each as of 31 December	2021			2022			
	m	f	total	m	f	diverse	total
Employees (= headcount)	997	831	1,828	995	855	1	1,851
Full time equivalents (rounded)	851	656	1,507	848	681	1	1,530

* The total income corresponds to the sales revenue and other operating income according to investment and financial controlling as per Company Code. The figures for 2022 are provisional. Source: OeAW.

3.3.2 Development of indicators

In contrast to the "central indicators" listed above, all of the following indicators, with the exception of indicator 7, refer exclusively to the OeAW as a research institution, i. e. excluding the learned society, fellowships and the commissioned area.

Indicator 1: Funding, including third-party funding

OeAW research performing organisation	2021 in €1,000	2022 in €1,000	Target value Average 2021–2023 in %**
Total income*	183,272	180,607	
of which federal funding due to OeAW -BMBWF performance agreement	116,160	116,074	
of which other income (costs charged on)	22,778	21,951	
of which third-party funding***	44,334	42,582	
of which non-EU countries and global organisations	881	360	
of which EU and European countries or organisations	16,258	12,086	
of which public	16,258	12,086	
of which private	0	0	
of which national and regional organisations	27,195	30,136	
Of which public	27,184	30,124	
of which NFTE, Ö-Fonds and FZÖ	3,020	1,572	
of which private	11	12	
Third-party funding ratio**** in %	27.6%	26.8%	> 27%

* Total income excludes extraordinary income from the reversal of provisions, accrued expenses and deferred income and excludes income from the disposal of fixed assets. ** Due to fluctuations in the disbursement of third-party funds between the individual years, an average value over the years 2021–2023 is given as the target value. *** Third-party funds are shown after the allocation of funds and do not include accruals. **** The third-party funding ratio is calculated as: Third-party funds/(funds from the performance agreement + third-party funds), excluding other income. Source: OeAW. The figures for 2022 are provisional.

Indicator 2: Evaluation systems

Evaluations of the thematic and strategic orientation

Regular or occasional evaluations by international teams of high-ranking researchers, whose independence and expertise are the responsibility of the OeAW Research Council, including Nobel Prize winners, provide essential impulses for the further development of the OeAW institutes and initiatives. The results of these procedures, which are carried out according to international standards, are incorporated into the three-year target agreements with the institutes and are the starting point for decisions on the design of the OeAW's research base.

JA Scientific Advisory Board, consisting of national and international experts, accompanies each of the institutes of the OeAW. The advisory boards are newly appointed every five years and have the task of continuously contributing to achieving and ensuring the highest possible level of research at the institutes.

Further measures designed according to international standards continuously and transparently ensure scientific quality, e.g. in filling scientific (management) positions, in ex-ante/ex-post project and programme controlling as well as in staff evaluation. All quality assurance processes take into account the particularities of the respective research field as well as special institute missions, e.g. the preservation of cultural heritage.

Indicator 3: Human capital and qualification

Number of employees of the OeAW research performing organisation (incl. 100% subsidiaries)	2021			2022			
	m	f	total	m	f	diverse	total
Employees (= headcount)	954	780	1,734	944	804	1	1,749
davon auf Management level	117	55	172	116	52	0	168
Full time equivalents (rounded)	814	614	1,428	806	637	1	1,444
davon auf Management level	104	51	155	105	48	0	153

Source: OeAW.

Junior researchers*	2021	2022	Target value 2023
Employees (= headcount)	770	768	
Share an den wissenschaftlichen Angestellten	65%	66%	> 60%**

* In defining junior researchers, the OeAW follows the European Commission document "Towards a European Framework for Research Careers" (https://era.gv.at/object/document/1509), which is one of the main foundations for the career model of the OeAW and is thus also reflected in the OeAW's collective agreement. It proposes a four-stage model: **R1** – First stage Researcher (up to the point of PhD); **R2** – Recognised Researchers (PhD holders or equivalent who are not fully independent); **R3** – Established Researchers (researchers who have developed a level of independence); **R4** – Leading Researchers (researchers leading their research area or field). In accordance with this model, the career levels R1 and R2 denote junior researchers.

** It is gratifying for the OeAW to have a large number of junior researchers in its ranks. However, in order to remain true to the principle of excellence, it is not desirable to have too high a proportion of junior researchers. In the view of the OeAW, this already high figure should therefore not increase any further.

Source: OeAW.

The following staff development measures were implemented in 2021 and 2022:

In 2022, the mentoring programme again offered early career researchers networking opportunities with mentors and each other. Workshops on career planning, staff development and leadership, on unconscious bias, and on presentation and moderation techniques familiarise the mentees with key skills that will help them in their careers.

The suitability of the scientific career model in the context of the overall development of the framework conditions at the OeAW and beyond was discussed intensively and further optimisation is being sought.

With a view to acquiring competitive third-party funded projects, the OeAW continues to offer tailor-made training measures such as Excellence4GRANTed workshops for ERC aspirants.

Extramural and individual OeAW fellowship programmes aimed at junior researchers were continued.

Indicator 4: Output, innovation and excellence

Number of scientific publications from projects of the OeAW research performing organisation	2021	2022*
Monographs and editions	59	48
Articles/contributions in scientific journals, edited volumes and proceedings	1,832	1,756

* After two years with high growth rates – partly due to the pandemic – an expected decline in publication figures occurred in 2022.

Source: OeAW.

Grants by the OeAW research performing organisation in ERC and FWF excellence programmes		2021	2022
ERC	Number	5	7
	Total funding approved in €1,000	10,150	10,028
FWF Wittgenstein Prize	Number	0	0
	Total funding approved in €1,000	-	-
FWF Start Programme	Number	0	0
	Total funding approved in €1,000	-	-

Source: FWF (Wittgenstein Award, Start Programme), FFG EU Performance Monitor. For the ERC, Starting Grants, Consolidator Grants and Advanced Grants are counted. The year in which the contract is concluded applies.

In addition to the projects listed in the table, the OeAW participated in one ERC Consolidator Grant and one ERC Advanced Grant as a co-beneficiary in 2022 and also received approvals for two ERC Proof of Concepts. In 2022, the Austrian Academy of Sciences also acquired an ERC Consolidator Grant, which, however, was transferred to another research institution before the start of the project, as well as two ERC Starting Grants, whose final contracts were not signed until the beginning of 2023. In 2021, the OeAW was a co-beneficiary of two further ERC Advanced Grants.

Project components acquired by OeAW research performing organisation in the FWF 2023 Cluster of Excellence Programme	Share	Grant amount in €
OeAW total	**0.58**	**7,474,305**
Cluster EurAsia:Transformation Processes (EurAsia)	0.40	3,694,468
Cluster: Microbiomes as drivers of planetary health	0.07	1,469,836
Cluster: Quantum Science Austria	0.11	2,310,000

Source: FWF.

Investments in research infrastructures 2021 and 2022:

For the OeAW, research infrastructure is not an end in itself, but a prerequisite and framework condition for top-level research. Procurements coordinated between OeAW institutes and the expansion of infrastructural cooperation with non-OeAW research institutions are becoming increasingly important, be it in high-performance computing or bioarchaeology, and much more. Furthermore, the OeAW represents Austria in numerous European and international (large-scale) research infrastructures, especially within the framework of the ESFRI Roadmap 2021.

Three important investments in core facilities in 2021 and 2022		
Designation	**Research focus**	**Web link to the research infrastructure database**
2022		
Expansion of the Core Facilities at IMBA – Institute for Molecular Biotechnology GmbH (Vienna): Eppendorf Bioreactor	Bioreactor for use in the field of organoid research	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/_5353
Thermal ice core drill at the Institute for Interdisciplinary Mountain Research – IGF (Innsbruck)	Sample collection for the study of Austria's oldest glacier ice (e.g. as a climate archive)	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/_5350
Expansion of the digitisation centre at the Austrian Centre for Digital Humanities and Cultural Heritage –ACDH-CH (Vienna): Thermography system with IR book scanner table	Use in the ACDH-CH Digitisation Centre to support researchers in the digitisation of research-relevant sources.	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/_3894
2021		
Adaptive High-Speed Optical System at the Institute of Quantum Optics and Quantum Information – IQOQI (Vienna)	Adaptive optics device for real-time adjustment of optical wavefronts used in the mobile telescopes for beam tracking and optimisation of optical (Earth- and satellite-based) quantum communication.	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/_5112
Laser Beam Melting Machine at the Erich Schmid Institute for Materials Science – ESI (Leoben)	Additive manufacturing technology for the production of functional components with complex geometry	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/_5115
Expansion of the Biomedical Sequencing Facility at CeMM – Research Center for Molecular Medicine GmbH (Vienna): NovaSeq 6000	Next Generation Sequencing	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/_5211

* All research infrastructures that were newly acquired in the reporting period and have an acquisition value (cumulative) of more than €100,000 (incl. VAT) as of 31 December and are located at the institution. An explanation of investments or acquisition costs for research infrastructures can be found in the definitions.
Source: OeAW

Indicator 5: Internationalisation

	2021	2022	Target value 2021–2023*
Share of international co-publications in all publications listed in WoS** in the reporting year	80.6%	79.5%	
Number of newly approved participations of Austrian Academy of Sciences research institutions in Horizon 2020 and Horizon Europe programmes and initiatives	24	21	
Grant amount in €1,000***	14,157	12,194	
Number of Horizon Europe applications	63	77	> 200

* Number of cumulative applications in three years. ** The following "citable publication types" are taken into account: articles, proceedings papers, review articles, letters. *** Only EU funds are shown, no own contributions or national co-financing. The year of contract signature applies.
Source: OeAW, FFG EU-Performance Monitor.

Indicator 6: Knowledge and technology transfer

Patents & Exploitation Activities	2021	2022
Number of patent applications	30	39
of which national	0	0
of which EU/EPC	15	12
of which non-EU countries	15	27
Issued patents	6	10
of which national	0	0
of which EU/EPC	2	1
of which non-EU countries	4	9
Exploitation spin-offs	2	1
Licensing agreements	3	3
Options agreements	0	0
Sales agreements	3	0
Exploitation partners (companies, non-university research institutions)	8	2

Source: OeAW.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

In 2022, the OeAW's science dissemination activities were dominated by the 175th anniversary of the Academy's founding. With the opening of the Academy Campus, a new place for knowledge transfer was created in the heart of Vienna, with a wide range of offerings: the Children's University Vienna was a guest at the Academy for three days with lectures and workshops, the OeAW also participated in the Long Night of Research, and the exhibition "7 continents, 7 oceans" in the new OeAW library was well attended.

The new format "Science Update" promotes direct exchange between journalists and researchers. Also since 2022, the OeAW Instagram channel has been aimed at young people and shows them: science not only makes you smarter, but also fun. A popular science lecture highlight was the Christmas Lecture held by Alena Buyx in 2022.

The awarding of the Nobel Prize to Anton Zeilinger, who has many ties to the Austrian Academy of Sciences, triggered a broad media response.

Since 2022, the Austrian Study Foundation's cooperation with those in Germany and Switzerland has strengthened the networking of young gifted students.

Indicator 8: Gender and promotion of equality

Proportion of women in management positions by management level	2021	2022	Target value 2023
Institute directors	26%	26%	
Scientific directors	31%	33%	
(Senior) group leaders	28%	27%	
Junior group leaders	22%	30%	
Administrative and technical management staff	38%	35%	
Glass Ceiling Index on the basis of management levels*.	1.41	1.49	< 1.65**

* Calculated as the share of women in all employees/share of women in management positions. The explanation of the glass ceiling index can be found in the definitions. Management positions are defined as: Institute directors, scientific directors, (senior) group leaders, junior group leaders, administrative or technical management staff. ** Target value according to OeAW performance agreement 2021–2023.
Source: OeAW.

The following activities to promote equality were implemented in 2021 and 2022:

- In 2022, the OeAW signed the Endorsement Letter of the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers. The Welcome Service for international staff was expanded. The OeAW also expanded its networks with regard to dual career challenges.
- The guideline on gender-sensitive language was revised. A gender bias decoder is now used in the design of OeAW job advertisements and the like in order to avoid hidden gender-specific formulations.
- New at the OeAW is an Equal Treatment Officer who offers support and advice in cases of discrimination, mobbing or sexual harassment.
- An OeAW-wide survey on equality issues provided valuable input for future measures; a diversity report was prepared for the first time for the Gender & Diversity Forum 2022.
- Sociologist Astrid Mager presented her research on implicit values that guide the design of search engines in a "Gender & Diversity Lecture". In the "8ung auf Frauen" series, electrical engineer Lucy Pao gave a well-received lecture on International Women's Day 2022.

3.3.3 Special events in 2022 and outlook

Exemplary research findings 2022

During excavations in Ephesus, an archaeological team from the Austrian Academy of Sciences (OeAW) discovered an early Byzantine business and local quarter that had been destroyed in 614/615 AD; the household goods, sealed by a layer of fire, have been preserved largely intact for posterity and provide unique snapshots of life at the time.

Materials researchers at the OeAW and the British University of Cambridge have succeeded in producing the mineral tetrataenite, previously only known from meteorites, in the laboratory. This could be used to create enormously strong magnets, e.g. for electric cars or wind turbines, without the use of rare earths, thus reducing environmental destruction and resource dependency.

An international team, including OeAW space researchers, was able to detect sulphur dioxide in the atmosphere of an exoplanet, the gas giant WASP-39b, for the first time using the James Webb Space Telescope.

A study with OeAW participation showed how accurately sequencing and analysis of COVID-19 virus particles from wastewater samples reflects variant dynamics.

Once again, OeAW researchers set a world record in quantum entanglement: entangled photons were sent over 248 kilometres of laid optical fibre.

Outlook

The internationally successful IMBA celebrates its 20th founding anniversary. The Cori Institute for Metabolism Research and Anti-Semitism Research begin their work under the umbrella of the OeAW. A highly endowed funding programme for urgently needed register research is announced. A Joint Academy Day of the OeAW and the Leopoldina is dedicated to science-based advice for politics and the public.[336]

3.4 Silicon Austria Labs GmbH (SAL)

3.4.1 Profile and key data

Profile of the organisation

Silicon Austria Labs GmbH (SAL) is an Austrian, non-university research centre for electronics-based systems (EBS). The company is based in Graz. At its three locations in Graz, Villach and Linz, SAL conducts research along the entire EBS value chain in the areas of Microsystems, Sensor Systems, Intelligent Wireless Systems, Power Electronics, and Embedded Systems. Research is conducted at both model and hardware level (components, assemblies, and devices with micro- and nanoelectronics) as well as the associated embedded software level, combined with the holistic knowledge of comprehensive system integration. In contract and in-house research, as well as in cooperative projects, work is carried out on topics such as Industry 4.0, Internet of Things (IoT), autonomous driving, cyber-physical systems (CPS), AI, Smart City, Smart Energy or Smart Health.

Key figures 2021 and 2022

	2021			2022		
Total income in €1,000			32,163			40,992
Number of employees	**2021**			**2022**		
	m	**f**	**total**	**m**	**f**	**total**
Employees (= headcount)	191	60	251	213	76	289
Full time equivalents (rounded)	179	55	234	199	67	266

Source: SAL.

336 The OeAW Development Plan sets out strategic goals, the OeAW Performance Agreement corresponding measures of the Academy for three years at a time; the Academy's Annual Report provides information and the research highlights of the past year in each case. All the documents described are published at: https://www.oeaw.ac.at/en/oeaw/academy/performance-reports-strategy

3.4.2 Development of indicators

Indicator 1: Funding, including third-party funding

	2021 in €1,000	2022 in €1,000	Target value 2021–2023 in %**
Total income	32,163	40,992	
of which shareholder contributions	20,120	26,282	
of which third-party funding	12,043	14,710	
of which non-EU countries and global organisations	46	126	
of which public	46	126	
of which private	0	0	
of which EU and European countries or organisations	2,515	2,784	
of which public	1,252	1,659	
of which private	1,263	1,125	
of which national and regional organisations	9,482	11,800	
of which public	3,240	3,746	
of which private	6,242	8,054	
Third-party funding ratio* in %	37.4%	35.9%	> 37%

* Share of third-party funding in total income in %. ** Due to fluctuations in the disbursement of third-party funds between the individual years, average values over three years are given here. Source: SAL.

Indicator 2: Evaluation systems

Evaluations of the thematic and strategic orientation

The strategic orientation of the SAL is regularly evaluated by the FFG. This involves the quality of the projects, the suitability of the project partners, utilisation and exploitation, as well as the topics of internationalisation and Human capital. In addition, the research programme is regularly discussed in the SAL Programme Advisory Board (twice a year) and with the Scientific Advisory Board, which subsequently forwards its recommendations to the SAL Supervisory Board.

Indicator 3: Human capital and qualification

Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	191	60	251	213	76	289
of which at management level	19	3	22	16	4	20
Full time equivalents (rounded)	179	55	234	199	67	266
of which at management level	18	3	21	14	4	18

Source: SAL.

Number of PhD students	2021	2022
Number of theses completed	1	1
Employees (= headcount)	34	48
of which employed in the SAL	24	28
of which in structured education (doctoral schools or similar)	10	20

Source: SAL.

Junior researchers*	2021	2022	Target value 2023
Employees (= headcount)	84	101	> 110
Share an den (wissenschaftlichen) Angestellten	46%	47%	> 47%

* The report's definition of junior researchers is based on the European Commission's document "Towards a European Framework for Research Careers" (https://era.gv.at/object/document/1509). The report proposes a four-stage model: **R1** – First stage Researcher (up to the point of PhD); **R2** – Recognised Researchers (PhD holders or equivalent who are not fully independent); **R3** – Established Researchers. It proposes a four-stage model: **R1** – First stage Researcher (up to the point of PhD); **R2** – Recognised Researchers (PhD holders or equivalent who are not fully independent); **R3** – Established Researchers (researchers who have developed a level of independence); **R4** – Leading Researchers (researchers leading their research area or field). In accordance with this model, the career levels R1 and R2 denote junior researchers.

Source: SAL.

The following staff development measures were implemented in 2021 and 2022:

- The aims of the **gender equality policy** are to achieve a balanced proportion of men and women in research teams and enterprise functions, and to integrate gender and gender analysis into research content.
- Since its foundation, an **"extended" flexitime model has been applied;** this offer now also includes home office in Austria and within Europe.
- Project for **workplace health promotion (Vital4SAL).**
- Evaluation of mental stress among employees (online questionnaire and ABS groups).
- The company agreement on the implementation of **home** office **access.**
- **Online training catalogue:** The offer here ranges from recurring training courses, technical qualification measures and language seminars to soft skill offers.

Indicator 4: Output, innovation and excellence

Number of scientific publications	2021	2022
Monographs and editions	0	1
Articles/contributions in scientific journals, edited volumes and proceedings	142	127

Source: SAL.

In the reporting period 2021–2022, there were no approvals in the ERC, FWF START and FWF Wittgenstein programmes.

Investments in research infrastructures 2021 and 2022:

SAL pursues the strategy of continuously building up the research infrastructure of the five lighthouses (More than Moore, Photonics, Power Density, Dependable EBS and 6G) at the three locations Graz, Linz and Villach on the basis of the respective business plans. Examples of this are the Smart Testing Lab in Graz, the 6G Testbed in Linz or the new research clean room in Villach.

Three important Core Facilities 2021 and 2022*		
Designation	**Research focus**	**Web link to the research infrastructure database****
EBPG5200Plus – Electronbeam Lithography System	Lighthouses Photonics and More than Moore	https://forschungsinfrastruktur.bmbwf.gv.at/de/institution/silicon-austria-labs-gmbh-sal_87?id=3053
Keysight UXR Oscilloscope 110 GHz	Lighthouse 6G Millimetre-Wave Technologies	
EVG7300 – Nanoimprint Lithography and Wafer-Level Optics	Photonics Lighthouse	

* All research infrastructures that were newly acquired in the reporting period and have an acquisition value (cumulative) of more than €100,000 (incl. VAT) as of 31 December and are located at the institution. An explanation of investments or acquisition costs for research infrastructures can be found in the definitions. ** Under the link https://forschungsinfrastruktur.bmbwf.gv.at/de/institution/silicon-austria-labs-gmbh-sal_87 all FI entries of SAL can be found currently and in the future. An overview can also be found on the SAL webpage: https://silicon-austria-labs.com/forschung/equipment. Source: SAL.

Indicator 5: Internationalisation

	2021	2022
Share of international co-publications in all publications	48%	40%
Number of newly approved participations in Horizon 2020 and Horizon Europe programmes and initiatives (incl. ERC grants)	1	6
Total funding approved in €1,000*	271	4,913

* Only EU funds are shown, no own contributions or national co-financing. The year of contract signature applies.

Source: SAL, FFG EU-Performance Monitor.

Indicator 6: Knowledge and technology transfer

	2021	2022
Share of co-publications with industry or practice partners in all publications	32%	19%

Patents & Exploitation Activities	2021	2022
Number of patent applications	1	7
of which national	0	0
of which EU/EPC	1	5
of which non-EU countries	0	1
of which international (PCT)	0	1
Issued patents	8	5

Patents & Exploitation Activities	2021	2022
of which national	0	0
of which EU/EPC	2	0
of which non-EU countries	6	5
Exploitation spin-offs	0	0

Source: SAL.

In 2022, SAL developed and adopted its IP strategy. This is supplemented by concrete guidelines regarding IP, exploitation and spin-off foundations. Furthermore, a full-time staff position on IP issues was created and successfully filled.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2020 and 2021:

SAL's main communication channels are the SAL website (incl. information on research offerings, opportunities for collaboration, news, downloads), the SAL LinkedIn account (with over 9,000 followers) and the monthly SAL Science & Stories newsletter. SAL research results are also communicated to the public via press releases and media cooperation (e. g. *Der Standard, Die Presse)*.

SAL participates in various programmes for pupils, e. g. "Career Spy" organised by BBO Carinthia or "Future Jobs", where young people are introduced to technical professions. In addition, individual taster days can be completed at SAL and researchers can be accompanied. By participating in the Long Night of Research 2022, SAL has also presented itself to a broad public. SAL also offers guided tours for students on request. The video format "Superwomen in Science" (interviews with SAL researchers) aims to arouse the interest of young women in a technical profession. These are available on the SAL YouTube channel.

Indicator 8: Gender and promotion of equality

Proportion of women in management positions by management level	2021	2022
Executive Board (CEO and CTO)	0	0
All management levels	13.6%	20%
Glass Ceiling Index on the basis of management levels*.	1.75	1.31

* Calculated as the share of women in all employees/share of women in management positions. The explanation of the glass ceiling index can be found in the definitions. Management positions are defined as: Level 1 – CEO and CTO, Level 2 – Division Heads, Level 3 – Unit Heads and Enterprise Heads

Source: SAL.

The following activities to promote equality were implemented in 2021 and 2022:

The SAL Gender Equality Plan (GEP) was completed and published. In addition to the continuation and optimisation of ongoing measures, it describes in detail the strategy, the ongoing activities and the corresponding monitoring. The focus was on the following topics/areas:

Further development of the organisational culture

- Gender-sensitive language
- Clear rules for dealing with gender-based violence, including sexual harassment, bullying and bossing in the workplace and in business relationships
- Diversity & Inclusion
- Project start 2023 "HR Staff development 2023"
- Update Job Descriptions/Area Responsibilities

Work-life balance

- "Papamonat"
- Marginal employment during the maternity leave period

Audit Family & Work (recertification valid until 2023)

- Ongoing analysis of measures and implementation of goals
- Vital4SAL project in the context of occupational health care
- Offer all-in contracts for part-time parental leave (part-time all-in) to reduce the GenderPayGap

3.4.3 Special events in 2022 and outlook

Exemplary research findings 2022

In May, SAL participated in the 7th IEEE 5G++ Summit in Dresden, where Hans-Peter Bernhard presented SAL Linz's research work on 5G/6G. After a two-year break, the "Long Night of Research" took place on 20 May, where SAL gave children an insight into the research work in a playful way. SAL road shows took place in Linz, Vienna and Salzburg. On 22 June, SAL participated in the SFG Future Day. One day later, the MEMS World Summit started at Lake Maggiore. A special milestone was the opening of the new HTC2 building and its clean room in Villach at the end of June. In August, SAL presented its "Vision 2030" at the EFA. In September, SAL was represented at the MNE EUROSENSORS in Leuven. In addition to EBSCON in Graz, EWSN2022 was held in Linz in October under the co-organisation of SAL. SAL also had a stand at the IUS in Venice. In November, SAL was represented at the electronica in Munich. The PE team received the OVE Innovation Award for their Tiny Power Box.

Outlook

A special highlight in 2023 will be the move to the new SAL Building. Further B2B events are being planned. Regular press releases, news articles, LinkedIn postings and videos are also planned.[337]

337 Further information can be found in the SAL Annual Report. The most recent annual report can be found at https://silicon-austria-labs.com/jahresbericht

3.5 Ludwig Boltzmann Society – Austrian Association for the Promotion of Scientific Research (LBG)

3.5.1 Profile and key data

The Ludwig Boltzmann Gesellschaft (LBG) is a non-university research institution that currently operates 17 institutes and one research group as well as two centres. Ludwig Boltzmann Institutes (LBIs) initiate new socially relevant research topics and conduct innovative research at the interface to application and society. With their expertise, the Open Innovation in Science Center and the Career Center support the involvement of society in science as well as the individual development of researchers.

Key figures 2021 and 2022

	2021	2022
Total budget for the research units in €1,000	37,368	31,371

Number of employees of LBG	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	251	356	607	284	370	654
Full time equivalents (rounded)	137	223	360	147	218	365

Source: LBG.

3.5.2 Development of indicators

Indicator 1: Funding, including third-party funding

	2021 in €1,000	2022 in €1,000	Target value 2021–2023 in %**
Total budget for the research units	37,368	31,371	
of which global budget	7,413	6,977	
of which third-party funds	29,955	24,394	
of which non-EU countries and global organisations	21	184	
of which EU and European countries or organisations	2,818	669	
of which national and regional organisations	27,116	23,541	
of which public	21,810	19,349	
of which NFTE, Ö-Fonds and FZÖ	6,826	5,663	
of which private	5,306	4,192	
Third-party funding ratio* in %	80.2%	77.8%	72.9%

* Share of third-party funding in total income in %. ** Due to the fluctuations in third-party funding disbursements between the individual years, average values over three years are given here. The lower target value compared to the actual value of 2022 results from the closure of two research groups in 2022 and the termination of two institutes in 2023. Source: LBG.

Indicator 2: Evaluation systems

The research and development activities of the Ludwig Boltzmann Institutes are evaluated every three to four years within the framework of international peer review procedures. For this purpose, independent external commissions with scientific and quality assurance expertise are formed, which evaluate the institutes on a nine-level scale; the best three evaluations define the area of excellence. The evaluation results form the basis for the LBG Board's decisions to continue institute funding. In 2022, no institute was up for evaluation; in 2023, seven institutes will be evaluated.

For the ongoing institutional quality assurance of the research and development activities, there is a Scientific Advisory Board (SAB) for each research unit, which is staffed exclusively with international technical expertise, supplemented by Experts by Experience. In 2022, there were 19 SABs with 83 members. The Career Center and the Open Innovation in Science Center were evaluated in 2022/2023.

Indicator 3: Human capital and qualification

Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	251	356	607	284	370	654
of which at management level (institute management, research group management, centre management, department management, executive management, division management)	32	18	50	30	19	49
Full time equivalents	137	223	360	147	218	365
of which at management level	19	10	30	20	13	33

Source: LBG.

Number of PhD students	2021	2022	Target value 2023
Number of completed dissertations	15	21	> 14*
Employees (= headcount)	187	197	
of which employed at LBG	83	81	
of which in structured education (doctoral schools or similar)	104	116	

* The lower target value of completed dissertations compared to the actual value of 2022 results from the closure of two research groups in 2022 and the termination of two institutes in 2023. Source: LBG.

The following staff development measures were implemented in 2021 and 2022:
In addition to the individual support of junior researchers and managers, the programmes of the Career Center 2022 focused on leadership (Summer School, Leading Researchers Programme), entrepreneurship (4 Fellowships 4 Entrepreneurs, Innovator's Road), intersectoral work experience (Expert Internship) and digital skills (Digital Transformation in Research). Two-thirds of the programmes are now attended by external participants and underline the demand for career support in the RTI system. Equal opportunities and mental health are deliberate focal points in all offers. As part of the certification of family-friendly employers, new measures were implemented, such as the development and introduction of a well-founded maternity leave guide.

Indicator 4: Output, innovation and excellence

Scientific publications	2021	2022
Monographs and editions	19	25
Articles/contributions in scientific journals, edited volumes and proceedings	637	673

Source: LBG.

Grants in ERC and FWF Excellence Programmes		2021	2022
ERC	Number	0	0
	Total funding approved in €1,000	0	0
FWF Wittgenstein Prize	Number	0	0
	Total funding approved in €1,000	0	0
FWF START	Number	0	1
	Total funding approved in €1,000	0	1,191*

* The starting awardee is now based at the University of Innsbruck; the FWF indicates this accordingly. For the ERC, Starting Grants, Consolidator Grants and Advanced Grants are counted; other grants and co-beneficiaries can be indicated in free text. The year of contract conclusion applies. Source: FWF, FFG EU Performance Monitor.

Investments in research infrastructures 2021 and 2022:

The digitisation of administration and research go hand in hand at LBG to ensure professionalisation and modernisation of the overall organisation. The LBG's goal in the administrative area is an overall IT strategy with a web-based solution to integrate the LBIs as well as a connection of all source systems by means of a management information system to record the most important organisational key figures and data, e.g. on research output, for knowledge management. A comprehensive process has been initiated in recent years and is to be completed in the next few years. A digital workflow will be integrated into the overall digital strategy and contribute to increasing efficiency.

Three important Core Facilities* 2021 and 2022		
Designation	**Research focus**	**Web link to the research infrastructure database**
MORE platform	Tool for conducting large-scale studies with different data origins	https://dhp.lbg.ac.at/more/**

* All research infrastructures that were newly acquired in the reporting period and have an acquisition value (cumulative) of more than €100,000 (incl. VAT) as of 31 December and are located at the institution. An explanation of investments or acquisition costs for research infrastructures can be found in the definitions. ** The platform is not yet completed and therefore not yet registered in the research infrastructure database. All future FI entries can be found under the link to the LBG profile page. https://forschungsinfrastruktur.bmbwf.gv.at/de/institution/ludwig-boltzmann-gesellschaft-mbh-lbg_26 Source: LBG.

Indicator 5: Internationalisation

	2021	2022
Share of international co-publications in all publications	54.3%	62.5%
Number of newly approved participations in Horizon 2020 and Horizon Europe programmes and initiatives*	2	2
Total funding approved in €1,000*	424	179

* All newly acquired projects mapped via the Horizon Platform are included. ** Only EU funds are shown, no own contributions or national co-financing. The year of contract signature applies. Source: LBG, FFG EU Performance Monitor.

Indicator 6: Knowledge and technology transfer

	2021	2022
Share of co-publications with industry or practice partners in all publications	13.6%	13.4%

Patents & Exploitation Activities	2021	2022
Number of patent applications	4	0
of which national	2	0
of which EU/EPC	2	0
of which non-EU countries	0	0
Issued patents	0	0

Source: LBG.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

LBG organised numerous public events as part of its work, including crowd sourcing on research topics, symposia, panel discussions and lectures on various topics. The LBG was also represented at research events that were particularly popular with the public, such as the Long Night of Research, the Lower Austria Research Festival and the European Researchers' Night.

Furthermore, the LBG Open Innovation in Science Center (OIS) operates its own competence centre for the involvement of civil society. In the period 2021–2022, the following projects were carried out, among others:

- Open Innovation in Science Impact Lab "Caring Communities for Future": The project was set up with Gesundheit Österreich GmbH to develop innovative solutions for the challenges of demographic change with civil society actors.
- The OIS zam ("Forum für Gesundheit und Wohlbefinden") made the cooperation between science and society on health issues visible and presented projects that conduct research together with patients.

- PPIE and OIS Enrichment Fund: The OIS Centre funded 18 projects that involve affected people and other stakeholders in research processes.

Indicator 8: Gender and promotion of equality

Proportion of women in management positions by management level in %	2021	2022	Target value 2023
All management levels	36%	38.8%	
Management	100%	100%	
Institute management and research group management	31.7%	32.5%	
Centre management, divisional management and departmental management	60%	57.1%	
Glass Ceiling Index on the basis of management levels*.	1.63	1.46	<1.55

* Calculated as the share of women in all employees/share of women in management positions. Management positions are defined as: Management and division management, institute management and research group management, centre management and department management. An explanation of the glass ceiling index can be found in the definitions. Source: LBG.

The following activities to promote equality were implemented in 2021 and 2022:
The equality plan has been developed. It has been published on the LBG website and also uploaded on the staff platform. One point of the equality plan is to create equality monitoring through data analysis. The aim is to improve the analysis of data. In 2022, a data system was therefore created to carry out evaluations and the standardisation of function titles was worked out. The data was entered into the data system and can now be analysed. LBG collects data on gender and equality promotion annually.

3.5.3 Special events in 2022 and outlook

Exemplary research findings 2022 and outlook
In 2022, a START Prize was awarded by the Austrian Science Fund FWF to William Barton of the LBI for Neo-Latin Studies.

On the occasion of the 75th anniversary of the Liebenau Trial in autumn 1947, the LBI for Research on the Consequences of War co-organised a scientific conference of post-war justice, remembrance culture and family memory in connection with the death marches of Hungarian Jews immediately before the end of the war.

In the research group D.O.T. (The Open Door), the scientifically accompanied peer mentoring platform by young people for young people aged 14 and over open2chat was established.

The LBI Rare and Undiagnosed Diseases organised the 11th conference of the International Network for Undiagnosed Diseases in Vienna in November 2022. This institute was also able to show that ticks are particularly dangerous disease vectors because the saliva of ticks inhibits the skin's defence function and thus increases the known risk of diseases such as early summer meningoencephalitis (FSME) or Lyme disease. The study was published in the Journal of Clinical Investigation.

A call for clinical research groups to improve training and research structures at hospitals was opened in summer 2022 and received 44 submissions, reflecting the high demand for funding of clinical research in Austria. With funding from the BMBWF, this call closes a significant funding gap in Austria. The selection of three clinical research groups will take place in 2023.[338]

3.6 GeoSphere Austria (GSA)

3.6.1 Profile and key data

Profile of the organisation

GeoSphere Austria has been Austria's Federal Institute for Geology, Geophysics, Climatology and Meteorology since 1 January 2023. It resulted from the merger of the "Zentralanstalt für Meteorologie und Geodynamik" (ZAMG) and the "Geologische Bundesanstalt" (GBA).

As a national geological, geophysical, climatological and meteorological service, GeoSphere Austria makes an important contribution to safeguarding Austria's livelihood and economic foundations and to increasing the country's overall resilience, and contributes to the precautionary approach to climate change, its consequences and Austria's sustainable development.

To this end, GeoSphere Austria combines more than 170 years of experience and expertise with the latest research results and always puts the needs of the people in Austria in the foreground in all its activities. With over 500 experts at seven locations in Austria as well as two observatories, its own test sites and laboratories, GeoSphere Austria is the knowledge partner on the topics of weather, climate change, natural hazards, raw material security, geology, environment and groundwater in Austria.

338 Further information can be found in the LBG Annual Report. The latest annual report can be found at: https://lbg.ac.at/download/?lang=en

Key figures 2021 and 2022

ZAMG	2021	2022
Total income in €1,000	34,918	35,071

Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	230	107	337	245	117	362
Full time equivalents (rounded)	211	84	295	223	97	320

GBA	2021	2022
Total income in €1,000	10,940	11,273

Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	76	48	124	79	47	126
Full time equivalents (rounded)	71	41	112	69	44	113

The figures for 2022 are provisional. Source: GeoSphere Austria.

3.6.2 Development of indicators

Indicator 1: Funding, including third-party funding

ZAMG	2021 in €1,000	2022 in €1,000
Total income	34,918	35,071
of which public	22,369	22,944
of which third-party funds	12,549	12,127
Third-party funding ratio in %	35.9%	34.6%

GBA	2021 in €1,000	2022 in €1,000
Total income	10,940	11,273
of which public	9,359	9,827
of which third-party funds	1,581	1,446
Third-party funding ratio in %	14.45%	12.83%

The figures for 2022 are provisional. Source: GeoSphere Austria.

Indicator 2: Evaluation systems

Evaluations of the thematic and strategic orientation

GeoSphere Austria and its predecessor organisations have established a large number of processes with the aim of continuous improvement. Management systems according to ISO 9001 (quality management in the areas of the former ZAMG, initial certification 2004) and ISO 27001

(information security management in the area of ICT, initial certification 2021) have been implemented as an essential factor. Within the framework of the management systems, internal and external audits are carried out by Quality Austria and CIS Certification Information Security Services GmbH, management reviews and evaluations, customer satisfaction measurements (e. g. of the provincial disaster control departments), complaint evaluations as well as process and product conformity evaluations and internal staff surveys. Internally, strategy workshops (forums) are also organised twice a year with the first three management levels and annual management reports are prepared. In addition, an overall organisational evaluation process was commissioned by the former UK MetOffice Director Rob Varley for the ZAMG Forecast 2021 and a corresponding report with development recommendations was prepared. Regular content and progress monitoring is carried out via meeting formats as well as departmental activity reporting. Projects, both externally financed and internal, are evaluated and approved by a project portfolio team and accompanied and controlled throughout the project duration with the help of project management and controlling tools. In the area of raw materials research, the evaluation of projects was carried out by expert committees.

With the reorganisation of GeoSphere Austria, the Board of Trustees was appointed from October 2022 to oversee the development of the organisation's content. In addition, the Scientific Advisory Board will be appointed in 2023.

Indicator 3: Human capital and qualification

ZAMG – Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	230	107	337	245	117	362
of which at management level	19	5	24	28	7	35
Full time equivalents (rounded)	211	84	294	223	97	320
of which at management level	19	5	24	28	7	35

GBA – Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	76	48	124	79	47	126
of which at management level	13	0	13	14	0	14
Full time equivalents (rounded)	71	41	112	69	44	113
of which at management level	13	0	13	14	0	14

Source: GeoSphere Austria.

The following staff development measures were implemented in 2021 and 2022:

The development of employees is a key success factor for GeoSphere Austria. Measures in this context include annual staff appraisals, individual training measures, internal academies, knowledge transfer formats and, especially for the period of the merger of GBA and ZAMG, change management support. To this end, 378 training and further education measures were carried out in 2021 and around 250 (provisional figure) training and further education measures

in 2022 at the former ZAMG alone. In 2022, in the context of the merger of the GBA and ZAMG, additional management seminars on the topic of change processes were organised, resonance groups were formed and four change agents were established in the institutions.

Indicator 4: Output, innovation and excellence

ZAMG – Number of scientific publications	2021	2022
Monographs and editions	2	1
Articles/contributions in scientific journals, edited volumes and proceedings	108	84

GBA – Number of scientific publications	2021	2022
Monographs and editions	2	3
Articles/contributions in scientific journals, edited volumes and proceedings	122	100

Source: GeoSphere Austria.

ZAMG* – Grants in ERC and FWF Excellence Programmes		2021	2022	Grant amount in €1,000
ERC**	HELIO4CAST	0	1	1,999
FWF Wittgenstein Prize	–	0	0	
FWF Start Programme	–	0	0	

* There are/were no projects at the GBA. ** For the ERC, Starting Grants, Consolidator Grants and Advanced Grants are counted; other grants and co-beneficiaries can be specified in free text. The year of contract conclusion applies.

Source: FWF, FFG EU Performance Monitor.

Investments in research infrastructures 2021 and 2022:

The research infrastructure and core facility strategy of GeoSphere Austria focuses on three areas: measurement infrastructures, spatial research infrastructures (observatories, test sites and laboratories) and data processing and storage infrastructures.

Measurement infrastructures: In 2021 and 2022, both the meteorological and seismic measurement stations were expanded (six new TAWES stations and five new seismic stations). In addition, monitoring networks for gravitational natural hazards are in place at various locations in Austria (e. g. "Gschliefgraben"). In the coming years, it will be important to operate the internationally high-quality measuring system sustainably and efficiently and to examine the use and usefulness of new systems such as private weather stations.

Research infrastructures: Both observatories (Sonnblick and Conrad Observatory) were further established as internationally recognised measurement and research facilities and corresponding infrastructures for long-term research cooperation with universities and non-university research organisations were set up. Measuring stations and observatories are indispensable for Austria's contribution to essential international programmes or networks as listed under Indicator 5.

GeoSphere Austria operates a geophysical field test site in Melk, which is used to test, calibrate and evaluate the applied geophysical methods. At Erzberg, GeoSphere Austria maintains a drill core storage facility, most of which are expertly selected core sections of great

scientific and economic importance. At the Neulinggasse site, GeoSphere Austria operates laboratories for rock geochemical analyses, sample preparation and hydrogeological investigations, as well as a test site for geothermal energy (geothermal probe for test measurements and for research purposes) and geophysics (geoelectric profile for reference and test measurements).

Data processing and data storage infrastructures: At the Hohe Warte site, GeoSphere Austria operates a high-performance computer as well as nationally relevant data storage and processing infrastructures in order to fulfil its statutory tasks as a national weather, climate, geological and geophysical service. These infrastructures must thereby fulfil the requirement of a sovereign crisis infrastructure. These sovereign tasks will be sustainably secured by a new high-performance computer from 2024.

ZAMG* – Three important Core Facilities 2021 and 2022**

Designation	Research focus	Web link to the research infrastructure database
Earthquake measuring station	Seismic observation stations/Simulation laboratories	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/_2441
Sonnblick Observatory	Atmospheric research facilities In situ Earth Observatories Physics under extreme conditions	https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/_2463

* All research infrastructures that were newly acquired in the reporting period and have an acquisition value (cumulative) of more than €100,000 (incl. VAT) as of 31 December and are located at the institution. An explanation of investments or acquisition costs for research infrastructures can be found in the definitions

Source: GeoSphere Austria.

Indicator 5: Internationalisation

ZAMG	2021	2022
Share of international co-publications in all publications in the reporting year	67% (72)	68% (57)
Number of newly approved participations in Horizon 2020 and Horizon Europe programmes and initiatives (including ERC*)	1	2
Total funding approved in €1,000	129.9	2,188.4

GBA	2021	2022
Share of international co-publications in all publications in the reporting year	50%	50%
Number of newly approved participations in Horizon 2020 and Horizon Europe programmes and initiatives (including ERC*)	0	4
Total funding approved** in €1,000	0	2,216.5

* Starting Grants, Consolidator Grants and Advanced Grants, no Co-Beneficiaries ** Only EU funds are shown, no own contributions or national co-financing. The year of contract signature applies.

Source: GeoSphere Austria, FFG EU-Performance Monitor.

In addition to the projects listed in the table, GeoSphere Austria received the following further participations in other programmes funded by the EU:

2021: TRANS-ALP in the UCPM programme with a grant amount of €96,500

2022: RODEO in the DIGITAL programme with a grant amount of €324,900

GeoBOOST in the LIFE programme with a grant amount of €230,500

In addition to the listed publication activities and project activities in Horizon 2020 and Horizon Europe, a major contribution of GeoSphere Austria to the internationalisation of research findings and the positioning of Austria as an international science and business location is its participation in European and international networks and committees, the operation of internationally recognised and used observatories and measurement infrastructures, and the provision of high-quality reference data in the fields of weather, climate, geology, geophysics and the environment. GeoSphere Austria is the main international representative of Austria at WMO, ECMWF, EUMETNET, EUMETSAT, EPOS, GCOS, GEO, EGS, UNDRR and the CTBTO. Major networks and programmes to which GeoSphere Austria contributes data include GSEU, EGDI, OneGeology, CGMW, GCOS, GAW, EPOS, ACTRIS, WDC, Intermagnet.

In addition, GeoSphere Austria pursues research and consulting activities in selected countries such as Nepal, Mexico, Myanmar or Kazakhstan.

Indicator 6: Knowledge and technology transfer

Patents & Exploitation Activities	2021	2022
Patent applications	0	0
Issued patents	0	0
Exploitation spin-offs	1	1

GeoSphere Austria currently has no patent applications. Two existing patents were resigned in 2021.

Source: GeoSphere Austria.

The social mission of GeoSphere Austria lies primarily in the collection, verification and provision of high-quality and resilient data and information, which form an essential basis for research achievements and innovations in Austria as well as for fact-based decisions in politics and administration within the framework of the "Grand Societal Challenges". Since 2021, these high-quality data have been made freely available via central data hubs (https://data.hub.zamg.ac.at/; https://www.tethys.at).

In addition, GeoSphere Austria conducts mainly application-oriented research and operationalises research and development findings. To this end, it is strongly involved in the Austrian research landscape as a partner and user and actively exchanges information with other operational services and corresponding specialised service providers throughout Europe. It also organises national and international exchange and knowledge transfer formats, such as the GELMON conference in the field of geoelectrical monitoring, working conferences of the Federal Geological Survey, the ASDR Natural Hazards Conference or the Avalanche Conference.

Since 2014, ZAMG has been involved in the Earth Observation Data Centre (EODC) for the storage and better usability of Earth observation data. The capacities of the EODC have been continuously expanded since its foundation.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

Communication and knowledge transfer play an essential role in the orientation of GeoSphere Austria and its predecessor organisations. Active press and media work was used as the most important instrument of communication with the public in 2021 and 2022. In 2021 alone, there were more than 8,000 press reports, in 2022 about 10,000, with ZAMG mentioned in the press review. At the same time, the social media presence was strengthened. Knowledge parks are operated at several locations in Austria and regular public events are offered to impart knowledge. Participation in the Long Night of Research is an annual fixture. The in-house publishing house also supports the communication activities in the direction of laypersons. In 2021, Thomas Hofmann, head of the GBA library and publishing house, named the book "Abenteuer Wissenschaft" (Adventure Science) the science book of the year. Finally, GeoSphere Austria's experts also regularly communicate important knowledge in the public interest in television and radio appearances.

Citizens, in turn, can directly influence the work of GeoSphere Austria by means of tools and programmes such as wettermelden.at, Trusted Spotter, the Nature Calendar App or Quake Watch Austria. Data collected in this way complement and condense the information and help to bring our services literally to the point.

Active customer communication plays an essential role in the successful further development of operational services and has therefore also been anchored in quality management. As an application-oriented research organisation, demand orientation also plays an important role in research. In addition, GeoSphere Austria organises and participates in topic-specific exchange and learning formats in which local actors, stakeholders and decision-makers are directly involved. Examples of this are the Avalanche Conference, the ASDR Natural Hazards Conference, the training of avalanche commissions or art events on the issue of raw materials.

Indicator 8: Gender and promotion of equality

ZAMG – Proportion of women in management positions by management level	2021	2022
Management	0	0
All management levels*	21%	20%
Glass Ceiling Index based on management levels**	1.52	1.62

GBA – Proportion of women in management positions by management level	2021	2022
Management	0	0
All management levels	0	0
Glass Ceiling Index based on management levels**	n. a.	n. a.

* Management positions are defined as: Directorate, divisional management, departmental management and departmental management ** Calculated as share of women in all employees/share of women in management positions. At GBA, the GCI cannot be calculated because the proportion of women in management positions is zero. The explanation of the Glass Ceiling Index can be found in the definitions.

Source: GeoSphere Austria.

The following activities to promote equality were implemented in 2021 and 2022:
In March 2021, the BMBWF appointed the Women's Representative of ZAMG. In the same year, ZAMG's first gender equality plan was prepared and published on the homepage in English and German. Within this framework, the gender distribution was analysed separately for different organisational units and a plan of measures to balance gender equality was developed for 2021–2023. In 2022, the Federal Geological Survey developed a gender equality plan and published it on its homepage. Central measures in the corresponding plans are increasing the proportion of women in management positions, promoting young women in scientific and technical professions, involving female employees in application processes and supporting a family-friendly corporate culture.

To promote young women in scientific and technical professions, three FEMtech interns were employed at ZAMG in 2022. On 28 April 2022, ZAMG also participated in Daughters' Day 2022 with a half-day programme for schoolgirls at the Hohe Warte site in Vienna.

An occupational psychologist was commissioned to develop gender awareness training for ZAMG in 2022. Six half-day gender awareness workshops were held in December 2022 and January 2023. 93 people (28% of the staff) participated.

In the course of merging the ZAMG and the GBA, a process was started to certify work and family. In workshops with staff and management of both institutions, existing measures were made aware and new measures were developed.

3.6.3 Special events in 2022 and outlook

Exemplary research and development findings 2022
2022 brought exciting research and development results in all fields of activity of GeoSphere Austria's predecessor organisations. In the field of weather, the Destination Earth project for the creation of digital twins of our planet was launched on behalf of the European Commission. In the future, this should make it possible to forecast extreme events and their effects with a global resolution of 1km and a regional resolution of approx. 200m. In the area of natural hazard management and public welfare, the Austrian Multihazard Advise System (AMAS) and the RiskLab were launched and successfully established. Both initiatives drive the developments of impact-oriented services (for example, a national event and damage database) and support the prevention of disaster events. As early as 2021, ZAMG established itself as one of 10 WMO crisis data centres worldwide for nuclear incidents. Since the outbreak of the Ukraine war, GeoSphere Austria has been providing potential radiological dispersion modelling for government crisis management on a daily basis, building on these competencies. In the field of climatology, ZAMG has developed into the national climate service (also legally anchored since the establishment of the GSA Act) and, in addition to reference climate data for the past and the future, also offers corresponding services for the public and decision-makers. Key offerings include data and advice for climate change adaptation in municipalities and regions (see KLAR programme), new snow scenarios for Austria and urban climate scenarios. The next

generation of Austrian reference climate scenarios (klimaszenarien.at) will also be developed by 2026 under the direction of GeoSphere Austria. Current requirements such as those of the EU taxonomy are also taken into account in this creation process.

The security of supply in the area of mineral raw materials is increasingly in the focus of public attention due to current crises. This applies in particular to energy raw materials, battery metals and mineral raw materials, which are necessary for the transformation to a climate-neutral economy and society. The raw material geological research of the Austrian federal territory is one of the central statutory tasks of GeoSphere Austria. In this context, the basic information on raw material deposits and raw material potentials in Austria is made publicly accessible online via the IRIS portal.

On the way to a climate-neutral economy, alternative energy sources also play an essential role. GeoSphere Austria is a key competence and knowledge partner in questions concerning the use and potential of solar energy, wind power and geothermal energy. Currently, work is being done in this area on high-resolution solar atlases and a geothermal atlas for Austria. At the same time, it is involved in the balancing and verification of official Austrian greenhouse gas emissions using satellite data.

In 2022, the establishment of an Austrian Space Weather Platform (SWAP for short) and the Space Weather Office in Graz literally took us into new spheres. Solar storms can cause disruptions in the power grid, for example. SWAP networks all researchers in Austria working on the topic of space weather and those potentially at risk, and develops scenarios and application-oriented forecasting systems. The Space Weather Office, led by one of the world's leading teams of researchers in the field of solar wind forecasting, provides additional support for these activities.

Outlook

The year 2022 and 2023 were and are focused on the spin-off and merger of the two institutions, as well as the development of a three-year plan and the conclusion of a performance agreement. The focus in terms of content is fundamentally prescribed by the GSA Act. In terms of research strategy, the focus will continue to be on impact-oriented warnings and support for public services, natural hazards, climate change and its impacts (with a new focus on groundwater), alternative energy sources, raw material security, space weather and new measurement methods. International activities are also to be coordinated more closely.[339]

339 The most recent annual report will be available on the GeoSphere Austria website. Old annual reports of ZAMG and GBA can be found at https://www.zamg.ac.at/cms/de/topmenu/ueber-uns/jahresberichte; https://www.geologie.ac.at/ueber-uns/aufgaben/jahresberichte/

3.7 Austria Wirtschaftsservice Gesellschaft (aws)

3.7.1 Profile and key figures

Austria Wirtschaftsservice GmbH (aws) is the promotional bank of the Austrian Federal Government and the central point of contact for the promotion of entrepreneurial growth and innovation. By granting low-interest loans, guarantees, subsidies as well as equity capital, it supports companies from the initial idea to international market success. The aws also provides support with regard to the protection of intellectual property. Coaching and mediation services for companies are also offered. Since 2020, aws has contributed to economic stabilisation by handling COVID-19 measures of the Federal Government as well as the investment premium, and in 2022 it additionally introduced the special programmes of the Federal Government on the Ukraine war, in particular the energy cost subsidy. The information relating to key figures and indicators in each case covers the entire promotion and financing portfolio of aws.

Key figures 2021 and 2022

aws total without COVID-19 assistance and without special Ukraine war programmes	**2021**	**2022**
Number of projects	9,720	9,120
Financing performance incl. liabilities in €1,000*	1,272,000	1,054,000
Present value in €1,000	287,000	247,000

Number of employees of the aws	**2021**			**2022**		
	m	**f**	**total**	**m**	**f**	**total**
Employees (= headcount)	153	202	355	168	232	400
Full time equivalents (rounded)	144	177	321	154	192	346

COVID-19 Aids**	**2021**	**2022**
COVID-19 assistance – number of projects	245,290	15,240
COVID-19 assistance – financing performance in €1,000	6,584,000	311,000

Special programmes Ukraine war	**2021**	**2022**
aws energy cost subsidy – number of projects	0	650
aws energy cost subsidy – financing performance in €1,000	0	16,000

* The financing performance is calculated in each case as the commitment assumed, the volume of the loan granted or the amount of the grant awarded, or as established value of a consultation service. ** These include: aws investment premium, aws bridging guarantees, COVID-19 package for start-ups, NPO funds, comeback grant for film and TV productions, operational testing. Source: aws.

3.7.2 Development of indicators

Indicator 1: Funding, including third-party funding

Source of funds (without COVID-19 aid and without special Ukraine war programmes) (public funds and third-party funds, without contributions from companies)	Financing service	
	2021	2022 in €1,000
ERP Fund	600,000	500,000
Federal ministries acting as owners	366,000	344,000
BMK	25,000	82,000
BMDW/BMAW	341,000	262,000
BMLRT/BML	36,000	21,000
NFTE, Ö-Fonds and FZÖ	13,000	11,000
Regional governments	5,000	0
EU	18,000	9,000
Other (including third-party funding raised)*	234,000	170,000
Total	1,272,000	1,055,000

* Others are entirely BMF funds (Guarantee Act). Source: aws.

Indicator 2: Evaluation systems

Evaluations are essential components of the planning and implementation of funding. An evaluation plan is already prepared when programme documents and guidelines are drawn up. Typically, interim evaluations are carried out at least before or shortly after the end of a programme. As a rule, external evaluation teams carry out these evaluations. In addition, internal evaluations are planned in the multi-year programmes. On the one hand, a systematic survey representative of the monetary funding is carried out every three years ("aws impact monitoring"); on the other hand, internal evaluations are carried out on selected topics, issues and programmes.

In addition, aws has been conducting a systematic, electronic survey of customers since 2013. A few weeks after a grant has been approved or rejected, customers are invited to participate in the feedback. Semi-annual evaluations allow conclusions to be drawn about the quality of the funding services provided in terms of information, advice and processes. The standardised questions are supplemented by verbal comments on experiences made in the funding process and provide valuable information on potential for improvement.

Indicator 3: Human capital and qualification

	Headcount									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Support staff/ Student Support	122	152	78	64	100	66	44	36	52	34
Experts	204	219	110	54	119	54	94	46	100	46
Team/business field management	25	25	12	48	11	44	13	52	14	56
General Management	4	4	2	50	2	50	2	50	2	50
Total	**355**	**400**	**202**	**57**	**232**	**58**	**153**	**43**	**168**	**42**

Source: aws, data includes aws, erp funds, aws fund management.

	Full time equivalents (rounded)									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Support staff/ Student Support	106	120	67	63	77	64	39	37	43	36
Experts	186	197	96	52	101	51	90	48	96	49
Team/business field management	25	25	12	48	12	48	13	52	13	52
General Management	4	4	2	50	2	50	2	50	2	50
Total	**321**	**346**	**177**	**55**	**192**	**55**	**144**	**45**	**154**	**45**

Source: aws, data includes aws, erp funds, aws fund management.

The following staff development measures were implemented in 2021 and 2022:

Staff development has a very high priority in a service organisation. The continuing education programme offers suitable measures for all target groups; both professional and personal development topics are offered. In 2022, a focus was placed on green finance topics and digital training formats were increasingly used. Furthermore, new employees were trained in operational funding processing (overview of funding products, funding guidelines, consulting, funding processing procedures, AIS funding application).

Indicator 4: Output, innovation and excellence

Projects and participations*	2021		2022		Target value 2023
	Number	Share	Number	Share	Share
Funded projects	9,720		9,120		
Funded companies	6,400		5,970		
of which SMEs	6,340	99%	5,710	96%	> 96%
of which enterprise formation	2,660	42%	2,450	41%	

* Excluding COVID-19 aid and special Ukraine war programmes. Source: aws.

Time to contract and consultations	2021	2022	Target value 2023
Median processing time (time to contract) in days*			
aws guarantee	15	15	
aws programme for knowledge and technology transfer**	8	40	
Seedfinancing I Preseed Deep Tech***	38	55	
aws innovation protection	62	47	
Number of consultations for (potential) funding applicants****	~12,400	~10,300	~10,500

* Excluding COVID-19 aid and special Ukraine war programmes. ** Change 2021/2022 from Prototypes & Programmes programme lines to STC3. *** 2022 includes pre-submissions. **** Internally conducted consultations incl. consultations COVID-19 support measures. The 2023 target value is lower than the value for 2021; it takes into account the declining demand for consultations for COVID-19 support measures. Source: aws.

Patents and licences	2021	2022	Target value 2023
Support with IP consulting and financing	484	428	> 430

Source: aws.

Indicator 5: Internationalisation

Programmes with a special focus on internationalisation	Approvals	
	Present value 2021 in €1,000	Present value 2022 in €1,000
Global Incubator Network	500	476
Green Frontrunner	3,258	10,610
Guarantees for internationalisation*	3,100	24,401

* Data on financing performance (= guarantee commitment). Source: aws.

Indicator 6: Knowledge and technology transfer

Funding programmes and awards in the field of knowledge and technology transfer	2021		2022	
	Projects	Present value in €1,000	Projects	Present value in €1,000
Impulse programme for Austrian knowledge and technology transfer	42	700	29	1,566
Youth Innovative*	409	45	336	69
aws first	13	400	25	1,155
Phoenix – Founders' Prize*	205	20	205	20
KI Marketplace**	139	0	88	0
Wings4innovation	26	3,400	35	3,173

* Jugend Innovativ and Phönix Gründerpreis are competitions with bonus payments. ** AI Marketplace is a platform for artificial intelligence (AI) that supports networking activities. Services are offered, but no monetary funding is promised. Source: aws.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

In the area of entrepreneurship, aws offered established formats such as "Jugend Innovativ" and "aws first" to teach STEM and start-up skills. In the academic spin-off environment, focal points were communicated in the area of creating sustainable exploitation strategies and in knowledge transfer, such as the "World IP Day" and the "Phoenix" competition to an interested public.

Indicator 8: Gender and promotion of equality

	2021		2022		Target value 2023
	Number	Share	Number	Share	Share
Women in funded projects[1]	2,537	29%	2,609	29%	
Women project managers	2,279	30%	2,263	32%	> 30%
Women founders	258	21%	346	20%	
Women on committees and juries					
aws Supervisory Board	8	53%	9	60%	
ERP Credit Commission (ECC)	2	16%*	2	16%*	
ERP Expert Commission Tourism	3	43%*	3	43%*	
ERP Expert Commission Agriculture and Forestry	3	43%*	3	29%*	
ERP Expert Commission on Transport	3	43%*	3	43%*	
Juries of individual aws programmes					
Processing, marketing and development	5	45%	5	45%	
FISA – Film Location Austria	7	64%	7	64%	
Preseed I Seedfinancing – Innovative Solutions Innovative Solutions	18**	64%**	7	70%	50%
Seedfinancing I Preseed – Deep Tech	12	50%	12	50%	50%
State Prize for Innovation	3	33.3%	4	44.4%	50%
Youth Innovative	13	48%	14	41%	50%
First Incubator	3	30%	6	50%	50%

[1] Excluding COVID-19 aid and special Ukraine war programmes. * Composition of bodies not under the responsibility of aws. ** Figures for 2021 refer to Creative Impact, the predecessor programme of Innovative Solutions. Source: aws.

Programmes/initiatives with gender or equality as a funding criterion:

The criterion of diversity in companies is included in the economic evaluation of all aws-funded projects. The aws multi-year programme 2020–2022 has also defined the topic of "sustainable growth" as an important field of action, and "diversity" is a focal point. As part of the funding agreement for 2022 and 2023, gender aspects are taken into account as a funding criterion in various programmes by means of a "Women's Bonus".

3.7.3 New initiatives and instruments 2022; outlook

Volatile times require innovation, which is supported by the aws core programmes. In 2022, the focus was, among other things, on establishing preseed and seed financing, as well as on promoting start-up companies in the areas of digital health and green tech. The protection of innovations through the aws innovation protection programmes, which advise companies and support them with grants, is also relevant to RTI as a location. It is also important to promote spin-offs from universities; this is supported by AplusB Scale-up and the promotion of prototypes.

Due to the increase in energy costs, the Federal Government launched the energy cost subsidy for companies as part of a comprehensive anti-inflationary package. With the energy cost subsidy I, energy-intensive companies are supported with an amount of 30% of their additional costs from February to September 2022 for electricity, natural gas and fuels in the first of the four stages. In the pre-registration period, around 93,600 companies registered for the subsidy.

Outlook for the coming years

In view of continuing uncertainties in energy supply, the energy cost subsidy will play a central role in the foreseeable future. Due to the continued tight financing for business investments, the aws core programmes for innovation and growth continue to be of essential importance. The thematic focus is on digitalisation, sustainability and key technologies such as artificial intelligence, hydrogen and microelectronics. In the future, aws will also support and promote sustainability innovations in the food system via future funds.[340]

3.8 Christian Doppler Research Association (CDG)

3.8.1 Profile and key figures

Profile of the organisation

The Christian Doppler Research Association (CDG) supports Christian Doppler Laboratories (CD Laboratories) at universities and non-university research institutions as well as Josef Ressel Centres (JR Centres) at universities of applied sciences.

Around 50% of the CDG's funding programmes are financed by public funds (Federal Ministry of Labour and Economy (BMAW) and, in 2021, the Federal Ministry for Digital and Economic Affairs (BMDW) and the National Foundation for Research, Technology and Development (NFTE) as well as the Future Austria Funds (Ö-Fonds and FZÖ)) and another 50% by the CDG's member companies.

The funding is aimed at application-oriented basic research and strengthens both the business location and the science location of Austria. Due to this essential bridging function from basic research to innovation, the CDG is internationally regarded as a best practice model.

340 Further information can be found in the aws performance report. The most recent performance report can be found at: https://www.aws.at/berichte/

In addition, the CDG has a very high social benefit, as numerous CDG research units contribute to the implementation of the UN 2030 Agenda for Sustainable Development.

Key figures for 2021 and 2022

	2021	2022
Number of CD Laboratories	87	90
Number of JR centres	15	16
Funding budget in €1,000 without company contributions	16,964	20,485

Office staff	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	7	12	19	7	13	20
Full time equivalents (rounded)	5	10	15	6	10	16

Note: Budget data for 2022 corresponds to the maximum budget framework, as accounting data are not yet available. Source: CDG.

3.8.2 Development of indicators

Indicator 1: Funding, including third-party funding

ource of funds (public funds and third-party funds, without contributions from companies)	2021 in €1,000	2022 in €1,000
Public funding at the federal level	16,936	20,365
of which basic budget (BMDW/BMAW)	9,983	14,660
of which NFTE, Ö-Fonds and FZÖ	6,953	5,705
Other funds (incl. third-party funds raised)	28	120
Total funding budget	16,964	20,485

Note: Budget data for 2022 corresponds to the maximum budget framework, as accounting data are not yet available. Source: CDG.

Indicator 2: Evaluation systems

The impact of the CDG's funding programmes is analysed within the framework of comprehensive programme evaluations in a multi-year cycle. The results are incorporated into the programme design. In addition, a comprehensive discourse on the framework conditions for operating CD Laboratories and JR Centres is conducted every five years with the involvement of universities (uniko), universities of applied sciences (FHK), CDG member companies and the Ministry of Labour and Economy, and these are adjusted accordingly.

A 2022 analysis (Elsevier SciVal based on Scopus (>50 million publications) and data from five of the world's largest patent offices) certifies that publications from CDG research units have international highs in patent relevance (out of 1,000 publications, over 250 are cited in patents) and in the number of joint publications between academia and industry.

Indicator 3: Human capital and qualification

Office staff	Headcount									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Assistants	5	5	4	80	4	80	1	20	1	20
Experts	11	10	6	55	6	60	5	45	4	20
Management level	3	5	2	67	3	60	1	33	2	40
Total	19	20	12	63	13	65	7	37	7	35

	Full time equivalents (rounded)									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Assistants	3	3	3	100	2	67	0	0	1	33
Experts	9	9	5	56	5	56	4	44	4	44
Management level	3	4	2	67	3	75	1	33	1	25
Total	15	16	10	67	10	63	5	33	6	37

Source: CDG.

The following staff development measures were implemented in 2021 and 2022:

The CDG's staff development is subject to a continuous process and includes training programmes that are important for the development of the organisation (e.g. digitalisation, DSGVO, compliance training). The measures are defined for the respective function as well as individually adapted to the person.

Indicator 4: Output, innovation and excellence

Participations	2021	2022
Companies involved	189	191
of which SMEs	42	43
Universities	14	14
Non-university research institutions	1	1
Universities of applied sciences	9	10
Foreign universities	2	2

Source: CDG.

Supported persons	2021	2022
Total	1,194	1,244
of which women	470	446
of which men	724	798

Source: CDG.

Time to contract and consultations	2021	2022	Target value 2023
Processing time for applications without revision in days	202	188	
Processing time for applications with revision in days	312	349	
Number of consultations for (potential) funding applicants	49	52	> 51

Source: CDG.

Number of scientific publications from the funded projects	2021	2022
Monographs and editions	2	5
Articles/contributions in scientific journals, edited volumes and proceedings	748	676

Source: CDG.

Patents and invention disclosures	2021	2022	Target value 2023
Patents applied for	n. a.	n. a.	n. a.
Patents granted	9	10	> 9
Invention disclosures to the university of applied sciences/research institution	33	10	> 9

Source: CDG.

Indicator 5: Internationalisation

	2021		2022*	
	Number	in %	Number	in %
Projects with international partners	45	44	41	39
Participating companies located abroad	50	26	49	26

* Provisional, not yet finalised data. Subsequent registrations on the part of the funding recipients are still possible. Source: CDG.

Indicator 6: Knowledge and technology transfer

	2021	2022*
Total funding volume in €1,000 including company contributions	32,798	38,686
of which cooperation science/business	32,798	38,686
Share in %	100%	100%

* Budget data for 2022 corresponds to the maximum budget framework, as accounting data are not yet available. Source: CDG.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

Openings of CD labs and JR centres are used for networking and knowledge communication in close cooperation with the PR departments of the respective universities and universities of applied sciences.

The CDG Prize for Research and Innovation is awarded annually, and the scientific content is disseminated to the public in a generally understandable way via print and online media. Success stories are developed and disseminated in close cooperation with the respective companies or researchers from the universities.

Researchers and their fields of work are regularly presented via LinkedIn and the CDG website.[341] In the "CDG Future Talks", which are also accessible to the public via streaming, current topics (pandemic, energy, cancer, …) are discussed and illuminated from a scientific, entrepreneurial, and political perspective in a panel discussion with people from the field with the involvement of the audience.

In total, the research topics of the CDG 2022 were picked up in around 1,000 reports in print and online media and social media. The CDG is a member of the Open Science Association and Uni.PR.

Indicator 8: Gender and promotion of equality

	2021		2022		Target value 2023
	Number	Share	Number	Share	Share
Funded projects					
Women in CD labs and JR centres	470	39%	446	36%	
Female heads of CD Laboratories and JR Centres	17	16%	19	17%	> 16%
Evaluation committees and assessments					
Women in permanent evaluation bodies and advisory boards	12	27%	12	27%	> 26%
Reviews carried out by women	13	16%	19	15%	> 14%

Source: CDG.

Programmes/initiatives with gender or equality as a funding criterion:
In order to promote women in the sciences, CDG foundation managements allow the staff costs of female scientists who do not have a permanent employment relationship at the respective university to be partially funded.

As part of Girls' Day, CD labs convey the fascination of science in an experience-oriented approach.

3.8.3 New initiatives and instruments 2022; outlook

In 2022, the CDG introduced a new format for public science communication with the CDG Future Talks. Experts from science, business and politics discuss socially relevant topics in a public panel discussion with audience participation. The first two Future Talks took place on the topics "Covid-19: Lessons Learned" and "Wanted: Energy Transition".

341 https://www.cdg.ac.at, https://www.linkedin.com/company/CDGnet

In March 2022, the CDG issued a flash call for emergency assistance for Ukrainian junior researchers. Three researchers who are unable to return to Ukraine due to the Russian invasion or who have fled Ukraine and are conducting research in the thematic area of a CD Laboratory or JR Centre were granted bridging funding.

In 2022, around 25% of CDG research units dealt with questions on transformative RTI topics such as energy and green tech that contribute to tackling the energy and climate problem. Around 40% of CDG research units made contributions to EU missions.

Overall, the CDG model continues to enjoy high popularity among both academia and business.[342]

3.9 The Austrian Science Fund (FWF)

3.9.1 Profile and key figures

The Austrian Science Fund (FWF) is Austria's leading organisation for the funding of basic research and artistic and scientific research on an open-topic basis. In a selective, international peer-review process, the FWF promotes those researchers and ideas that are pathbreaking due to their scientific quality. The findings strengthen Austria as a research nation and lay a broad foundation for better meeting future societal challenges.

Investments in basic research awarded through the FWF are efficient and have a major leverage effect in the knowledge and innovation sector. Strongly positioned basic research attracts the most talented minds and thus know-how. This strengthens Austria's economic power in the sustainable long term.

Key figures 2021 and 2022

	2021	2022
Total funding budget in €1,000	270,017	286,092
of which new or extended projects (new approval amount)	256,078	272,969
Number of approved research projects	732	743
Number of persons funded via FWF funds	4,458	4,842

Staff FWF Office	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	36	102	138	38	108	146
Full time equivalents (rounded)	32	87	119	34	91	125

Source: FWF.

342 Further figures, data and facts can be found at: https://www.cdg.ac.at/en/about-us/facts-and-figures-on-the-christian-doppler-model

3.9.2 Development of indicators

Indicator 1: Funding, including third-party funding

Source of funds	2021 in €1,000	2022 in €1,000
Federal funding	265,222	283,444
of which basic budget (BMBWF)	234,022	273,548
of which NFTE, Ö-Fonds and FZÖ	31,200	9,896
Regional governments	2,251	2,426
EU	1,152	5
Other (incl. third-party funds raised)	1,392	216
Total	270,017	286,092

Source: FWF.

Indicator 2: Evaluation systems

The evaluation system includes surveys of applicants and project leaders, evaluations of ongoing funding programmes[343] and of implementations of new funding programmes, as well as statistical analyses of decision-making procedures. All analyses are put out to international tender and the results are published in a freely accessible form.

Of particular importance was an analysis of funding decisions in the Individual Projects Programme by the University of Zurich.[344] According to this analysis, the homogeneity or heterogeneity of international reviews is comparable to other funding organisations. The approval probabilities by gender, age, disciplines of the applicants as well as by decision-making sessions do not differ significantly – although international reviews slightly favour men and older applicants, this is balanced out in the further decision-making process by the work of the Board of Trustees. Interdisciplinary applications have a very weak disadvantage in the probability of approval.

Indicator 3: Human capital and qualification

Office staff	Headcount									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Assistants	74	82	58	78	65	79	16	22	17	21
Experts	49	47	36	73	32	68	13	27	15	32
Management level*	15	17	8	53	11	65	7	47	6	35
Total	138	146	102	74	108	74	36	26	38	26

343 See Glinsner et al. (2022) and Nindl et al. (2022).
344 See Mutz et al. (2022).

	Full time equivalents (rounded)									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Assistants	59	68	47	79	54	79	12	21	14	21
Experts	45	41	32	71	27	66	13	29	14	34
Management level*	15	16	8	52	10	62	7	48	6	38
Total	119	125	87	73	91	73	32	27	34	27

* The management level includes the executive board and the department heads. Source: FWF.

The following staff development measures were implemented in 2021 and 2022:

As an expert organisation and due to its funding activities, the FWF is highly aware of the importance of its employees' qualifications. To ensure that the FWF's quality standards, which are supported by its employees, are lived and further developed, the FWF invests in the training and continuing education of its employees. The departments have an annual budget for this purpose. In the years 2020–2022, due to the pandemic, many staff development measures were carried out virtually, resulting in a slight reduction in the corresponding costs. In the coming year, training will focus on topics related to the FWF4.0 project (process management, IT, change management).

Indicator 4: Output, innovation and excellence

Funded projects (new approvals)	2021		2022	
	Number	in €1,000	Number	in €1,000
Total	732	256,078	743	272,969
of which universities*	605	215,431	621	228,921
of which universities of applied sciences	8	4,261	6	3,010
of which non-university research institutions**	119	36,386	116	41,038

* Including private universities. ** Including research institutions abroad. Source: FWF.

Supported persons	2021	2022
Total	850	821
of which women	304	288
of which men	546	527
of which diverse	–	6

Source: FWF.

Time to contract* and consultations	2021	2022	Target value 2023
Processing time for programmes without deadline** in days	170	171	
Number of counselling events for (potential) funding applicants			
Total	47	46	> 45
of which coaching workshops	3	4	
of which information events	44	34	
of which Proposers' Days	0	8	

* The period between receipt of the application by the FWF and the funding decision. In the case of approval, it usually then takes only a few days until the funding agreement is issued. ** Programmes without deadlines are individual projects, Clinical Research Programme, ESPRIT Programme and Schrödinger Programme. Source: FWF.

Scientific publications from the funded projects*	2021	2022
Monographs and editions	101	42
Articles/contributions in scientific journals, edited volumes and proceedings	5,634	6,589

* Data from final project reports received in the respective year. Source: FWF.

Patents and records of invention*	2021	2022
Patents applied for	5	4
Patents granted	6	16
Records of invention submitted to the university/university of applied sciences/research institution	n. a.	n. a.

* Data from final project reports received in the respective year. Source: FWF.

Indicator 5: Internationalisation

	2021		2022		Target value 2023
	Number	in %	Number	in %	in %
Projects with international partners	1,953	75	2,015	74	> 73
Involved persons domiciled abroad	6,272	46	5,652	42	

Source: FWF.

Bilateral and multilateral agreements with foreign research funding institutions (these are existing agreements, i. e. not that there is the possibility of submitting projects or that projects are funded in every year):

		2021	2022
Within Europe	Multilateral	• 9 ERA-Net participations • Weave* (Belgium, Germany, Luxembourg, Poland, Switzerland, Slovenia, Czech Republic) • European Partnership Biodiversa+ • European Partnership Water4All	• 9 ERA-Net participations • Weave* (Belgium, Germany, Luxembourg, Poland, Switzerland, Slovenia, Czech Republic) • European Partnership Biodiversa+ • European Partnership Water4All • European Partnership ERA4Health
	Bilateral	• France • Italy/South Tyrol • Russia • Hungary	• France • Italy/South Tyrol • Russia (suspended) • Hungary
Outside Europe	Multilateral	• Belmont Forum	• Belmont Forum
	Bilateral	• China • India • Israel • Japan • South Korea • Taiwan • USA	• China • India • Israel • Japan • South Korea • Taiwan • USA

* Weave is a network of European research funding organisations that aims to jointly fund international research projects.

Source: FWF.

Indicator 6: Knowledge and technology transfer

Funding programmes in the field of knowledge and technology transfer*	2021		2022	
	Projects	Total funding approved in €1,000	Projects	Total funding approved in €1,000
Clinical Research Programme	18	5,964	16	5,080
Weiss Prize	3	399	3	1,288
Net Idea SCIENCE	1	246	–	–
Projects of the Herzfelder Foundation	7	2,565	–	–
Replacement methods for animal experiments	6	1,553	3	1,091
Quantum Austria	–	–	22	7,422

	2021		2022	
	Approvals in €1,000	Proportion of all approvals (%)	Approvals in €1,000	Proportion of all approvals (%)
All funding for the cooperation between science and industry	**10,728**	**4.2**	**14,882**	**5.5**

* There must be no direct interests of commercial companies in the results of the projects. Co-funders are not permitted to act as sponsors within the meaning of the ICH-GCP rules.

Source: FWF.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

The Austrian Science Fund FWF promotes communication and interaction with society on several levels: on the one hand, at the level of its programme portfolio with specific funding offers that enable researchers to expand their dialogue with society. These include the "Science Communication" and "Top Citizen Science" programmes as well as the transdisciplinary #ConnectingMinds programme. In the Science Communication programme, the FWF doubled the funding volume in 2022, thus expanding support for communication projects by FWF-funded researchers. In addition, the FWF as an institution implements numerous communication and dialogue measures to communicate the impact of basic research – e. g. the "Am Puls" series of events. Another component is the strengthening of Open Science in order to make scientific findings freely accessible. For example, from 2023 the FWF will be the first research funder to support the Open Knowledge Maps online platform developed in Austria.

Indicator 8: Gender and promotion of equality

	2021		2022		Target value 2023
	Number	Share in %	Number	Share in %	Share in %
Women in funded projects					
Women project employees	2,099	47	2,307	48	
Women project managers	248	34	253	34	> 33
Women on committees					
Presidium	3	60	3	60	
Supervisory Board	8	80	7	70	
Assembly of Delegates	24	41	26	44	
FWF Board	28	44	27	42	
Strategic Advisory Board	4	50	4	50	
Women on Programme Juries					
Jury START Programme and Wittgenstein Prize	5	38	5	38	
Jury Programme for the Development and Accessibility of the Arts (PEEK)	3	50	3	50	
Jury Science Communication Programme	3	50	3	50	
Jury doc.funds Programme	7	50	6	43	
Jury doc.funds.connect Programme	7	50	1	14	
Jury Zukunftskollegs	4	40	–	–	
Jury 1000 Ideas Programme	6	33	7	37	
Reviews conducted by women	1,586	28	1,316	27	
Difference in approval rate women vs. men	–1.3%-points		+1.4%-points		±2.0%-points

Source: FWF.

Programmes/initiatives with gender or equality as a funding criterion:
In all but a few programmes, it is obligatory to address gender and gender-relevant aspects in the project description (excerpt from the application guidelines): "All potential gender and gender-relevant components in the planned project: How will these be integrated into the research approach? In any case, this complex of topics must be briefly addressed in a separate section of the project description – even if, in the opinion of the applicants, the project does not contain any such components. Isolated exceptions apply to the Wittgenstein Prize, among others, since no project descriptions are submitted here, but nominations are made by third parties. In the case of research groups and special research areas, the team composition is a funding criterion".

3.9.3 New initiatives and instruments 2022 and outlook

With the excellence initiative excellent=austria, the FWF together with the BMBWF opened a new chapter in research funding. In the Clusters of Excellence, 35 consortia submitted applications. Five Clusters of Excellence will launch projects at eleven locations in 2023 with an investment volume of €135 million. Researchers from eleven universities and non-university research institutions work together in the clusters. Basic research on key topics such as energy storage, quantum technologies, global health, the future of knowledge and the relationship between Europe and Asia will be addressed. In this way, long-term structures, attractive framework conditions and international visibility can be created. A cluster is characterised by the combination of cutting-edge research, research-led training and promotion of junior researchers as well as the national and international exchange of knowledge. In addition, cooperation with business and society is a central element.

In September 2022, the call for proposals for the second pillar of excellent=austria, Emerging Fields, was launched with the aim of helping new transformative scientific approaches achieve a breakthrough. In addition, the FWF expanded its funding portfolio in individual thematic areas in 2022. AI Mission Austria, a funding programme for the development of AI as a key technology, was launched together with aws and FFG. As part of Quantum Austria 2022, 22 university research projects with a total volume of €7.4 million were approved with funds from the NextGenerationEU development and resilience plan.[345]

3.10 OeAD-GmbH (OeAD)

3.10.1 Profile and key figures

The OeAD-GmbH, Agency for Education and Internationalisation, promotes and networks people and institutions from education, science and research with its future-oriented programmes. As an agency of the Republic of Austria, it contributes to inclusive, equal and high-quality education and initiates innovations in education, teaching and research. In addition to mobility and project funding to support the internationalisation of educational institutions, the tasks in the school sector were expanded in 2022.

345 For more information, see the FWF Annual Report. The most recent annual report can be found at: https://www.fwf.ac.at/en/about-the-fwf/publications

The OeAD headquarters are in Vienna, there are five regional offices at Austrian university locations, an office in Bregenz for the area of Holocaust Education, five cooperation offices in Eastern and South Eastern Europe with an educational focus, as well as cooperation offices in Lviv and Shanghai with a scientific focus. OeAD-Wohnraumverwaltungs-GmbH provides accommodation for around 12,000 international students, researchers and teachers.

Key figures for 2021 and 2022

	2021	2022
Total funding budget, disbursements in €1,000	53,725	96,103

Number of employees	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	83	221	304	98	242	340
Full time equivalents (rounded)	62	186	248	82	191	273

Source: OeAD.

The significant increase in the central key figures in 2022 is mainly due to the commissioning of the Ukraine Scholarship Programme, the takeover of the School Fund (support for school events lasting several days), the new measure "Prevention of Extremism", the expansion of the project management "Digital Learning", which is part of the Austrian Federal Government's 8-point plan for digital education, as well as the new area of responsibility "Holocaust Education".

3.10.2 Indicators for 2021 and 2022

In contrast to the central indicators, the indicators only refer to the research-relevant activities of the OeAD; for 2022, these also include the measures for Ukraine.

The BMBWF funds are research-related activities such as incoming and outgoing scholarship programmes, the actions with our neighbouring countries Hungary, the Czech Republic and Slovakia, the lectureship programme, scientific and technical cooperation, international research cooperation and internationalisation measures, support for university networks with Southeast Asia, China and African countries, as well as the Children's and Youth Universities and Sparkling Science programmes.

Indicator 1: Funding, including third-party funding

	2021 in €1,000	2022 in €1,000
Total research-related funding (all income relevant to research from federal funds and third-party funds)	14,339	23,505
of which federal funds BMBWF (approvals incl. Ukraine scholarships)	12,860	21,326
of which other federal funds (Austrian Development Agency; disbursements)	632	1,219
of which other (third-party funds e.g. Indonesia, Pakistan; disbursements)	847	960

Source: OeAD.

Reason for the increase: for 2022, a "return" to figures for international projects and mobilities, which in some cases even exceed the pre-crisis level, is noted. In addition, the funding agreement concluded between the BMBWF and the OeAD for the three-year period 2021–2023 includes funding for the Sparkling Science programme again for the first time in 2022.

Indicator 2: Evaluation systems

Surveys of the (potential) applicants and the sponsored persons

Scholarship holders are regularly surveyed on the implementation of their study or research project and the OeAD services. Among other things, these surveys provide information on the level of satisfaction with the OeAD's programme management. The results of these surveys show values between 1.1 and 1.5 for overall satisfaction on a four-part scale (1: very good; 4: not satisfactory) for the individual programmes.

Evaluations of funding programmes, impact analyses

In 2022, the scholarship and research cooperation programmes funded by the science sector were externally evaluated by WPZ Research GmbH. In the education sector, the "culture connected" initiative for cooperation between schools and cultural institutions was evaluated.

Indicator 3: Human capital and qualification

Personnel office	Headcount									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Assistants	6	5	6	100	4	80	0	0	1	20
Experts	31	45	27	87	37	82	4	13	8	18
Management level	3	3	2	67	2	67	1	33	1	33
Total	**40**	**53**	**35**		**43**		**5**		**10**	

	Full time equivalents (rounded)									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Assistants	4	4	4	100	3	75	0	0	1	25
Experts	24	36	22	91	30	83	2	9	6	17
Management level*	2	2	2	100	2	100	2	100	0	0
Total	**30**	**42**	**28**		**35**		**2**		**7**	

Source: OeAD.

The increase in reported staff is mainly due to the takeover of measures for students and researchers who have fled Ukraine, as well as the first-time programme implementation of Sparkling Science 2.0.

The OeAD's comprehensive continuing education programme with the focus on "IT Security Awareness", conducted entirely as an e-learning course, was carried out according to plan. The measures were handled both in an online format and in classroom form.

Indicator 4: Output, innovation and excellence

	2021		2022	
	Number	Share	Number	Share
Funded projects	415		652*	
of which in universities	266	64%	542	76%
of which in universities of applied sciences	19	5%	27	4%
of which in other institutions	130	31%	140	20%
Supported persons (incl. Ukraine)	1,604		3,358	
of which men	773	48%	1,410	42%
of which women	831	52%	1,948	58%

* The total number does not correspond to the sum of the projects in the different institutions, as projects with several partners are only counted once. For the same reason, the percentages given do not result from a division of the numbers given in the table.

Source: OeAD.

The trend towards a "return" to earlier figures for international projects and mobilities, which began with the decline of the COVID-19 pandemic from the winter semester 2021/22, continued in 2022. A large-scale "catch-up" process can be observed in 2022. In addition, the establishment of a scholarship programme for students and researchers who have fled Ukraine (657 persons in total) has contributed significantly to the increase in the number of women receiving funding.

Time to contract and consultations	2021	2022	Target value 2023
Processing time (time to contract) in days*	90 to 180	90 to 290	
Enquiries answered	5,300	6,134	> 5,500
of which legal advice on foreign nationals	2,404	2,622	> 2,650

* The average processing time is defined from the end of the application deadline until the contract is signed or the fellowship award is issued. For fellowship programmes, the average duration is up to 180 days, for Sparkling Science up to 290 days. Source: OeAD.

The increase in counselling services, especially from the second half of the year onwards, is due to the war in Ukraine and the associated refugee flows.

Indicator 5: Internationalisation

All of the programmes reported here are per se internationalisation programmes in the field of science and research. This applies to both the mobility programmes (3,358 mobile persons who studied or conducted research in another country in 2022) and 652 cooperation projects, in which the focus was on international cooperation.

Indicator 6: Knowledge and technology transfer

In the OeAD's scholarship and cooperation programmes, knowledge and technology transfer takes place at both the individual and institutional level, even if this is not stated as an explicit objective of the funding programme in many programmes.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

In the area of Public Science, various measures are taken to communicate science (outside of) school and to build up know-how in the area of Citizen Science. The goal is to increase trust in science.

To expand the citizen science research approach in the research and education landscape and civil society, the OeAD holds lectures and offers networking opportunities, among other things. In addition, 34 newly funded projects of the Sparkling Science 2.0 research funding programme started in autumn with a funding amount of €11.5 million. Out-of-school science education was promoted with 22 initiatives of the children's and youth universities.

In the area of science education in schools, 163 visits or workshops by the Young Science Ambassadors took place. The "Citizen Science Award" research competition also contributed to strengthening trust in science with 2,050 participants. The focus in 2022, however, was the #YoungScienceRocks campaign, in which more than 700 pupils visited the Young Science Congress and a collection of materials and initiatives was created so that teachers can easily integrate science and research into the classroom.

Participants in the following projects	2021	2022	Target value 2023
Children's and youth universities (funded initiatives)	18	20	20
Sparkling Science (funded partnerships between institutions; funding only from 2022)		225	
Citizen Science Award (persons involved)	3,117	2,046	2,500

Source: OeAD.

Indicator 8: Gender and promotion of equality

Women in evaluation committees and reviews	2021		2022		Target value 2023
Juries, evaluation panels (raised from 2021)	19	46%	21	47%	
Assessments (collected from 2021)	241	35%	407	36%	
Supervisory Board	5	42%	5	42%	
Strategy Advisory Board	3	38%	3	42%	
Total	268	36%	436	40%	

Source: OeAD.

3.10.3 New initiatives and instruments 2022; outlook

The OeAD's programmes, especially the promotion of international mobility and cooperation, were only affected by the COVID-19 pandemic in the first half of 2022; since the winter semester of 2022/23, a "catching up" process, which led to a very strong increase in mobility and project numbers, has been observed. The trend is clearly moving in the direction of even surpassing the figures before the COVID-19 pandemic.

The funding agreement between the BMBWF and the OeAD, which was concluded for the first time, has also proven its worth for the 2nd year of the three-year period 2021–2023 with its content planning horizon and financial security. The inclusion of the Sparkling Science funding programme, which also provides an important building block for the areas of science communication and interaction with society, as well as the measures for Ukraine contribute to a significant expansion of the OeAD's funding volume.

For 2023, the OeAD's programmes will be even more strongly geared towards being able to contribute to the current trends and the priorities given by the BMBWF in the areas of STEM, skills shortages and Trust in Science and Democracy. In addition, the sports agendas funded for the first time in the framework of Erasmus+ will be taken over and an office for digital competences will be established.[346]

3.11 Austrian Research Promotion Agency (FFG)

3.11.1 Profile and key figures

Profile of the organisation

The FFG sees itself as a central agency for the promotion of applied research, development and innovation. It is the implementation partner of the Federal Government for its strategies to strengthen the research and innovation location and to meet current challenges in the context of the ecological and digital transformation.

In this function, the FFG offers a differentiated portfolio of support services. Beyond the funding of RTI projects and the further development of infrastructures and institutions, the FFG addresses in particular the need for highly qualified employees in research and development.

In addition to implementing funding initiatives for BMK, BMAW, BMBWF, BML, FFG is an implementing partner of the Climate and Energy Fund and the majority of the Austrian provinces.

Finally, the FFG supports companies and research institutions in participating in European programmes and assesses applications for the research premium.

346 Further information can be found in the OeAD annual financial statements. The most recent annual financial statements can be found at https://oead.at/en/the-oead/publications.

Key figures for 2021 and 2022

FFG R&D funding	2021	2022
Projects	4,977	5,367
Participations	7,828	7,906
Stakeholders	4,884	4,643
Subsidies incl. liabilities in €1,000	737,679	693,385
Present value in €1,000	640,131	559,810
Disbursements in €1,000	572,681	607,500

Staff	2021			2022		
	m	f	total	m	f	total
Employees (= headcount)	158	213	371	170	239	409
Full time equivalents (rounded)	145	186	331	157	203	360

FFG infrastructure funding (broadband, EBIN*)	2021	2022
Projects	304	253
Present value in €1,000	183,596	111,587
Disbursements in €1,000	108,394	80,773

* Investment funding for zero-emission buses and commercial vehicles.

Source: FFG.

3.11.2 Indicators for 2021 and 2022

Indicator 1: Funding, including third-party funding

Source of funds (for R&D funding, excluding commissions) (public funds and third-party funds, excluding contributions from companies)	Present values within the scope of contractual commitments in €1,000	
	2021	2022
Federal ministries acting as owners	494,420	398,067
BMK	415,756	339,048
BMDW/BMAW	78,664	59,019
BMBWF	1,507	50,788
BML	12,564	29,366
NFTE, Ö-Fonds, FZÖ	49,248	8,548
Climate and Energy Fund	57,121	50,856
Regional governments	13,365	13,861
EU	7,811	4,903
Other	4,095	3,422
Total	640,131	559,811

Source: FFG.

Indicator 2: Evaluation systems

FFG funding is evaluated externally according to predefined indicators. In the transferred sphere of action, the ministries with strategic responsibility usually commission the evaluation. In its own sphere of action, the FFG also commissions evaluations itself.

Furthermore, on behalf of the FFG, a survey of the funded organisations on the effects of the funded projects is conducted annually, in each case four years after completion of the funded RTI projects. Special focus is placed on the economic utilisation of the project results. The results are published.

Feedback from applicants and sponsored persons is obtained on a regular basis:

- Annual telephone survey on satisfaction with the services of the FFG (processes, accessibility and quality of services) and new needs among the target groups
- Timely online surveys on satisfaction with project support, application or contract preparation. Focus questions on the user-friendliness of the processing systems, effort, comprehensibility of requirements. The results are incorporated into the continuous process optimisation
- If required: focus groups during the development of new processes in order to involve customers well, especially when it comes to the further development of applications or settlement processes
- Possibility to make suggestions at any time

Indicator 3: Human capital and qualification

Personnel FFG	Headcount									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Assistants	61	63	49	80	49	78	12	20	14	22
Experts	261	294	141	54	164	56	120	46	130	44
Team/units/dep. management	47	50	22	47	25	50	25	53	25	50
General Management	2	2	1	50	1	50	1	50	1	50
Total	371	409	213	57	239	58	158	43	170	42

	Full time equivalents (rounded)									
	total		female				male			
	2021	2022	2021		2022		2021		2022	
	Number	Number	Number	%	Number	%	Number	%	Number	%
Assistants	53	50	42	80	40	80	10	20	10	20
Experts	232	262	122	53	140	53	110	47	122	47
Team/units/dep. management	45	46	20	44	22	48	25	56	24	52
General Management	2	2	1	50	1	50	1	50	1	50
Total	332	360	185	56	203	56	146	44	157	44

Source: OeAD.

The following staff development measures were implemented in 2021 and 2022:

In addition to the individual further training measures in the form of coaching, seminar and conference visits, as well as internal training, the following focal points were set:

- Introduction or increased use of new learning methods:
  - Self-directed learning in the form of eLearning
  - Learning from each other in the form of peer-to-peer training (colleagues pass on their knowledge and experience to colleagues)
  - Learning from and with each other in the form of communities of practice (informal communities of practice and learning that are linked by a common theme).
- Launch of a new leadership development programme (individual further training and coaching, workshops and regular exchange of experience)
- Introduction of a new staff survey tool with short, monthly surveys (mood barometer)

Indicator 4: Output, innovation and excellence

Projects, participations and organisations	2021		2022		Target value 2023
	Number	Share	Number	Share	
Funded projects	4,977		5,367		
Participations in projects, total	7,828	100%	7,906	100%	
Organisations	4,884		4,643		
of which company	3,473	71%	3,882	84%	
of which SMEs	2,785	80%	3,265	84%*	~75%**
of which research institutions	188	4%	159	3%	
of which universities (institutes)	493	10%	424	9%	
of which intermediaries and others	730	15%	178	4%	

* The SME share follows the funding offer available in the respective year. In 2022, a particularly large number of SMEs were reached through the Digital Skills Cheque, a new offer from the BMAW with a high broad impact, which is aimed at SMEs. ** In the course of standardisation with the indicator reported by the aws, the calculation was changed as follows: old calculation = SME participations/company participations; new calculation = number of SMEs/number of companies. Source: FFG.

Time to contract, median values in days

Funding offer	2021	2022
FFG total	22	7
of which as examples		
Bottom-up programmes*	77	83
Small-scale programmes**	8	3
Research premium	38	39

* Includes all funding offers that are implemented within the framework of the Basic Programmes: Basic Programme Classic, Early Stage, Impact Innovation. ** Includes mainly the student internships, the eco-cheque, the continuing education cheque, the patent cheque and the innovation cheque. Source: FFG.

Number of consultations for (potential) funding applicants	2021	2022	Target value 2023
Funded nationally by the FFG	10,928	12,307	~10,000*
Consultations within the framework of the EIP mandate	5,906	6,238	~6,000*

* Both the advisory activities of the funding service and those within the framework of the EIP mandate are demand-driven. It is about orientation on funding opportunities and concrete support in the application phase. The monitoring of implementation performance is primarily based on the feedback regularly obtained from the advisors on the quality of advice and accessibility. Source: FFG.

Patents and licences	2021	2022	Target value 2023
Patents applied for*	505	597	> 500**
Patents granted	n.a.	n.a.	
Licensing agreements	n.a.	n.a.	

* Data basis: Impact monitoring (survey 4 years after the end of the project); Patent.Scheck monitoring (cleared cheques 2022). ** The value 500 is an empirical value that results from the directly funded patent application activities within the scope of the Patent.Scheck on the one hand and from the results of the impact monitoring (four years after the end of the project) on the other.
Source: FFG. KMU-Forschung Austria (impact monitoring).

Indicator 5: Internationalisation

	2021		2022	
	Number	in %	Number	in %
Projects with international partners	215*	16%	157	13%
Participating companies based abroad	209	4%	149	3%

* The number of projects with international partners in 2021 was 256 in last year's report. The now lower number is explained by changes in the delimitations, according to which small-scale instruments are no longer taken into account. Source: FFG.

Funding in transnational calls for proposals (commitments)	2021	2022
	Present value in €1,000	Present value in €1,000
Article 185: Eel	3,674	1,390
Article 185: Eurostars	4,815	4,641
Eranet EU Co-financed	904	1,967
Eranet not EU co-financed	5,663	3,867
Eureka	2,255	4,749
Joint Programming Initiatives	3,999	3,635
Joint Technology Initiatives	11,829	-
Other Transnational Projects	1,000	3,429
Total	**34,139**	**23,678**

Source: FFG.

As there will be no more Horizon 2020 projects when the contract ends in 2022, the table now presents the pillars and instruments of Horizon Europe.

Pillar	Instrument	Number of projects 2022
Global Challenges and European Industrial Competitiveness	HORIZON-COFUND	3
Global Challenges and European Industrial Competitiveness	HORIZON-CSA	5
Innovative Europe	HORIZON-COFUND	1
Innovative Europe	HORIZON-CSA	1
Widening Participation and Strengthening the European Research Area	HORIZON-CSA	1
Overall result		**11**

Indicator 6: Knowledge and technology transfer

Promotion activities in the area of knowledge and technology transfer	2021		2022	
Themes and programmes*	Projects	Present value in €1,000	Projects	Present value in €1,000
Cooperation structures (FinV)	258	116,538	182	61,569
Energy and Environmental Technologies (FinV)	116	63,235	103	68,345
Innovation, Competitiveness and Internationalisation (FinV)	181	37,822	196	49,422
Mobility system (FinV)	67	38,280	54	30,926
Digital Technologies (FinV)	32	18,851	40	23,151
Production Technologies (FinV)	30	23,262	24	18,100
Quantum Austria		-	6	30,270
Lighthouses eMobility	12	12,607	11	4,338
KIRAS	17	7,124	17	7,988
THINK.WOOD	1	335	15	11,559
Space (FinV)	19	4,351	17	6,484
Smart Cities	11	4,112	11	4,371

	2021		2022	
	Present value in €1,000	Share of total present value	Present value in €1,000	Share of total present value
All funding for the cooperation between science and industry	**349,432**	**55%**	**334,987**	**60%**

* The majority of the FFG's funding offers promote cooperation at the interface between science and industry. The listed allocation is based on the one hand on the topics of the funding agreement 2022/23, and on the other hand on the programmes commissioned by other funding sources not covered by the funding agreement (e.g. BML, KLIEN, FZÖ). Topics of the 2022/23 funding agreement are marked with (FinV). Source: FFG.

Indicator 7: Communication and interaction with society

The following activities and formats for the communication and transfer of knowledge as well as for the inclusion and addressing of civil society actors were implemented in 2021 and 2022:

- **Co-Creation-Spaces Climate & Energy**: Establishment and operation of four new, innovative learning spaces in the thematic area of climate and energy with the active participation of children and young people, schools, science and business (https://www.ffg.at/ausschreibungen/CoCreationSpacesKlimaundEnergie-1-Ausschreibung)
- **Laura Bassi 4.0 – Digitalisation and Equal Opportunities.** Network for people who want to work for more equal opportunities in digitisation and who want to contribute their experience, knowledge, energy and links to their life worlds and networks in this regard (https://www.ffg.at/laura-bassi-4.0-digitalisierung-und-chancengerechtigkeit-netzwerk).
- **HUB CIRCLE event series:** Networking and dialogue of the Digital Innovation Hubs with an interested community on current and relevant sector-, region- or event-related digitisation topics (https://www.ffg.at/dih)
- Pilot in the framework of **PRO-Ethics** (EU project): Involvement of citizens in the development of tender topics. Participation takes place via a stakeholder workshop and an online survey (https://www.ffg.at/pro-ethics-projekt).
- **Future.Lab**: Workshop for Social Innovation and Sustainable Transformation in Urban Development (https://futurelab.tuwien.ac.at/research-center/innovationswerkstatt)
- **BMK expert dialogue**: Contribution of research and innovation to an accelerated and purposeful transformation of energy systems, with workshops and seminars and, as a conclusion, the hackathon (https://nachhaltigwirtschaften.at/de/veranstaltungen/2022/20221104-hackathon-energiewende.php)

Indicator 8: Gender and promotion of equality

	2021		2022		Target value 2023
	Number	Share	Number	Share	
Women in funded projects					
FTEs based on audited reports	1,240	17.8%	1,272	17.6%	
Women project leaders*	1,403	22%	1,764	22.7%	> 25%
Women on committees and juries					
FFG Supervisory Board	8	53%	10	59%	
Bridge Advisory Board	4	25%	4	27%	
Basic Programmes Advisory Board	8	36%	11	50%	
Reviews conducted by women**	1,914	35%	1,633	35%	> 35%

* Refers to the total number of participations with names of persons. If no project management function is entered, the evaluation is based on the gender of the technical contact person. ** Excluding broadband and EBIN. Source: FFG.

Programmes/initiatives with gender or equality as a funding criterion:

In almost all funding programmes implemented by the FFG, gender is anchored in the funding criteria – in terms of the composition of the project team and with regard to the content of the project. In addition, specific funding programmes with a gender focus are supervised:

- Funding priority "Talent" (BMK) promotes equal opportunities in companies and applied research, people in research and development throughout their careers, and gender-equitable research projects and innovation.
- INNOVATORINNEN (BMAW) makes women in formative roles in RTI visible and strengthens career competences of female researchers.
- With its innovation network projects, Laura Bassi 4.0 is aimed at women and companies who want to shape digitalisation in a way that provides equal opportunities.
- Industry-related dissertations: 50% of the funds for projects by female dissertation candidates.

3.11.3 New initiatives and instruments 2022; outlook

2022 was the first year in the regime of the first funding agreement. This has created new scope for integrative funding along thematic and priority lines.

- For the BMK, the four priority areas – energy transition, mobility transition, climate-neutral city, circular economy – were comprehensively addressed. A defining element is the clear transformative claim and thus the strengthening and direct promotion of concrete steps towards the implementation of innovative solutions. Two initiatives illustrate the approach:
- 100% Renewable Energy Real Labs with a high implementation standard and the impetus to involve stakeholders.
- The initiative "Pioneer City – Partnership for Climate Neutral Cities 2030". Here, too, the focus is on implementation orientation and support for transformative processes. A new instrument – public-public partnership – was developed and used for the first time to mobilise cities.

Additional funding, including from the RRF (EU Reconstruction and Resilience Plan), has financed:

- BMBWF – Quantum Austria in cooperation with the Austrian Science Fund FWF
- BMK – Investment support for fleet conversion (EBIN – zero-emission buses and commercial vehicles) and charging infrastructure (LADIN)
- BMAW – Life Science Focus
- BMAW – Qualification initiative

Outlook

Enabled by the Federal Government's transformation initiative and the allocated resources of the Future Austria Fund, the following new focal points are planned for 2023, among others:

- Expansion of the qualification initiative
- Promotion of entrepreneurial transformation projects
- Promoting radical innovation with a new integrative stage-gate approach[347]

347 Further information can be found in the FFG annual financial statements. The most recent annual financial statements can be found at https://www.ffg.at/publikationen#annualreport.

Annex

Annex I – Directories and data sources

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Bibliography

Accenture (2021): Studie "Business Futures 2021: Signale des Wandels" (Study "Business Futures 2021: Signals of Change"). https://www.accenture.com/de-de/insights/consulting/business-change#Nachhaltiger-Purpose

Alwert, K. (2006): Wissensbilanzen für mittelständische Organisationen (Intellectual capital reports for medium-sized organisations). Stuttgart, Fraunhofer IRB Verlag.

Austrian Institute of Technology, Austria Wirtschaftsservice, Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, Research Promotion Agency, Institute of Industrial Sciences, SME Research, Council for Research and Technology Development, WPZ Research, Centre for Social Innovation(2021): Umweltwirkungen von FTI-politischen Maßnahmen: Herausforderungen und Ansätze für die Evaluierungspraxis (Environmental impacts of RTI policy measures: Challenges and Approaches for Evaluation Practice), Vienna. https://repository.fteval.at/id/eprint/576/1/fteval_J52_10.22163_fteval.2021.517.pdf

Austrian Institute of Technology (2021): Ex-post-Evaluierung der Pilotförderungsaktion für Inkubatoren JumpStart Phase 1 und Phase 2 (Ex-post evaluation of the pilot funding action for incubators JumpStart Phase 1 and Phase 2), Vienna. https://repository.fteval.at/id/eprint/646/1/Endbericht%20JumpStart%20Evaluation%20Oktober%202021.pdf

Außenwirtschaft Österreich (2022): Österreichische Exportwirtschaft 2022/2023 (Austrian Export Economy 2022/2023), Vienna. https://www.wko.at/service/aussenwirtschaft/exportwirtschaft.pdf

Barbieri, N., Marzucchi, A., Rizzo, U. (2020): Knowledge sources and impacts on subsequent inventions: Do green technologies differ from non-green ones? Research Policy, 49(2), 103901.

BMAW (2023): Bundesminister Kocher: Förderauftakt im Rahmen der Klima- und Transformationsoffensive (Federal Minister Kocher: Funding launch under the Climate and Transformation Offensive, Media Information), Medieninformation, Vienna.

BMBWF (2022): Österreichischer Aktionsplan für den Europäischen Forschungsraum (ERA-NAP) 2022–2025 (Austrian Action Plan for the European Research Area (ERA-NAP) 2022–2025), Vienna.

BMBWF (2023): Horizon Europe. URL: https://www.bmbwf.gv.at/Themen/Forschung/Forschung-in-der-EU/EU-Rahmenprogrammes/Horizon-Europe.html

BMF (2021): Österreichischer Aufbau- und Resilienzplan 2020–2026 (Austrian Recovery and Resilience Plan 2020–2026). https://www.oesterreich.gv.at/nachrichten/allgemein/EU-Aufbauplan.html

BMK (2019): EXTRA LAW – MOBILITY, Experimentierräume im Verkehrs- und Mobilitätsrecht, Interdisziplinäre Studie zur Erarbeitung eines neuen (Rechts)-Rahmens für die Erprobung neuer Verkehrstechnologien und Mobilitätskonzepte für Österreich, Teil 1–3 (Experimental Spaces in Transport and Mobility Law, Interdisciplinary Study on the Development of a New (Legal) Framework for the Experimentation of New Transport Technologies and Mobility Concepts for Austria, Parts 1-3.), Vienna. https://www.bmk.gv.at/themen/mobilitaet/alternative_verkehrskonzepte/automatisiertesFahren/publikationen/extralawmobility.html

BMK (2020a): FTI-Strategie Mobilität, Innovationen in und aus Österreich für ein klimaneutrales Mobilitätssystem in Europa (RTI Strategy Mobility, Innovations in and from Austria for a climate-neutral mobility system in Europe), Vienna. https://mobilitaetderzukunft.at/resources/pdf/broschueren/BMK_FTI_Strategie_Mobilitaet_barrierefrei.pdf

BMK (2022a): Österreich auf dem Weg zu einer nachhaltigen und zirkulären Gesellschaft: Die österreichische Kreislaufwirtschaftsstrategie (Austria on the way to a sustainable and circular society: The Austrian circular economy strategy), Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, Vienna. https://www.bmk.gv.at/themen/klima_umwelt/abfall/Kreislaufwirtschaft/strategie.html

BMK (2022b): Dritter Projektbericht/Ergebnisbericht: Grüne Industriepolitik, Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie (Third Project Report/Results Report: Green Industrial Policy, Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology), Vienna. https://www.bmk.gv.at/themen/klima_umwelt/gruene-industriepolicy/goals.html

BMK and BMAW (2022): Vortrag an den Ministerrat, Klima- und Transformationsoffensive der österreichischen Bundesregierung, 32/25, Geschäftszahlen: BMK 2022-0.728.602, BMAW 2022-0.730.109 (Presentation to the Council of Ministers, Climate and Transformation Initiative of the Austrian Federal Government, 32/25, reference: BMK 2022-0.728.602, BMAW 2022-0.730.109).

BMBWF and BMK (2022a): More quality of life and sustainability through research and application: Implementation framework for the EU Horizon Europe missions in Austria (Mehr Lebensqualität und Nachhaltigkeit durch Forschung und Anwendung: Umsetzungsrahmen für die EU-Missionen von Horizon Europe in Österreich), Vienna.

BMBWF and BMK (2022b): Österreichischer Aktionsplan für den Europäischen Forschungsraum (ERA NAP) 2022–2025 (Austrian Action Plan for the European Research Area (ERA NAP) 2022–2025). December 2022, Vienna.

BMBWF, BMK, BMDW (2022): Österreichischer Forschungs- und Technologiebericht 2022 (Austrian Research and Technology Report 2022), Vienna.

BMBWF, BMVIT, BMDW (2020): Österreichischer Forschungs- und Technologiebericht 2020 (Austrian Research and Technology Report 2020), Vienna.

Claeys, G., Tagliapietra, S., Zachmann, G. (2019): How to make the European Green Deal work, Bruegel Policy Contribution 13. https://www.jstor.org/stable/resrep28626

Council of the European Union (2022): Conclusions on European Missions. 10124/22, RECH 369, COMPET 489, Brussels, 10 June 2022.

Dealroom (2021): Five years on: global climate tech investment trends since the Paris Agreement. https://dealroom.co/blog/climate-tech-investment-trends

Diercks, G., Larsen, H., Steward, F. (2019): Transformative innovation policy: Addressing variety in an emerging policy paradigm. Research Policy, 48(4), 880–894.

Edler, J., Blind, K., Kroll, H., Schubert, T. (2021): Technology sovereignty as an emerging frame for innovation policy – defining rationales, ends and means, Fraunhofer ISI Discussion Papers Innovation Systems and Policy Analysis 70.

Eidenberger, H., Ecker, B., Régent, V. (2023): BMBWF Forschungsinfrastruktur-Datenbank: Evaluierungsstudie 2022 (BMBWF Research Infrastructure Database: Evaluation Study 2022), Vienna.

European Commission (2010): EUROPE 2020 A strategy for smart, sustainable and inclusive growth. https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=celex%3A52010DC2020

European Commission (2014): Leading Industry – Innovation in SMEs. https://cordis.europa.eu/programme/id/H2020-EU.2.3./de

European Commission (2019): The European Green Deal, COM (2019) 640 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019 %3A640 %3AFIN

European Commission (2020a): A New Industrial Strategy for Europe, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, COM (2020) 102 final, Brussels, 10 March 2020.

European Commission (2020b): Strategic Perspectives: Setting the course for a more resilient Europe. https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52020DC0493&from=EN

European Commission (2021a): Updating the New Industrial Strategy of 2020: Building a Stronger Single Market for Europe's Recovery, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2021) 350 final, Brussels, 5 May 2021. https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52021DC0350&from=DE

European Commission (2021b): The Global Approach to Research and Innovation: Europe's Strategy for International Cooperation in a Changing World, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2021) 252 final, Brussels, 18 May 2021.

European Commission (2021c): The Digital Economy and Society Index (DESI) 2021: DESI methodological note. https://ec.europa.eu/newsroom/dae/redirection/document/80560

European Commission (2021d): European Green Deal. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

European Commission (2022a): Science, research and innovation performance of the EU 2022 – Building a sustainable future in uncertain times. https://op.europa.eu/s/xUi2

European Commission (2022b): A New European Innovation Agenda, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2022) 332 final, Strasbourg, 5 July 2022. https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52022DC0332&from=DE

European Commission (2022c): European Innovation Scoreboard 2022. Main Report. Luxembourg: Publications Office of the European Union. https://op.europa.eu/en/publication-detail/-/publication/f0e0330d-534f-11ed-92ed-01aa75ed71a1/language-en/format-PDF/source-272941691

European Commission (2022d): European Innovation Scoreboard 2022. Methodology Report. Luxembourg: Publications Office of the European Union. https://research-and-innovation.ec.europa.eu/system/files/2022-09/ec_rtd_eis-2022-methodology-report.pdf

European Commission (2022e): European Research Council. Funding. https://erc.europa.eu/funding/

European Commission (2022f): European Research Council. Statistics. https://erc.europa.eu/project-statistics/project-database

European Commission (2022g): The Digital Economy and Society Index Report 2022. https://ec.europa.eu/digital-single-market/en/digital-economy-and-society-index-desi

European Commission (2022h): Digital Economy and Society Index (DESI) 2022: Austria. Country Profile. https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022

European Commission (2022i): Quantum Flagship. https://qt.eu/about-quantum-flagship/

European Commission (2022j): Resilience dashboards for the social and economic, green, digital, and geopolitical dimensions. https://joint-research-centre.ec.europa.eu/scientific-activities-z/resilience/resilience-dashboards_en

European Commission (2022k): A New European Innovation Agenda. Communication from the European Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. 5 July 2022 (COM2022, 332 final).

European Union (2021): European citizens' knowledge and attitudes towards science and technology. https://europa.eu/eurobarometer/surveys/detail/2237

European Patent Office (2022): https://worldwide.espacenet.com/

Eurostat (2022): Eurostat Database. https://ec.europa.eu/eurostat/data/database

Eurostat (2023): R&D personnel and researchers by sector of performance, fields of R&D and sex. ULR: https://ec.europa.eu/eurostat/databrowser/view/RD_P_PERSSCI/default/table?lang=en&category=scitech.rd.rd_p

Federal Government of the Republic of Austria (2022): FTI-Pakt 2024 – 2026 (RTI-Pakt 2024–2026), Vienna. https://www.bundeskanzleramt.gv.at/dam/jcr:1683d201-f973-4405-8b40-39dded2c8be3/FTI_strategie.pdf

Federal Government of the Republic of Austria (2020): RTI-Strategie 2030: Strategie der Bundesregierung für Forschung, Technologie und Innovation (RTI Strategy 2030: Strategy of the Federal Government for Research, Technology and Innovation), Vienna. https://www.bundeskanzleramt.gv.at/dam/jcr:1683d201-f973-4405-8b40-39dded2c8be3/RTI_strategie.pdf

FFG (2022a): Beteiligungsdaten der Europäischen Kommission (eCorda) (European Commission participation data (eCorda)

FFG (2022b): Pionierstadt – Partnerschaft für klimaneutrale Städte 2030, Ausschreibungsleitfaden Ausschreibung 2022 (Pioneer City – Partnership for Climate Neutral Cities 2030, Tender Guide Call for Proposals 2022), Vienna. https://www.ffg.at/pionierstadt

FFG (2022c): Leitfaden für Innovationslabore, VERSION 4.2 (Guide for Innovation Labs, VERSION 4.2), Vienna. https://www.ffg.at/instrumente/Innovationslabor

FFG (2022d): Assessment der Zielerreichung der Pilotlinie „Social Crowdfunding" des FFG-Programms „Impact Innovation". Endbericht (Assessment of the achievement of objectives of the pilot line "Social Crowdfunding" of the FFG programme "Impact Innovation". Final report), Vienna.

FFG (2023a): EU Performance Monitor of 20 February 2023. https://eu-pm.ffg.at/ui/login/

FFG (n. a.): Impact Innovation 2023, Vienna. https://www.ffg.at/ausschreibung/impact-innovation-laufende-ausschreibung

Foray, D., Mowery, D. C., Nelson, R. R. (2012): Public R&D; and social challenges: What lessons from mission R&D; programs? Research Policy, 41, 1697–1702.

Friesenbichler, K. S., Janger, J., Kügler, A., Reinstaller, A. (2020): Auswirkungen der COVID-19-Pandemie auf die Forschungs- und Innovationsaktivität (Impact of the COVID-19 pandemic on research and innovation activity). WIFO, Austrian Institute of Economic Research.

FWF (2023): Special evaluation.

Gaddy, B. E., Sivaram, V., Jones, T. B., Wayman, L. (2017): Venture capital and cleantech: The wrong model for energy innovation, Energy Policy 102, 385–395. https://doi.org/10.1016/j.enpol.2016.12.035

Glinsner, B., Stalder, F., Schuch, K. (2022): Evaluation of the Arts-based Research Programme of the Austrian Science Fund (PEEK). https://doi.org/10.5281/zenodo.6318805

Greer, S. L., Rozenblum, S., Falkenbach, M., Löblová, O., Jarman, H., Williams, N., Wismar, M. (2022): Centralizing and decentralizing governance in the COVID-19 pandemic: The politics of credit and blame, Health Policy 126(5), 408–417. https://doi.org/10.1016/j.healthpol.2022.03.004

Haddad, C. R., Nakić, V., Bergek, A., Hellsmark, H. (2022): Transformative innovation policy: A systematic review. Environmental Innovation and Societal Transitions, 43, 14–40.

Haščič, I., Johnstone, N., Kahrobaie, N. (2012): International Technology Agreements for Climate Change: Analysis Based on Co-Invention Data, OECD Environment Working Papers, No. 42. https://doi.org/10.1787/5k9fgpw5tt9s-en

Haščič, I., and Migotto, M. (2015): Measuring environmental innovation using patent data, OECD Environment Working Papers, No. 89. https://doi.org/10.1787/19970900

Hausmann, R., Hidalgo, C., Bustos, S., Coscia, M., Simoes, A., Yildirim, M. (2013): The Atlas of Economic Complexity: Mapping Paths to Prosperity. Cambridge/Massachusetts, MIT Press.

Hekkert, M. P., Janssen, M. J., Wesseling, J. H., Negro, S. O. (2020): Mission-oriented innovation systems. Environmental Innovation and Societal Transitions, 34, 76–79.

IMD World Competitiveness Center (2022): IMD World Talent Ranking 2022. https://www.imd.org/centers/world- competitiveness-center/rankings/world-talent-competitiveness/

Industriewissenschaftliches Institut (2022): Evaluierung der Kooperation im Bereich der IÖB zwischen BMDW, BMK und BBG (Evaluation of cooperation in the field of PPPI between the BMDW, BMK and BBG). Synthesis report, Vienna. https://repository.fteval.at/id/eprint/622/

Inspire research (2022): Evaluierung des Emergency-alls zur Erforschung von COVID-19 im Zuge des Ausbruchs von SARS-CoV-2. Bericht an die FFG (Evaluation of the Emergency-all for COVID-19 research in the wake of the SARS-CoV-2 outbreak. Report to FFG), June 2022.

Janssen, M. J., Torrens, J., Wesseling, J. H., Wanzenböck, I. (2021): The promises and premises of mission-oriented innovation policy – A reflection and ways forward. Science and Public Policy, 48(3), 438–444.

Keuschnigg, C., Ecker, B., Johs, J., Kritzinger, M., Sardadvar, S., Würfel, B. (2022): Wirkungen des Wissens- und Technologietransfers, im Speziellen von Spin-offs: Eine makro- und mikroökonomische Analyse, St.Gallen – Wien (Effects of knowledge and technology transfer, in particular of spin-offs: A macro- and microeconomic analysis, St.Gallen – Vienna). https://www.ffg.at/sites/default/files/downloads/BMBWF_WTT_Spin-off_final_barrierefrei.pdf

KMU Forschung Austria (ongoing): Entwicklung eines Monitorings für das missionsorientierte Themenfeld Mobilität der Zukunft (Development of a monitoring system for the mission-oriented thematic field of mobility of the future), Vienna.

KMU Forschung Austria (2022): Programmevaluierung „Stadt der Zukunft" 2013 – 2021 (Programme Evaluation "City of the Future" 2013–2021), Vienna. https://nachhaltigwirtschaften.at/en/sdz/projekte/programmevaluierung-stadt-der-zukunft-2013-2021.php

Kügler, A., Friesenbichler, K., Janger, J. (2023): Innovationen und Investitionen österreichischer Unternehmen in der Krise (Innovation and investment by Austrian companies in the crisis) [in preparation].

Liu, L.-J., Jiang, H.-D., Liang, Q.-M., Creutzig, F., Liao, H., Yao, Y.-F., Quian, X.-Y., Ren, Z.-Y., Qing, J., Cai, Q.-R., Edenhofer, O., Wie, Y.-M. (2023): Carbon and economic impacts of an EU embargo on Russian fossil fuels. Nature Climate Change. https://doi.org/10.1038/s41558-023-01606-7

Mazzucato, M. (2018): Mission-oriented innovation policies: challenges and opportunities. Industrial and Corporate Change, 27(5), 803–815.

Morwinsky, O., Schebesta, O. (2021): Die neue europäische Industriestrategie, Konrad-Adenauer-Stiftung Analysen & Argumente 447 (The New European Industrial Strategy, Konrad-Adenauer-Stiftung Analysen & Argumente 447). https://www.kas.de/de/analysen-und-argumente/detail/-/content/die-neue-europaeische-industriestrategie

Mutz, R., Daniel, H.-D. (2022): Scientific analysis of data on proposals and the decision-making procedure of the FWF with particular focus on the programme "Stand-Alone Projects" in the years 2010–2019. Zenodo. https://doi.org/10.5281/zenodo.6596769

Nagaoka, S., Motohashi, K., Goto, A. (2010): Patent statistics as an innovation indicator, in: Handbook of the Economics of Innovation (Vol. 2, pp. 1083–1127), North-Holland.

Nindl, E., Reckling, F., Wald-Bruckner, A. (2022): External evaluation of the Programme on Arts-based Research (PEEK): Statement of the Austrian Science Fund FWF on the evaluation report. https://doi.org/10.5281/zenodo.6319172

OECD (2011): OECD Green Growth Studies: Fostering Innovation for Green Growth. https://doi.org/10.1787/9789264119925-en

OECD (2015): Making Open Science a Reality, OECD Science, Technology and Industry Policy Papers, No. 25, OECD Publishing, Paris. https://doi.org/10.1787/5jrs2f963zs1-en

OECD (2018): Frascati Manual 2015: Guidelines for the collection and reporting of data on research and experimental development. OECD Publishing, Paris. https://doi.org/10.1787/9789264291638-de

OECD (2020): The Digitalisation of Science, Technology and Innovation: Key Developments and Policies, OECD Publishing, Paris. https://doi.org/10.1787/b9e4a2c0-en

OECD (2022a): Gross domestic spending on R&D (indicator). https://doi.org/10.1787/d8b068b4-en

OECD (2022b): Triadic patent families (indicator). https://doi.org/10.1787/6a8d10f4-en

OECD (2022c): OECD.Stat. Main Science and Technology Indicators. https://stats.oecd.org/

OECD (2022d): Education at a Glance 2022: OECD Indicators. OECD Publishing, Paris. https://www.oecd.org/education/education-at-a-glance-19991487.htm/?refcode=20190209ig

OECD (2022e): OECD REGPAT Database. EPO & PCT Patent Applications at Regional Level. August 2022 edition.

OECD (2023): OECD Science, Technology and Innovation Outlook 2023: Enabling Transitions in Times of Disruption, OECD Publishing, Paris. https://doi.org/10.1787/0b55736e-en

Ploder, M., Linshalm, E., Breitfuss-Loidl, M., Hartmann, C., Kasztler, A., Heller-Schuh, B., Lamprecht, K. (2022): Baseline Studie zu EU-Missionen in Österreich (Baseline Study on EU Missions in Austria), commissioned by BMBWF, BMK and BML, Vienna.

Reinstaller, A. (2022): Auswirkungen der COVID-19-Pandemie auf die Innovationsfähigkeit von Unternehmen in Österreich (Impact of the COVID-19 pandemic on the innovation capacity of companies in Austria). https://www.wifo.ac.at/wwa/pubid/69398

RFTE (2021): Ratsempfehlung für eine Neuausrichtung der österreichischen Industriepolitik (Council Recommendation for a Reorientation of Austrian Industrial Policy), Vienna. https://www.rat-fte.at/files/rat-fte-pdf/einzelempfehlungen/2021/211020_Empfehlung_Industriepolitik.pdf

Sardadvar, S. (2022): Rekord-Investitionen in österreichische Start-ups – der Wendepunkt? (Record investment in Austrian start-ups – the turning point?), WPZ Research Policy Brief 320.

Scimago Journal & Country Rank (2022): Country Rankings. https://www.scimagojr.com/countryrank.php

Schot, J., Steinmueller, W. E. (2018): Three frames for innovation policy: R&D, systems of innovation and transformative change. Research Policy, 47(9), 1554–1567.

Scopus (2022): https://www.scopus.com/

Shapiro, M. A. (2014): International Collaboration and Green Technology Generation, EAI Fellows Program Working Paper Series No. 46.

Statistics Austria (2023): Globalschätzung vom 21. April 2023 (Global estimate as of 21 April 2023).

Szczepanski, M. (2019): Economic impacts of artificial intelligence (AI). European Parliamentary Research Service (PE 637.967).

Technopolis (2022): Evaluierung der IEA Forschungskooperation 2011 – 2021 (Evaluation of the IEA Research Cooperation 2011–2021), Vienna.

The Growth Lab at Harvard University (2022): The Atlas of Economic Complexity. http://www.atlas.cid.harvard.edu/rankings

Times Higher Education (2023a): Times Higher Education World University Rankings 2023. https://www.timeshighereducation.com/world-university-rankings/2023/world-ranking#!/page/0/length/100/sort_by/rank/sort_order/asc/cols/stats

Times Higher Education (2023b): Times Higher Education Young University Rankings 2022. https://www.timeshighereducation.com/world-university-rankings/2022/young-university-rankings#!/page/0/length/-1/sort_by/rank/sort_order/asc/cols/stats

Travagnin, M. (2019): Patent analysis of selected quantum technologies. ISBN 978-92-79-98120-3, doi:10.2760/938284, JRC115251. https://publications.jrc.ec.europa.eu/repository/bitstream/JRC115251/patent_analysis_of_selected_quantum_technologies_1.pdf

UNESCO (2022): UNESCO Institute for Statistics. http://data.uis.unesco.org/

United Nations (2021): Technology and Innovation Report 2021. Catching technological waves: Innovation with equity. Geneva: United Nations Conference on Trade and Development. https://unctad.org/webflyer/technology-and-innovation-report-2021

WIPO (2022): The Global Innovation Index 2022: What is the future of innovation-driven growth? https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2022-section1-en-gii-2022-at-a-glance-global-innovation-index-2022-15th-edition.pdf

WPZ Research (2022): Evaluierung der IEA Forschungskooperation 2011–2021 (Added value of the BMBWF's scholarship and research cooperation programmes), Vienna. https://repository.fteval.at/id/eprint/619/

Wuppertal Institut (2022): Klimaschutz und Versorgungssicherheit – eine Wechselwirkungsanalyse: geopolitische Lage mit Booster- oder Bremswirkung? (Climate Action and Security of Supply – An Interaction Analysis: Geopolitical Situation with Booster or Brake Effect?). https://wupperinst.org/a/wi/a/s/ad/7764

Data sources

- **EUROSTAT Database:**[348] The Statistical Office of the European Union provides official data on a wide range of topics in country comparisons. Data from countries of the European Union are listed, and for some indicators there is also information from large economies outside the EU, such as the USA.
- **Resilience Dashboard:**[349] The Resilience Dashboard of the Joint Research Center of the European Commission has been presenting the relative resilience capacities and weaknesses of European and non-European countries since 2021. Various indicators from the four areas of "social and economic", "green", "digital" and "geopolitics" are collected and summarised in (sub-)indices.
- **Global Innovation Index 2022 (GII):**[350] The Global Innovation Index (GII) is published annually by the United Nations World Intellectual Property Organization (WIPO). Between 2013–2020, the GII was published together with the French business school INSEAD and Cornell University. Since 2021, the GII has been published by WIPO in collaboration with the Portulans Institute, various corporate and academic network partners and the GII Advisory Board. In 2022, 132 economies will be compared both on the overall index and in terms of more detailed indicators on innovation system inputs and outputs.
- **Digital Economy and Society Index (DESI) Report 2022:**[351] The Digital Economy and Society Index (DESI) is published periodically by the European Commission. The following four areas of the DESI are evaluated in this report: connectivity, human capital, integration of digital technology and digital public services.
- **European Innovation Scoreboard 2022 (EIS):**[352] The European Innovation Scoreboard report provides a comparative analysis of the innovation performance of EU Member States and other European and non-European countries.
- **OECD – Main Science and Technology Indicators:** The OECD publishes key indicators on a wide range of topics, including the industry, education, energy, transport, and research and development, in its database.[353]
- **Education at a Glance 2022:**[354] In the report Education at a Glance, the Organisation for Economic Co-operation and Development (OECD) publishes an annual compilation of internationally comparative indicators on education. The focus is on participation in education, graduate ratios, investment in education and teaching-learning settings.
- **The Atlas of Economic Complexity:**[355] The Atlas of Economic Complexity, produced by Harvard University, contains an index of economic complexity. The index is calculated from data on foreign trade and depicts the knowledge intensity of goods or the processes required to produce these goods.
- **Scimago Journal & Country Ranks:**[356] The Scimago Journal & Country Rank database is a publicly accessible portal that provides indicators on scientific publications.
- **Scopus:**[357] Scopus is a fee-based literature database that also allows advanced searches and bibliometric analyses.
- **IMD World Talent Ranking:**[358] The IMD World Competitiveness Center of the business school IMD - International Institute for Management Development presents in its Talent Ranking the development of competencies and the retention as well as the international attractiveness of or for highly qualified workers.
- **Readiness for Frontier Technologies Index 2021:**[359] The United Nations Technology and Innovation Report 2021 provides a comparative analysis of the ability to adopt future technologies. The Readiness for Frontier Technologies Index measures a country's ability to use, adopt and adapt frontier technologies and is composed of five pillars: ICT deployment, skills, Research and Development, industry activity and access to finance.

348 Cf. Eurostat (2022).
349 Cf. European Commission (2022d).
350 Cf. WIPO (2022).
351 Cf. European Commission (2022a).
352 Cf. European Commission (2022b); European Commission (2022c).
353 Cf. OECD (2022c).
354 Cf. OECD (2022d).
355 Cf. The Growth Lab at Harvard University (2022).
356 Cf. Scimago Journal & Country Rank (2022).
357 Cf. Scopus (2022).
358 Cf. IMD World Competitiveness Center (2022).
359 See United Nations (2021).

Annex II – Definitions and abbreviations

Definitions from the monitoring activities in accordance with the Research Financing Act (FoFinaG)

Time to Contract: The time to contract represents the period between the receipt of an application by the research funding organisation and the finalisation (sending) of the contract to the grant recipient. Differing definitions are explained in footnotes.

Third-party funds: The third-party funds of the research institutions include both customer revenues (private and public) and acquired funding. Funds from the National Foundation for Research, Technology and Development (NFTE), the Austria Fund (Ö-Fonds) and the Future Austria Fund (FZÖ) also count as third-party funds, but not other income from the charging on of costs by e.g. charging for services, AMS subsidies and research premiums.

Grants: The volumes of grants by the research institutions are also stated as funding amounts ("awarded") without own contributions. To avoid double counting, only the newly acquired and contractually fixed projects in the respective reporting year are shown, not the ongoing projects. The year in which the contract was concluded counts.

Research infrastructure: Research infrastructures are instruments for excellent research, research-led teaching, training of junior researchers as well as for profile building and knowledge transfer and support technological advances and societal innovations. This is understood to mean facilities, equipment, equipment or other resources that are at one location or distributed at several locations or virtual. See the Intellectual Capital Statement Ordinance (WBV) 2016 https://www.bmbwf.gv.at/Themen/Forschung/Forschung-in-%C3 %96sterreich/Forschungsinfrastruktur.html or the Research Infrastructure Database (FID) https://forschungsinfrastruktur.bmbwf.gv.at, as well as the Austrian Research Infrastructure Action Plan 2030.

Funding budget: The research funding institutions use different terms to represent their funding performance. In the context of the FTB, grants and commitments are shown as present values.

Total income: Total income corresponds to sales revenue and other operating income according to investment and financial controlling as per the Austrian Commercial Code (UGB).

Glass Ceiling Index: According to SHE figures,[360] the index compares the share of women in all employees with the share of women in management levels. The index can take on any value between zero and infinity. A value below 1 indicates that women are relatively overrepresented in leadership positions, a value above 1 indicates that women are underrepresented. The higher the value, the greater the underrepresentation.

Global budget: The global budget or the basic funding of the research institutions defines all grants from the owners/shareholders/maintainers without earmarking (often on the basis of a performance agreement). The allocation of basic funding is carried out by the institution itself.

Employees are employees, freelancers, temporary workers, marginal part-time workers, but not employees on leave or contracts for work.

Practice partners: Practice partners are cooperation partners with implementation relevance that do not belong to the "industry" sector, such as service companies, hospitals, local authorities, NGOs.

PhD students: With the exception of ISTA, the research institutions do not have the right to award doctorates. Therefore, all doctoral students who are supervised in cooperation with a university, for the most part at the research institution, are assigned to the institutions.

Publications: The publications contain only scientific publications (no project reports, etc.) that have undergone a quality assurance procedure (peer review). All publications have an identifiable consistent identifier such as DOI, ISSN, etc. and were published in scientific journals, edited volumes, proceedings or monographs. Publications with several authors are reported as "whole counts" (each author is attributed the publication as a whole).

Foundation funds: At the end of 2020, the special endowment of the National Foundation for Research, Technology and Development (NFTE) and the Austrian Fund (Ö-Fonds), two important sources of funding for research, expired. In 2021, however, funds could still be drawn from NFTE and Ö-Fonds. From 2022 onwards, the institutions (aws, CDG, FFG, FWF, LBG and OeAW) will have access to funds from the FZÖ. Under Indicator 1 (third-party funding and financing), the funds from these three sources are aggregated.

Reference dates: All figures are collected as of 31 December of the respective reporting year.

The Technology Readiness Level (TRL) is a scale for assessing the development status of new technologies based on a systematic analysis. It indicates on a scale of 1 to 9 how advanced a technology is. TRL 1 indicates basic research that is still very far from application, TRL 9 technologies that have already been successfully implemented.

360 See European Commission (2021): https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/67d5a207-4da1-11ec-91ac-01aa75ed71a1

Country code

Abbreviation	Country	Abbreviation	Country	Abbreviation	Country
AT	Austria	**EE**	Estonia	**MT**	Malta
AU	Australia	**GB**	Great Britain	**NL**	Netherlands
BE	Belgium	**EL**	Greece	**PL**	Poland
BG	Bulgaria	**ES**	Spain	**PT**	Portugal
BR	Brazil	**FI**	Finland	**RO**	Romania
CH	Switzerland	**FR**	France	**RU**	Russia
CN	China	**HU**	Hungary	**SE**	Sweden
CR	Croatia	**IE**	Ireland	**SI**	Slovenia
CY	Cyprus	**IT**	Italy	**SK**	Slovakia
CZ	Czech Republic	**LT**	Lithuania	**US**	United States of America
DE	Germany	**LU**	Luxembourg		
DK	Denmark	**LV**	Latvia	**ZA**	South Africa

Abbreviations

ABOL	Austrian Barcode of Life
ACDH-CH	Austrian Centre for Digital Humanities and Cultural Heritage
ACTRIS	Aerosols, Clouds and Trace Gases Research Infrastructure
AIT	Austrian Institute of Technology
AKH Wien	Vienna General Hospital
AMDC	Austrian Micro Data Center
APCC	Austrian Panel on Climate Change
APRI	Austrian Polar Research Institute
ASCII	Austrian Supply Chain Intelligence Institutes
ASEP	Austrian Socio Economic Panel
AUSSDA	Austrian Social Science Data Archive
aws	Austria Wirtschaftsservice Gesellschaft mit beschränkter Haftung
BBG	Bundesbeschaffungsgesellschaft (Federal Procurement Agency)
BBO	Vocational and educational orientation
BKA	Bundeskanzleramt (Austrian Federal Chancellery)
BMAW	Bundesministerium für Arbeit und Wirtschaft (Federal Ministry of Labour and Economy)
BMBWF	Bundesministerium für Bildung, Wissenschaft und Forschung (Federal Ministry of Education, Science and Research)
BMDW	Bundesministerium für Digitalisierung und Wirtschaftsstandort (Austrian Federal Ministry for Digital and Economic Affairs)
BMEIA	Bundesministerium für europäische und internationale Angelegenheiten (Federal Ministry for European and International Affairs)
BMF	Bundesministerium für Finanzen (Federal Ministry of Finance)
BMI	Bundesministerium für Inneres (Federal Ministry of the Interior)
BMJ	Bundesministerium für Justiz (Federal Ministry of Justice)
BMK	Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology)
BMKÖS	Bundesministerium für Kunst, Kultur, öffentlichen Dienst und Sport (Federal Ministry of Arts, Culture, Civil Service and Sport)
BML	Bundesministerium für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft (Federal Ministry of Agriculture, Forestry, Regions and Water Management)
BMLRT	Bundesministerium für Landwirtschaft, Regionen und Tourismus (Federal Ministry of Agriculture, Regions and Tourism)

BMLV	Bundesministerium für Landesverteidigung (Federal Ministry of Defence)
BMSGPK	Bundesministerium für Soziales, Gescundheit, Pflege und Konsumentenschutz (Federal Ministry of Social Affairs, Health, Care and Consumer Protection)
BMVIT	Bundesminsterium für Verkehr, Innovation und Technologie (Federal Ministry for Transport, Innovation and Technology)
BOKU	Universität für Bodenkultur Wien (University of Natural Resources and Applied Life Sciences)
BSAIO	Boosting Sustainability with Artificial Intelligence and Optimisation
CCCA	Climate Change Centre Austria
CCU	Sustainable Carbon Cycles
CDG	Christian Doppler Forschungsgesellschaft (Christian Doppler Research Association)
CeMM	Research Centre for Molecular Medicine GmbH
CEAP	Circular Economy Action Plan
CES	Circular Economy Strategy
CGMW	Commission for the Geological Map of the World
CIS	Certification Information Security
CMC	Institute for Comparative Media and Communication Studies
CPC	Cooperative Patent Classification
CPS	Cyber-physical systems
CSH	Complexity Science Hub Vienna
CTBTO	Comprehensive Nuclear Test Ban Treaty Organization
DeGEval	Deutsche Gesellschaft für Evaluation (German Society for Evaluation)
DESI	Digital Economy and Society Index
DIGITAL	Institute for Digital Technologies
DIH	Digital Innovation Hubs
DTA	Digital Transformation Accelerator
EAG	Renewable Energy Expansion Act
EAP	Employee Assistance Program
EBIN	Emissionsfreie Busse und Nutzfahrzeuge (Emission-free buses and commercial vehicles)
EBS	Electronics-based systems
EC	European Commission
ECI	Economic Complexity Index
ECMWF	European Centre for Medium-Range Weather Forecasts
ECSA	European Citizen Science Association
EDIH	European Digital Innovation Hubs
EEK	Entwicklung und Erschließung der Künste (Development and Exploration of the Arts)
EEN	Enterprise Europe Network
EFSD+	European Fund for Sustainable Development Plus
EGDI	European Geological Data Infrastructure
EGS	Enhanced Geothermal Systems
EIC	European Innovation Council
EIE	European innovation Ecosystems
EIS	European Innovation Scoreboard
EIT	European Institute of Innovation and Technology
eLTER	European Infrastructure for Long-Term Ecosystem Research
EOSC	European Cloud for Open Science
EPC	European Patent Convention
EPO	European Patent Office
EPOS	European Plate Observing System
ERA	European Research Area
ERA-NAP	Österreichischer Aktionsplan für den Europäischen Forschungsraum (Austrian Action Plan for the European Research Area)
ERC	European Research Council
ESFRI	European Strategy Forum on Research Infrastructures
ESI	Erich-Schmid-Institut für Materialwissenschaft (Erich Schmid Institute for Materials Science)
ESS	Earth System Sciences
ETH Zurich	Swiss Federal Institute of Technology Zurich
EU	European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EU RRF	European Recovery and Resilience Facility
FFG	Österreichische Forschungsförderungsgesellschaft (Austrian Research Promotion Agency)
FH	Fachhochschule (University of Applied Sciences)
FinV	Finanzierungsvereinbarung (Funding agreement)
FISA	Filmstandort Austria (Film Location Austria)
FMA	Financial Market Authority
FMABG	Finanzmarktaufsichtsbehördengesetz (Financial Market Authority Act)
FSP	Forschungsschwerpunkt (Research focus)
FTE	Full-time equivalent

fteval	Plattform für Forschungs- und Technologiepolitikevaluierung (Platform for Research and Technology Policy Evaluation)
FWF	Fonds zur Förderung der wissenschaftlichen Forschung (Fund for the Promotion of Scientific Research)
FWIT Council	Forschungs-, Wissenschafts-, Innovations- und Technologieentwicklungsrat (Research, Science, Innovation and Technology Development Council)
FZÖ	Fonds Zukunft Österreich (Future Austria Fund)
GBA	Geologische Bundesanstalt (Federal Geological Institute)
GCI	Glass Ceiling Index
GCOS	Global Climate Observing System
GDP	Gross domestic product
GELMON	Geoelectrical Monitoring
GEP	Gender Equality Plan
GII	Global Innovation Index
GÖG	Gesundheit Österreich GmbH (Health Austria Ltd.)
GSA	GeoSphere Austria – Bundesanstalt für Geologie, Geophysik, Klimatologie und Meteorologie (Federal Agency of Geology, Geophysics, Climatology and Meteorology)
GSEU	Geological Service for Europe
GUEP	Gesamtösterreichischer Universitätsentwicklungsplan (Austrian National Development Plan for Public Universities)
HOP	Hochschulplan (Austrian University Plan)
IAEA	International Atomic Energy Agency
ICDP	International Continental Scientific Drilling Program
IEA	International Energy Agency
IEP	Impact and Evaluation Plans
IGF	Institut für interdisziplinäre Gebirgsforschung (Institute for Interdisciplinary Mountain Research)
IHS	Institut für Höhere Studien (Institute for Advanced Studies)
IIASA	International Institute for Applied Systems Analysis
iit	Institute for Innovation and Technology
IMBA	Institute for Molecular Biotechnology GmbH
IMBK	Interministerielles Beamtenkomitee (Interministerial Committee of Civil Servants)
IMC	International Management Center
IODP	International Ocean Discovery Program
IoT	Internet of Things
IP	Intellectual Property
IPCC	Intergovernmental Panel on Climate Change
IPCEI	Important Projects of Common European Interest
IPCEI ME/CT	IPCEI Microelectronics and Communication Technologies
IQOQI	Institute for Quantum Optics and Quantum Information
IQS	Institut des Bundes für Qualitätssicherung im österreichischen Schulwesen (Federal Institute for Quality Assurance in the Austrian School System)
IRA	Inflation Reduction Act
ISI	Ignaz Semmelweis Institute
ISTA	Institute of Science and Technology – Austria
ITA	Institute for Technology Assessment
IWI	Industriewissenschaftliches Institut (Industry Science Institute)
JKU Linz	Johannes Kepler University Linz
JPO	Japan Patent Office
AI	Artificial intelligence
KIÖS	Commission for Interdisciplinary Ecological Studies
KIPO	Korean Patent Office
KKL	Kommission für Klima und Luftqualität (Climate and Air Quality Commission)
KKS	Kaufkraftstandards (Purchasing power standards)
KMFA	KMU Forschung Austria (Austrian Institute for SME Research)
KPC	Kommunalkredit Public Consulting GmbH
KWSAT	Circular Economy Strategy
LADIN	Ladeinfrastruktur (Charging infrastructure)
LBG	Ludwig Boltzmann Gesellschaft – Austrian Association for the Promotion of Scientific Research
LIFE	Institut für Klima, Energiesysteme und Gesellschaft (Institute for Climate, Energy Systems and Society)
LKR	Leichtmetallkompetenzzentrum Ranshofen GmbH (Light Metal Technologies Ranshofen)
LTER	Long Term Ecosystem Research
LV	Leistungsvereinbarung (performance agreement)
MCI	Management Center Innsbruck
MINT	Mathematics, Computer Science, Natural Sciences, Technology
MSCA	Marie Skłodowska-Curie Actions

naBe	Aktionsplan für nachhaltige öffentliche Beschaffung (Action Plan for Sustainable Public Procurement)
NCP-IP	National Contact Point for Knowledge Transfer and Intellectual Property
NFTE	Nationalstiftung für Forschung, Technologie und Entwicklung (National Foundation for Research, Technology and Development)
NIPA	National Intellectual Property Office of the People's Republic of China
NPO	Non-profit organisations
OeAW	Österreichische Akademie der Wissenschaften (Austrian Academy of Sciences)
OeAD	OeAD-GmbH – Agency for Education and Internationalisation
OECD	Organisation for Economic Co-operation and Development
Ö-Fonds	Österreichfonds (Austria Fund)
ÖGUT	Österreichische Gesellschaft für Umwelt und Technik (Austrian Society for Environment and Technology)
OIS	Open Innovation in Science
ÖÖK	Öffentlich-Öffentliche Kooperationen (public-public partnership)
OPEC	Organization of the Petroleum Exporting Countries
ÖROK	Austrian Conference on Spatial Planning (Österreichische Raumordnungskonferenz)
OSA	Open Science Austria
OSCE	Organisation for Security and Cooperation in Europe
P&I	Research & Innovation
PCT	Patent Cooperation Treaty
PoC	Proof of concept
PSC	Power System Components
PPPI	Public Procurement Promoting Innovation
R&D	Research and development
REDII	Renewable Energy Directive (REDII)
RFTE	Rat für Forschung und Technologieentwicklung (Austrian Council for Research and Technology Development)
RRF	Recovery and Resilience Facility
RTI	Research, technology and innovation
SAB	Scientific Advisory Board
SAL	Silicon Austria Labs GmbH
SDG	Sustainable Development Goal
SEEP	Socio-Ecological Economics and Policy
SKKM	Nationales und europäisches Krisen- und Katastrophenschutzmanagement (National and European crisis and disaster management)
SME	Small and medium-sized enterprises
STaR	Sustainability Transformation and Responsibility
STS	Science, Technology and Society
TBE	Early summer meningoencephalitis
TCP	Technology Collaboration Programmes
TFEU	Treaty on the Functioning of the European Union
THE ranking	Times Higher Education World Ranking
TRL	Technology Readiness Level
TU	Technical University
UMDRR	United Nations Office for Disaster Risk Reduction
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UniNEtZ	Universities and Sustainable Development Goals
USD	US dollar
USPTO	United States Patent and Trademark Office
VAO	Virtual Alpine Observatory
VAT	Value added tax
VEN	Vienna Evaluation Network
VID	Vienna Institute of Demography
WDC	World Data Center
WIFO	Austrian Institute for Economic Research
WIPO	World Intellectual Property Organization
WKO	Wirtschaftskammer Österreich (Austrian Federal Economic Chamber)
WMO	World Meteorological Organization
WPZ	Wirtschaftspolitisches Zentrum
WTI	Wissenschaft, Technologie und Innovation (Science, Technology and Innovation)
WTR	IMD World Talent Ranking
WTZ	Wissenstransferzentrum (Knowledge Transfer Centre)
WU	Wirtschaftsuniversität (University of Economics and Business)
WWTF	Wiener Wissenschafts-, Forschungs- und Technologiefonds (Vienna Science, Research and Technology Fund)
ZAMG	Zentralanstalt für Meteorologie und Geodynamik (Central Institute for Meteorology and Geodynamics)
ZSI	Centre for Social Innovation

Annex III – Open Innovation

	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	Measure 6	Measure 7
	Building open innovation and experimental spaces	Embed Open Innovation elements in kindergartens and schools as well as in teacher training	Further develop public administration by means of Open Innovation and greater public involvement	Set up and operate an Open Innovation platform for social/societal innovation and as a contribution to overcoming global challenges	Set up and operate an innovation map including a match-making platform for innovation actors	Build up research competence for the application of Open Innovation in science	Establish incentive mechanisms for research partnerships with non-traditional players in scientific research funding to strengthen Open Innovation
Field of action 1 Creation of a culture of Open Innovation and teaching of Open Innovation skills to all age groups	KLIEN, FFG – Young talents for the energy transition – Co-Creation-Spaces Climate & Energy Innovation Foundation for Education – Innovation Labs for Education	FFG, BMK – Regional Talents BMBWF, BMAW, BMK, aws – Innovative Youth (with the cooperation of the Patent Office)				LBG – Open Innovation in Science (OIS) Impact Labs	
Field of action 2 Formation of heterogeneous Open Innovation networks and partnerships across disciplines, industries and organisations	BMKÖS – GovLabAustria Bertha von Suttner Privatuniversität St. Pölten GmbH – Rethinking vulnerabilities in times of crisis: Cov_enable	BMBWF, OeAD, Innovation Foundation for Education - Innovation Network Education	PPPI, BMAW, BMK – Innovation Platform ASFINAG – Challenge on "Emergency Call as a Service"	FFG, BMDW – Laura Bassi 4.0 BMK – Innovation Platform AAL Austria	PPPI, BMK, BMAW – PPPI Open Innovation Challenges BMBWF Research Infrastructure Database	LBG – Experiment „How will AI influence openness and collaboration in science?" LBG – Data Reuse in Science OeAD, BMBWF – OeAD Centre for Citizen Science LBG – Crowdsourcing Research Questions in Science	FFG, BMAW – Open Innovation focus at COIN SME innovation networks CDG – CD Laboratories and JR Centres
Field of action 3 Mobilisation of resources and creation of the framework conditions for Open Innovation	FFG – Future. Lab – Innovation Workshops FFG, BMK – Urban Mobility Labs	BMBWF, OeAD, Innovation Foundation for Education FFG – Innovation labs for education	BMKÖS – Guidelines for the implementation of participation projects		BMK – Open4Innovation platform	LBG – Open Innovation in Science Research Enrichment Fund	CDG – Partnership in Research

Measure 8	Measure 9	Measure 10	Measure 11	Measure 12	Measure 13	Measure 14
Increased involvement of users and citizens in RTI funding programmes	Develop fair sharing and compensation models for crowd work	Further develop and provide Open Innovation methods and instruments specifically for small and medium-sized enterprises (SMEs)	Develop and implement co-creation and Open Innovation training programmes for interested parties.	Embed Open Data and Open Access principles in research	Gear the IP and exploitation strategies of companies, higher education institutions, research institutions and intermediaries to Open Innovation in order to optimise innovation potential	Implement a comprehensive communication initiative on Open Innovation to raise awareness and create networks
OeAD, BMBWF – Sparkling Science 2.0		Open Innovation Salzburg – The competence platform	Austrian Patent Office – Training and events	Austrian Patent Office – IP Buddy	Austrian Patent Office – Raising awareness for exploitation strategies aws (ncp-ip) – Web-Guide OI Toolbox (https://www.ncp-ip.at/methodbox)	BMBWF & BMK – Information & communication work via the official Open Innovation website www.open-innovation.gv.at BMBWF & BMK – Focused networking on OI in workshops OeAD, BMBWF — Citizen Science Award
BMK – AAL tTest regions FFG, BMK – Talents – FEMtech research projects FFG, COMET Centre ACIB – Open Innovation Platform LBG (OIS) – Patient and Public Involvement and Engagement in Research Forschung Burgenland GmbH – Project RES2 Community		FFG, BMAW – Open Innovation focus on COIN programme line Networks New Design University Privatuniversität GesmbH – Transdisciplinary Innovation Network	FFG, BMAW– WOMEN INNOVATORS Bertha von Suttner Private University St. Pölten GmbH – Training course Action Research Summer Camp	BMK – Open Content Knowledge and Learning Platform "e-genius"		BMK – Information & communication work within the Open4Innovation platform
FFG, BMK – Innovation Labs FFG - Participation in the Mutual Learning Exercise (MLE) on Citizen Science FFG – End-user involvement in the basic programme FFG – Fast Track Digital	aws (ncp-ip) – Web-Guide OI Toolbox (https://www.ncp-ip.at/methodbox) aws (ncp-ip) – Webinar: The New Normal: Open Innovation in Practice	Open Innovation Salzburg – The competence platform Austrian Patent Office – SME Search Services, EP Searches for ÖPA First Filings	Universities, non-university research institutions, BMBWF, BMDW, BMK – Implementation of the Austrian Policy on Open Science and the European Open Science Cloud BMK – Provision of research results of funded projects (Open4Innovation-Platform) BMBWF – AT2OA^2 Austria Transition to Open Access 2 BMBWF – Open Education Austria Advanced BMBWF – FAIR Data Austria	FWF – FWF Open Science Policy		BMBWF, BMK – Participation in the EC Mutual Learning Exercise (MLE) on knowledge valorisation

Annex IV – Federal research funding and contracts according to the federal research database

The database for research funding and contracts (B_f.dat) for the Federal Government has been in place since 1975 and was set up by the former Federal Ministry of Science and Research as a "documentation of facts by the Federal Government". Today, the database is maintained by the Federal Ministry of Education, Science and Research (BMBWF). The mandatory reporting of the ministerial departments to the relevant Science Minister is recorded in the Research Organisation Act (FOG), Federal Law Gazette No. 341/1981, last amended by Federal Law Gazette I No. 60/2022. In 2008, it was changed to a database to which all ministerial departments have access and in which they all enter their research-related funding and contracts independently. Each department is responsible for the validity and completeness of the data in its respective field of activity. The federal research database has been publicly accessible since 1 June 2016 and provides an up-to-date overview of the projects funded by the ministries.[348] As a documentation database, the B_f.dat also serves to record brief information on the content of the registered research funding and grants. With regard to the relevant reporting year, the database includes ongoing, newly approved and also already completed R&D contracts and grants, as well as their overall funding volume and actual funds paid in the reporting year. Overall, this provides an up-to-date picture of directly commissioned R&D studies, assessments, evaluations, grants, etc. along with their funding by the Federal Government.

The federal research database thus contributes to transparency in the allocation of public funds and to the overall picture of research funding in Austria. In total, however, the volume of research contracts and funding directly commissioned by the ministries is relatively small, especially when compared to the university budgets and the resources of the research funding institutions (for details, see the overview of the Federal Government's use of research-related funds in Annex V). The amounts can therefore be considered as supplementary information in the sense of maximum transparency and completeness.

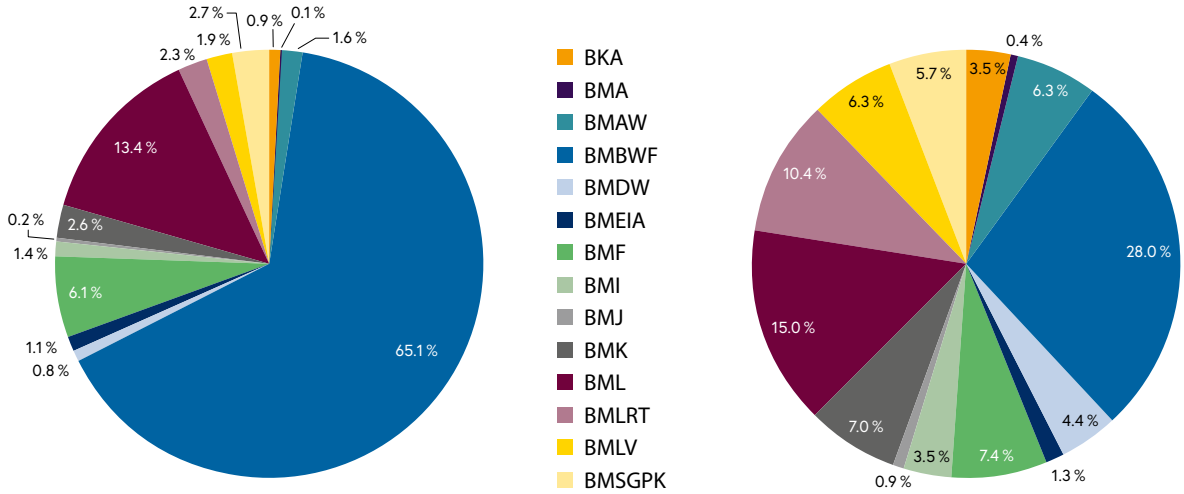
Figure A IV-1 provides an overview of the R&D projects included by the ministries in the B_f.dat. The share of R&D projects per ministry and the share of total funding are shown. The data in the B_f.dat reveal that a total of 460 R&D projects were funded in 2022 with a volume of €531.66 million. This sum also includes global institutional funding. Overall, about 85% of the funds in 2022 were paid out as global funding to research institutions. Subtracting this from the total disbursement volume in 2022, the remaining funding amounts to €80.24 million. This sum is €10.75 million or 15.0% higher than in 2021. It should be noted that this funding sum per reporting year often includes partial amounts of ongoing or completed projects and therefore the funding sum – depending on the respective project progress – is subject to annual fluctuations.

In 2022, as in previous years, the BMBWF was the ministry with the largest share of entries and funding amounts. As Figure A IV-1 illustrates, the BMBWF accounts for 28.0% of the R&D projects[349] and 65.1% of the amounts (without global funding). The entries and funding contributions have changed for the BMBWF compared to 2021: While the share of funding cases has risen by just under 0.5 percentage points, the share of amounts has fallen by just under 0.3 percentage points. In terms of funding amounts, the Federal Ministry of Agriculture, Forestry, Regions and Water Management (BML) follows with a share of

348 https://www.bmbwf.gv.at/bfdat-public

349 Due to combined projects between federal ministries, double counting may occur in this form of presentation.

Figure A IV-1: Share of ongoing and completed R&D projects and grants by funding amounts in 2022 (Fig. left) and by projects (Fig. right), in %



Source: BMBWF, Federal Research Database B_f.dat. Graphic: WPZ Research.

13.4% and the Federal Ministry of Finance (BMF) with a share of 6.1%. The comparatively low percentage of the BMK (2.6%) is due to the fact that the processing of R&D funds is largely outsourced to the federal funding institutions FFG and aws.

Annex V – Statistics

Funding of gross domestic expenditure on R&D[350] (Tables A V-1 and A V-2)

According to an estimate by Statistik Austria, around €15.5 billion is expected to be spent on research and development (R&D) in Austria in 2023. The R&D intensity, i.e. the share of R&D expenditure in nominal gross domestic product (GDP), is thus 3.22%. The nominal increase in total Austrian R&D expenditure from 2022 to 2023 is estimated at 8.0% and is thus higher than the forecast increase in nominal GDP of 7.4%. Over the past two decades, domestic expenditure on research and development has risen sharply: in 2013, the R&D intensity was still 2.95% in 2003 it was 2.17%.

In 2023, companies in Austria are expected to contribute about €7.8 billion to research, and thus finance about half of R&D expenditure (50%). The R&D funding of companies also includes the funding via the research premium, which is estimated by the Federal Ministry of Finance (BMF) at around €1.1 billion for 2023. The government sector will account for about €5.1 billion, or 33% of total R&D funding, with the Federal Government as the most important source of funding with about €4.2 billion (27%). About €625 million will be financed by the regional governments. Other public institutions (local governments, chambers, higher education institutions or social insurance institutions) will contribute about €280 million. Foreign sources, mainly foreign companies, are expected to finance research in Austria in the amount of more than €2.6 billion.

The estimates and year-end closing data of the Federal Government and the regional governments, current economic forecasts and the results of the most recent R&D survey were all taken into account in estimating the Austrian gross domestic expenditure on R&D in 2023.

However, the estimate for 2023 remains subject to particular uncertainty with regard to the further development of the entire global economy.

Federal R&D expenditure 2023

The tables "Federal expenditure on research and research promotion" show the total research-related expenditure of the Federal Government, which includes the research-related shares of contributions to international organisations. The source is the "Detailed overview of the research-related appropriation of federal funds" in the R&D supplement to the Federal Finances Act 2023 (part a and part b). In terms of methodology, this is in line with the internationally applied "GBARD" concept,[351] which, in contrast to the domestic concept, includes the research-relevant contributions to international organisations and forms the basis of the classification of R&D budget data according to socio-economic objectives for reporting to the EU and OECD.

In 2023, the following socio-economic objectives (each as a share of total funding) will account for the largest share of federal expenditure on research and research promotion:

- Promotion of trade, commerce and industry: 27.4%
- Promotion of the general knowledge advancement: 26.6%
- Promotion of the health care system: 20.1%

350 Statistics Austria usually creates an annual "global estimate of the gross domestic expenditure for R&D in Austria" based on the results of the R&D statistical surveys and other currently available documents and information, (in particular the R&D-related Cash Flow Budgets and Cash Flow Statements of the federal and regional governments). Within the context of the global estimate, retroactive revisions or updates are made to reflect the latest data. The funding for expenditure on research and experimental development carried out in Austria is presented in accordance with the definitions of the Frascati Manual, which is valid around the world (OECD, EU) and thus ensures international comparability.

351 GBARD: Government Budget Allocations for Research and Development.

- Promotion of social and socio-economic development: 5.3%
- Promotion of research covering the earth, the seas, the atmosphere, and outer space: 4.7%
- Promotion of energy production, storage and distribution of energy: 4.2%

R&D expenditure of the regional governments

The research funding by the regional governments shown as a subtotal in Table A V-1 is listed from the regional government budget-based estimates of R&D expenditure and financial statements as reported by the offices of the regional governments. The R&D expenditure of the regional hospitals is estimated annually by Statistics Austria in accordance with a methodology agreed with the offices of the regional governments.

An international comparison of R&D expenditure in 2020

The overview table shows Austria's position in comparison to the other Member States of the European Union and other countries on the basis of the most important R&D-relevant indices (source: Eurostat). Detailed information on R&D funding and R&D implementation by economic sector as well as on R&D employees is only available for international comparisons for the year 2020.

List of Tables in the Statistical Annex

Table A V-1: Global estimate for 2023: Gross domestic expenditure on R&D funding for research and experimental development carried out in Austria 2009–2023

Funding	2009 [1]	2010	2011 [1]	2012	2013 [1]	2014	2015 [1]	2016	2017 [1]	2018	2019 [1]	2020	2021	2022	2023
1. Gross domestic expenditure on R&D (in € million)	**7,479.75**	**8,066.44**	**8,276.34**	**9,287.84**	**9,571.28**	**10,275.18**	**10,499.15**	**11,145.02**	**11,289.78**	**11,912.00**	**12,441.23**	**12,199.02**	**12,879.54**	**14,313.09**	**15,454.95**
Funded by:															
Federal Government [2]	2,042.83	2,257.58	2,232.63	2,410.22	2,383.70	2,592.80	2,528.17	2,825.34	2,681.89	2,954.62	2,848.37	3,321.13	3,169.54	3,930.49	4,191.21
Research premium [3]	254.63	328.85	381.66	574.05	468.98	493.23	508.02	527.67	637.48	713.05	841.45	1,044.11	890.84	759.50	1,100.00
Regional governments [4]	273.37	405.17	298.71	416.31	307.45	461.59	344.97	445.78	392.66	500.57	464.38	568.68	582.90	597.18	625.23
Business enterprise sector [5]	3,520.02	3,639.35	3,820.90	4,243.33	4,665.75	4,901.28	5,222.22	5,377.52	5,532.82	5,610.62	5,982.34	5,030.65	5,772.46	6,380.89	6,693.74
Abroad [5]	1,255.93	1,297.63	1,401.67	1,495.94	1,590.21	1,663.95	1,737.69	1,802.16	1,874.27	1,944.37	2,110.77	2,022.80	2,232.69	2,392.55	2,568.81
Other [6]	132.97	137.86	140.77	147.99	155.19	162.33	158.08	166.55	170.66	188.77	193.93	211.65	231.11	252.48	275.96
2. Nominal GDP [7] (in € billion)	288.04	295.90	310.13	318.65	323.91	333.15	344.27	357.61	369.36	385.27	397.17	381.04	406.15	447.65	480.63
3. Gross domestic expenditure on R&D as % of GDP	***2.60***	***2.73***	***2.67***	***2.91***	***2.95***	***3.08***	***3.05***	***3.12***	***3.06***	***3.09***	***3.13***	***3.20***	***3.17***	***3.20***	***3.22***

Date: 21 April 2023

Source: Statistics Austria. On the basis of funding data from R&D carried out in Austria. Data as of April 2023.

1) Survey results.
2) 2009, 2011, 2013, 2015, 2017, 2019: Survey results (Federal Government incl. FWF, FFG and National Foundation for Research, Technology and Development). 2010, 2012: Supplements T to the Federal Finance Acts (part b, success in each case); 2014, 2016, 2018, 2020, 2021: Detailed overviews of the Federal Government's use of funds for research (part b, success in each case); 2022, 2023: Detailed overview of the Federal Government's use of funds for research purposes for the Federal Finances Act 2023 (part b, financing estimate).
   2010: Including €74.6 million National Foundation for Research, Technology and Development.
   2012: Including €51.3 million National Foundation for Research, Technology and Development.
   2014: Including €38.7 million National Foundation for Research, Technology and Development.
   2016: Including €51.7 million National Foundation for Research, Technology and Development.
   2018: Including €141.0 million National Foundation for Research, Technology and Development.
   2020: Including €140.4 million National Foundation for Research, Technology and Development.
   2022: Including €146.0 million National Foundation for Research, Technology and Development.
   2023: Including €140.0 million National Foundation for Research, Technology and Development.
3) 2009, 2011, 2013, 2015; 2017, 2019: Survey results. 2010, 2012, 2014, 2016, 2018, 2020, 2021, 2022, 2023: BMF.
4) 2009, 2011, 2013, 2015, 2017, 2019: Survey results. 2010, 2012, 2014, 2016, 2018, 2020, 2021, 2022, 2023: Based on R&D expenditure reported by the offices of the regional governments (Landesrechnungsabschlüsse, Cash Flow Budget 2022 and 2023).
5) 2009, 2011, 2013, 2015, 2017, 2019: Survey results. 2010, 2012, 2014, 2016, 2018, 2020, 2021, 2022, 2023: Estimate by Statistics Austria.
6) Financing by local governments (excluding Vienna), chambers, social insurance institutions, higher education sector as well as other public funding and funding from the private non-profit sector. 2009, 2011, 2013, 2015, 2017, 2019: Survey results. 2010, 2012, 2014, 2016, 2018, 2020, 2021, 2022, 2023: Estimate by Statistics Austria.
7) 2009–2022: Statistics Austria. 2023: WIFO economic forecast. Status April 2023.

Table A V-2: Global estimate for 2023: Gross domestic expenditure on R&D funding of research and experimental development carried out in Austria 2009–2023 as a percentage of GDP

Funding	2009 [1]	2010	2011 [1]	2012	2013 [1]	2014	2015 [1]	2016	2017 [1]	2018	2019 [1]	2020	2021	2022	2023
1. Gross domestic expenditure on R&D (in € million)	***2.60***	***2.73***	***2.67***	***2.91***	***2.95***	***3.08***	***3.05***	***3.12***	***3.06***	***3.09***	***3.13***	***3.20***	***3.17***	***3.20***	***3.22***
Funded by:															
Federal Government [2]	0.71	0.76	0.72	0.76	0.74	0.78	0.73	0.79	0.73	0.77	0.72	0.87	0.78	0.88	0.87
Research premium [3]	0.09	0.11	0.12	0.18	0.14	0.15	0.15	0.15	0.17	0.19	0.21	0.27	0.22	0.17	0.23
Regional governments [4]	0.09	0.14	0.10	0.13	0.09	0.14	0.10	0.12	0.11	0.13	0.12	0.15	0.14	0.13	0.13
Business enterprise sector [5]	1.22	1.23	1.23	1.33	1.44	1.47	1.52	1.50	1.50	1.46	1.51	1.32	1.42	1.43	1.39
Abroad [5]	0.44	0.44	0.45	0.47	0.49	0.50	0.50	0.50	0.51	0.50	0.53	0.53	0.55	0.53	0.53
Other [6]	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06
2. Nominal GDP [7] (in € billion)	**288.04**	**295.90**	**310.13**	**318.65**	**323.91**	**333.15**	**344.27**	**357.61**	**369.36**	**385.27**	**397.17**	**381.04**	**406.15**	**447.65**	**480.63**

Date: 21 April 2023. Source: Statistics Austria.

On the basis of funding data from R&D carried out in Austria. Data as of April 2023.
Footnotes: see Table A V-1.

Table A V-3: Federal expenditure on research and research promotion 2020–2023

Ministries [1]	Cash Flow Statement				Cash Flow Budget			
	2020 [2]		2021 [3]		2022 [3]		2023 [3]	
	in € million	%	in € million	%	in € million	%	in € million	%
Federal Chancellery (BKA) [4]	1.298	*0.0*	2.283	*0.1*	2.421	*0.1*	2.216	*0.1*
Federal Ministry of Arts, Culture, the Civil Service and Sport (BMKÖS)	49.851	*1.5*	46.803	*1.4*	50.441	*1.3*	51.221	*1.2*
Federal Ministry for European and International Affairs (BMEIA)	2.854	*0.1*	3.498	*0.1*	3.244	*0.1*	3.683	*0.1*
Federal Ministry of Labour, Family and Youth (BMAFJ)	5.688	*0.2*	.	.	.	.	.	.
Federal Ministry of Labour (BMA)	.	.	4.010	*0.1*	.	.	.	.
Federal Ministry of Labour and Economy (BMAW)	.	.	.	.	176.936	*4.5*	288.209	*6.9*
Federal Ministry for Digital and Economic Affairs (BMDW)	112.758	*3.4*	93.167	*2.8*	.	.	.	.
Federal Ministry of Education, Science and Research (BMBWF)	2,433.458	*74.0*	2,490.690	*76.2*	2,826.001	*72.7*	2,984.798	*71.5*
Federal Ministry of Finance (BMF)	28.838	*0.9*	27.776	*0.8*	37.203	*1.0*	36.236	*0.9*
Federal Ministry of the Interior (BMI)	1.757	*0.1*	2.011	*0.1*	1.859	*0.0*	1.574	*0.0*
Federal Ministry of Defence (BMLV)	2.138	*0.1*	2.516	*0.1*	3.968	*0.1*	4.830	*0.1*
Federal Ministry of Agriculture, Regions and Tourism (BMLRT)	43.572	*1.3*	64.376	*2.0*	.	.	.	.
Federal Ministry of Agriculture, Forestry, Regions and Water Management (BML)	.	.	.	.	66.173	*1.7*	52.975	*1.3*
Federal Ministry of Justice (BMJ)	0.036	*0.0*	0.070	*0.0*	0.139	*0.0*	0.173	*0.0*
Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)	597.245	*18.2*	523.163	*16.0*	710.955	*18.3*	738.972	*17.7*
Federal Ministry of Social Affairs, Health, Care and Consumer Protection (BMSGPK)	7.581	*0.2*	9.212	*0.3*	9.679	*0.2*	9.504	*0.2*
Total	**3,287.074**	***100.0***	**3,269.575**	***100.0***	**3,889.019**	***100.0***	**4,174.391**	***100.0***

Status: March 2023 Source: Statistics Austria

1) In accordance with the applicable version of the Federal Ministries Act 1986 (2020: Federal Law Gazette I No. 8 / 2020; 2021: Federal Law Gazette I No. 30 / 2021; 2022, 2023: BGBl. I No. 98 / 2022).

2) Federal Finances Act 2022. Detailed overview of research-related appropriation of federal funds.

3) Federal Finances Act 2023. Detailed overview of research-related appropriation of federal funds.

4) Including the highest executive bodies.

Table A V-4: Detailed overview of research-related appropriation of federal funds, 2020 to 2022

Detailed overview of research-related appropriation of federal funds

Research-related federal expenditure by ministerial departments, 2020 to 2022

The following overviews are structured according to:

1. Contributions from federal funds to international organisations that have research and research promotion as (one of) their objectives **(Part a)**
2. Federal budget expenditure on research and research promotion in Austria **(Part b, Federal budget for research)**

For the compilation of these expenditures, the decisive aspect is the extent to which an expenditure is research-related, based on the definition of research in the OECD's Frascati Manual. The same definition is also applied by Statistics Austria for its research and experimental development (R&D) surveys.

BUNDESVORANSCHLAG 2023

Detailübersicht Forschungswirksame Mittelverwendungen des Bundes

(Beträge in Millionen Euro)

a) Beitragszahlungen an internationale Organisationen - Finanzierungsvoranschlag

VA-Stelle	Konto	Ugl	Bezeichnung	Anm	Finanzierungsvoranschlag 2023			Finanzierungsvoranschlag 2022			Erfolg 2021		
					Insgesamt	hievon		Insgesamt	hievon		Insgesamt	hievon	
						%	Forschung		%	Forschung		%	Forschung
			Bundeskanzleramt										
			UG10										
10010100	7800	100	Mitgliedsbeiträge an Institutionen im Ausland		0,171	100	0,171	0,143	100	0,143	0,140	100	0,140
10010100	7800	110	Mitgliedsbeitrag AV-Infostelle		0,039	5	0,002	0,035	5	0,002	0,033	5	0,002
10010200	7800	100	Mitgliedsbeiträge an Institutionen im Ausland										
10010402	7800	100	Mitgliedsbeiträge an Institutionen im Ausland	*	0,012	100	0,012	0,012	100	0,012	0,012	100	0,012
			Summe UG10		**0,222**		**0,185**	**0,190**		**0,157**	**0,185**		**0,154**
			Summe Bundeskanzleramt		**0,222**		**0,185**	**0,190**		**0,157**	**0,185**		**0,154**
			BM für europäische und internationale Angelegenheiten										
			UG12										
12020200	7800	101	Mitgliedsbeitrag für OECD		4,200	35	1,470	4,113	35	1,440	4,071	35	1,425
12020200	7800	102	OECD-Energieagentur (Mitgliedsbeitrag)									20	
12020200	7840	000	Laufende Transfers an Drittländer	*	3,220	35	1,127	2,689	35	0,941	3,046	35	1,066
12020200	7840	002	Organisation der VN für industr.Entwicklung(UNIDO)		0,735	46	0,338	0,660	46	0,304	0,774	46	0,356
12020200	7840	003	Org. VN Erziehung,Wissensch.u.Kultur(UNESCO)		2,250	30	0,675	1,620	30	0,486	1,925	30	0,578
12020200	7840	056	Drogenkontrollprogramm der VN (UNDCP)		0,726	10	0,073	0,726	10	0,073	0,726	10	0,073
			Summe UG12		**11,131**		**3,683**	**9,808**		**3,244**	**10,542**		**3,498**
			Summe BM für europäische und internationale Angelegenheiten		**11,131**		**3,683**	**9,808**		**3,244**	**10,542**		**3,498**
			BM für Finanzen										
			UG15										
15010100	7800	000	Laufende Transferzahlungen an das Ausland		0,151	100	0,151	0,151	100	0,151	0,105	100	0,105
			Summe UG15		**0,151**		**0,151**	**0,151**		**0,151**	**0,105**		**0,105**
			Summe BM für Finanzen		**0,151**		**0,151**	**0,151**		**0,151**	**0,105**		**0,105**
			BM für Arbeit und Wirtschaft										
			UG40										
40020100	7800	100	Mitgliedsbeiträge an Institutionen im Ausland		0,550	15	0,083	0,735	15	0,110	0,408	15	0,061
			Summe UG40		**0,550**		**0,083**	**0,735**		**0,110**	**0,408**		**0,061**
			Summe BM für Arbeit und Wirtschaft		**0,550**		**0,083**	**0,735**		**0,110**	**0,408**		**0,061**
			BM für Bildung, Wissenschaft und Forschung										
			UG30										
30010300	7800	104	OECD-Schulbauprogramm		0,031	100	0,031	0,031	100	0,031		100	
30010400	7800	000	Laufende Transferzahlungen an das Ausland	*	0,692	100	0,692	0,435	100	0,435	0,482	100	0,482
			Summe UG30		**0,723**		**0,723**	**0,466**		**0,466**	**0,482**		**0,482**
			UG31										
31030100	7800	000	Laufende Transferzahlungen an das Ausland		0,800	100	0,800	0,800	100	0,800	0,368	100	0,368
31030100	7800	066	Forschungsvorhaben in internationaler Kooperation		0,201	100	0,201	0,201	100	0,201	0,157	100	0,157
31030100	7800	200	Beiträge an internationale Organisationen		2,103	50	1,052	2,012	50	1,006	1,202	50	0,601

a) Beitragszahlungen an internationale Organisationen - Finanzierungsvoranschlag

VA-Stelle	Konto	Ugl	Bezeichnung	Anm	Finanzierungsvoranschlag 2023			Finanzierungsvoranschlag 2022			Erfolg 2021		
					Insgesamt	hievon		Insgesamt	hievon		Insgesamt	hievon	
						%	Forschung		%	Forschung		%	Forschung
31030204	7800	062	ESO			100		6,200	100	6,200	6,175	100	6,175
31030204	7800	063	Europ. Zentrum für mittelfristige Wettervorhersage			100		1,300	100	1,300	1,234	100	1,234
31030204	7800	064	Molekularbiologie - Europäische Zusammenarbeit			100		3,521	100	3,521	3,053	100	3,053
31030204	7800	065	World Meteorological Organisation			50		0,550	50	0,275	0,422	50	0,211
31030204	7800	200	Beiträge an internationale Organisationen			50		0,900	50	0,450	0,887	50	0,444
31030204	7800	242	Beitrag für die CERN			100		25,200	100	25,200	23,745	100	23,745
31030300	7800	062	ESO		6,300	100	6,300						
31030300	7800	063	Europ. Zentrum für mittelfristige Wettervorhersage		1,300	100	1,300						
31030300	7800	064	Molekularbiologie - Europäische Zusammenarbeit		3,861	100	3,861						
31030300	7800	065	World Meteorological Organisation		0,550	50	0,275						
31030300	7800	200	Beiträge an internationale Organisationen		0,940	50	0,470						
31030300	7800	242	Beitrag für die CERN		25,700	100	25,700						
			Summe UG31		**41,755**		**39,959**	**40,684**		**38,953**	**37,243**		**35,988**
			Summe BM für Bildung, Wissenschaft und Forschung		**42,478**		**40,682**	**41,150**		**39,419**	**37,725**		**36,470**
			BM für Klimaschutz, Umwelt, Energie, Mobil., Innov. u.Technologie										
			UG34										
34010100	7800	200	Beiträge an internationale Organisationen		0,070	100	0,070	0,070	100	0,070	0,065	100	0,065
34010100	7800	488	Transferzahlungen an ESA Covid-19										
34010100	7800	600	ESA-Pflichtprogramme		19,462	100	19,462	19,462	100	19,462	20,126	100	20,126
34010100	7800	601	EUMETSAT		8,801	100	8,801	8,801	100	8,801	9,236	100	9,236
34010100	7800	602	OECD-Energieagentur		0,050	100	0,050	0,050	100	0,050	0,027	100	0,027
34010100	7800	603	ESA-Wahlprogramme		47,616	100	47,616	30,616	100	30,616	28,179	100	28,179
34010100	7830	000	Laufende Transfers an Drittländer		0,195	100	0,195	0,195	100	0,195	0,190	100	0,190
			Summe UG34		**76,194**		**76,194**	**59,194**		**59,194**	**57,823**		**57,823**
			UG41										
41010100	7800	200	Beiträge an internationale Organisationen		0,110	6	0,007	0,110	6	0,007	0,100	6	0,006
41010300	7830	000	Laufende Transfers an Drittländer		0,325	100	0,325	0,319	100	0,319	0,327	100	0,327
41020100	7800	200	Beiträge an internationale Organisationen			100		0,020	100	0,020	0,001	100	0,001
41020402	7800	200	Beiträge an internationale Organisationen		0,070	15	0,011	0,066	15	0,010	0,069	15	0,010
41020500	7800	200	Beiträge an internationale Organisationen		0,030	15	0,005	0,030	15	0,005		15	
41020500	7830	000	Laufende Transfers an Drittländer		0,482	15	0,072	0,482	15	0,072	0,387	15	0,058
41020601	7800	200	Beiträge an internationale Organisationen		0,050	50	0,025	0,050	50	0,025	0,036	50	0,018
41020700	7800	200	Beiträge an internationale Organisationen										
			Summe UG41		**1,067**		**0,445**	**1,077**		**0,458**	**0,920**		**0,420**
			Summe BM für Klimaschutz, Umwelt, Energie, Mobil., Innov. u.Technologie		**77,261**		**76,639**	**60,271**		**59,652**	**58,743**		**58,243**
			BM für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft										
			UG42										
42010100	7800	100	Mitgliedsbeiträge an Institutionen im Ausland										
42020202	7800	080	FAO-Beiträge								2,894	51	1,476
42020202	7800	083	Int. Vertrag für pflanzengenetische								0,025	100	0,025

a) Beitragszahlungen an internationale Organisationen - Finanzierungsvoranschlag														
VA-Stelle	Konto	Ugl	Bezeichnung	Anm	Finanzierungsvoranschlag 2023			Finanzierungsvoranschlag 2022			Erfolg 2021		
					Insgesamt	hievon		Insgesamt	hievon		Insgesamt	hievon	
						%	Forschung		%	Forschung		%	Forschung
			Ressourcen										
42040100	7800	100	Mitgliedsbeiträge an Institutionen im Ausland		0,008	50	0,004	0,003	50	0,002			
420503			FAO-Beiträge		3,400	51	1,734	3,400	51	1,734			
42050300	7800	083	Int. Vertrag für pflanzengenetische Ressourcen		0,025	100	0,025	0,025	100	0,025			
			Summe UG42		**3,433**		**1,763**	**3,428**		**1,761**	**2,919**		**1,501**
			Summe BM für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft		**3,433**		**1,763**	**3,428**		**1,761**	**2,919**		**1,501**
			Teil a -Summe		**135,226**		**123,186**	**115,733**		**104,494**	**110,627**		**100,032**

b) Bundesbudget Forschung - Finanzierungsvoranschlag

(ausgen. die bereits im Abschnitt a) ausgewiesen sind)

VA-Stelle	Konto	Ugl	Bezeichnung	Anm	Finanzierungsvoranschlag 2023			Finanzierungsvoranschlag 2022			Erfolg 2021		
					Insgesamt	hievon		Insgesamt	hievon		Insgesamt	hievon	
						%	Forschung		%	Forschung		%	Forschung
			Parlamentsdirektion										
			UG02										
02010500	7330	086	Nationalfonds für Opfer des Nationalsozialismus	*	2,487	3	0,075	2,309	5	0,115	1,109	7	0,078
			Summe UG02		**2,487**		**0,075**	**2,309**		**0,115**	**1,109**		**0,078**
			Summe Parlamentsdirektion		**2,487**		**0,075**	**2,309**		**0,115**	**1,109**		**0,078**
			Bundeskanzleramt										
			UG10										
10010100	7260	000	Mitgliedsbeiträge an Institutionen im Inland		0,011	13	0,001	0,011	28	0,003	0,009	15	0,001
10010100	7270	000	Werkleistungen durch Dritte		1,246	8	0,100	1,260	4	0,050	0,734	13	0,095
10010200	7260	000	Mitgliedsbeiträge an Institutionen im Inland			50			50		0,005	50	0,003
10010200	7270	000	Werkleistungen durch Dritte		4,935	4	0,197	3,935	4	0,157	1,849	4	0,074
10010401	7340	001	Pauschalabgeltung gem. § 32 Abs.5 BStatG		57,324	1	0,573	50,141	1	0,501	49,851	1	0,499
10010402			Österr. Staatsarchiv										
			Summe UG10		**63,516**		**0,871**	**55,347**		**0,711**	**52,448**		**0,672**
			UG25										
25010500	7270	006	Werkleistungen durch Dritte (zw)	*	0,343	12	0,040	0,824	74	0,612	0,448	92	0,411
25010500	7420	313	Familie und Beruf Management GesmbH Förd. (zw)	*	1,040	67	0,700	0,940	74	0,700	1,040	67	0,700
25010500	7664	007	Forschungsförderung gem. § 39i FLAG 1967 (zw)								0,250	100	0,250
25020100	7270	000	Werkleistungen durch Dritte	*	1,988	17	0,345	0,738	17	0,126	0,410	4	0,018
25020200	7270	000	Werkleistungen durch Dritte										
			Summe UG25		**3,371**		**1,085**	**2,502**		**1,438**	**2,148**		**1,379**
			Summe Bundeskanzleramt		**66,887**		**1,956**	**57,849**		**2,149**	**54,596**		**2,051**
			BM für Inneres										
			UG11										
11010100	7270	900	Werkleistungen durch Dritte	*	5,729						0,029	100	0,029
11010200	7270	900	Werkleistungen durch Dritte	*				0,015	100	0,015	0,039	100	0,039
11020600			Bundeskriminalamt	*	16,650	8	1,332	16,123	8	1,290	15,009	8	1,201
11020800	7270	900	Werkleistungen durch Dritte	*				0,039	100	0,039	0,059	100	0,059
			Summe UG11		**22,379**		**1,332**	**16,177**		**1,344**	**15,136**		**1,328**
			UG18										
18010100	7270	900	Werkleistungen durch Dritte	*							0,069	100	0,069
18010100	7660	900	Zuschüsse f. lfd. Aufwand an private Institutionen	*							0,354	100	0,354
18010100	7672	009	Projekte des AMIF (Kofinanzierung)	*							0,260	100	0,260
18010400	7660	900	Zuschüsse f. lfd. Aufwand an private Institutionen	*	0,177	100	0,177	5,200					
18010400	7670	309	Projekte des AMIF (EU) (zw)	*				0,260	100	0,260			
18010400	7672	009	Projekte des AMIF (Kofinanzierung)	*	0,065	100	0,065	0,255	100	0,255			
			Summe UG18		**0,242**		**0,242**	**5,715**		**0,515**	**0,683**		**0,683**
			Summe BM für Inneres		**22,621**		**1,574**	**21,892**		**1,859**	**15,819**		**2,011**
			BM für Justiz										
			UG13										
13010100	6430	000	Sonstige Beratungskosten	*	0,256	50	0,128	0,188	50	0,094	0,140	50	0,070
13030101	6430	000	Sonstige Beratungskosten	*	0,075	60	0,045	0,075	60	0,045			
			Summe UG13		**0,331**		**0,173**	**0,263**		**0,139**	**0,140**		**0,070**
			Summe BM für Justiz		**0,331**		**0,173**	**0,263**		**0,139**	**0,140**		**0,070**
			BM für Landesverteidigung										
			UG14										
14040100			Heeresgeschichtliches Museum	*				3,988	37	1,476	1,842	37	0,682
14050100	7270	000	Werkleistungen durch Dritte	*				0,200	58	0,116	0,230	58	0,133
14050100	7270	900	Werkleistungen durch Dritte	*				2,376	100	2,376	1,693	100	1,693
14050202	4691	000	Versuche und Erprobungen auf								0,077	10	0,008

b) Bundesbudget Forschung - Finanzierungsvoranschlag

(ausgen. die bereits im Abschnitt a) ausgewiesen sind)

VA-Stelle	Konto	Ugl	Bezeichnung	Anm	Finanzierungsvoranschlag 2023			Finanzierungsvoranschlag 2022			Erfolg 2021		
					Insgesamt	hievon		Insgesamt	hievon		Insgesamt	hievon	
						%	Forschung		%	Forschung		%	Forschung
			kriegstechn. Gebiet										
14070100	7270	900	Werkleistungen durch Dritte	*	3,126	100	3,126						
14070100	7411	002	FFG - FTI-Programme, Förderungen		0,174	100	0,174						
14070200			Heeresgeschichtliches Museum	*	4,115	37	1,523						
14080105	4691	000	Versuche und Erprobungen auf kriegstechn. Gebiet		0,070	10	0,007						
			Summe UG14		**7,485**		**4,830**	**6,564**		**3,968**	**3,842**		**2,516**
			Summe BM für Landesverteidigung		**7,485**		**4,830**	**6,564**		**3,968**	**3,842**		**2,516**
			BM für Finanzen										
			UG15										
15010100	6430	001	Arbeiten des WIIW		0,946	50	0,473	0,919	50	0,460	0,792	50	0,396
15010100	6430	002	Arbeiten des WSR		1,454	50	0,727	1,412	50	0,706	1,371	50	0,686
15010100	6430	003	Arbeiten des Wifo		4,986	50	2,493	4,653	52	2,420	4,419	52	2,298
15010100	7270	000	Werkleistungen durch Dritte	*	1,764	18	0,318	1,713	18	0,308	1,687	18	0,304
15010100	7661	002	Institut für Finanzwissenschaft und Steuerrecht										
15010100	7662	002	Institut für höhere Studien und wiss. Forschung	*	4,256	50	2,128	4,235	56	2,372	3,685	52	1,916
15010100	7669	020	Sonstige Förderungsbeiträge	*	0,400	100	0,400	0,400	100	0,400	0,681	100	0,681
15010600	7411	002	FFG - FTI-Programme, Förderungen		4,920	100	4,920	3,447	100	3,447			
15010600	7411	003	FFG - FTI-Programme (F&E-Dienstleist.,Sonst.WV)		1,230	100	1,230		100				
15010600	7411	004	FFG - Administrative Kosten		1,000	100	1,000	1,000	100	1,000			
			Forschungswirksamer Lohnnebenkostenanteil		22,396	100	22,396	25,939	100	25,939	21,390	100	21,390
			Summe UG15		**43,352**		**36,085**	**43,718**		**37,052**	**34,025**		**27,671**
			Summe BM für Finanzen		**43,352**		**36,085**	**43,718**		**37,052**	**34,025**		**27,671**
			BM für Kunst, Kultur, öffentlichen Dienst und Sport										
			UG17										
17020100	7411	071	Bundesinst. für Sporttechnologie/Training					2,500	100	2,500			
17020100	7672	132	Sporttechnologie Projekte		6,400	100	6,400	6,000	100	6,000	3,250	100	3,250
			Summe UG17		**6,400**		**6,400**	**8,500**		**8,500**	**3,250**		**3,250**
			UG32										
32010300			Denkmalschutz		45,103	18	8,119	42,181	18	7,593	41,151	18	7,407
32030100			Bundesmuseen		146,806	25	36,702	137,390	25	34,348	144,585	25	36,146
			Summe UG32		**191,909**		**44,821**	**179,571**		**41,941**	**185,736**		**43,553**
			Summe BM für Kunst, Kultur, öffentlichen Dienst und Sport		**198,309**		**51,221**	**188,071**		**50,441**	**188,986**		**46,803**
			BM für Arbeit und Wirtschaft										
			UG20										
20010101	7340	302	Überweisung an das AMS gem. § 41 (2) (zw)	*	662,100	1	5,250	622,311	1	5,250	588,834	1	3,526
20010201	7270	006	Werkleistungen durch Dritte (zw)	*	88,590	1	0,700	433,590		0,700	444,034		0,134
20010201	7668	900	Gemeinnützige Einrichtungen (zw)	*	124,620		0,400	110,000		0,400	157,668		0,350
20010202	7270	000	Werkleistungen durch Dritte	*	6,500	1	0,080	6,500	1	0,080			
			Summe UG20		**881,810**		**6,430**	**1.172,401**		**6,430**	**1.190,536**		**4,010**
			UG33										
33010100			Kooperation Wissenschaft-Wirtschaft		43,100	100	43,100	38,800	100	38,800	30,829	100	30,829
33010200			Innovation, Technologietransfer		214,546	100	214,546	116,296	100	116,296	51,780	100	51,780
33010300			Gründung innovativer Unternehmen		24,050	100	24,050	15,300	100	15,300	10,497	100	10,497
			Summe UG33		**281,696**		**281,696**	**170,396**		**170,396**	**93,106**		**93,106**
			Summe BM für Arbeit und Wirtschaft		**1.163,506**		**288,126**	**1.342,797**		**176,826**	**1.283,642**		**97,116**
			BM für Soziales, Gesundheit, Pflege und Konsumentenschutz										

b) Bundesbudget Forschung - Finanzierungsvoranschlag

(ausgen. die bereits im Abschnitt a) ausgewiesen sind)

VA-Stelle	Konto	Ugl	Bezeichnung	Anm	Finanzierungsvoranschlag 2023			Finanzierungsvoranschlag 2022			Erfolg 2021		
					Insgesamt	hievon		Insgesamt	hievon		Insgesamt	hievon	
						%	Forschung		%	Forschung		%	Forschung
			UG21										
21010100	7270	000	Werkleistungen durch Dritte		4,878	3	0,146	4,149	3	0,124	6,375	3	0,191
21010300	7270	000	Werkleistungen durch Dritte		1,660	16	0,266	1,251	16	0,200	0,860	16	0,138
21010300	7660	900	Zuschüsse f. lfd. Aufwand an private Institutionen		5,000	2	0,100	5,150	2	0,103	5,426	2	0,109
21010400	7262	001	Beitrag Europ. Zentrum Wohlfahrtspol.u.Sozialfor.		0,587	50	0,294	0,587	50	0,294	0,587	50	0,294
21010400	7270	000	Werkleistungen durch Dritte		33,452	2	0,669	19,800	4	0,792	2,703	4	0,108
21010400	7270	304	Werkleistungen EU-SILC		1,344	100	1,344	1,149	100	1,149	1,625	100	1,625
			Summe UG21		**46,921**		**2,819**	**32,086**		**2,662**	**17,576**		**2,465**
			UG24										
24010200	7420	012	Transferzahlungen AGES		49,878	11	5,487	55,878	11	6,147	55,878	11	6,147
24030100	7270	000	Werkleistungen durch Dritte		27,200	4	1,088	19,164	4	0,767	12,471	4	0,499
24030200	7270	000	Werkleistungen durch Dritte		5,515	2	0,110	5,168	2	0,103	5,071	2	0,101
			Summe UG24		**82,593**		**6,685**	**80,210**		**7,017**	**73,420**		**6,747**
			Summe BM für Soziales, Gesundheit, Pflege und Konsumentenschutz		**129,514**		**9,504**	**112,296**		**9,679**	**90,996**		**9,212**
			BM für Bildung, Wissenschaft und Forschung										
			UG30										
30010400			Qualitätsentwicklung und -steuerung	*	58,364	8	4,669	68,762	8	5,501	40,192	8	3,215
30010500			Lehrer/innenbildung		277,909	7	19,454	248,500	7	17,395	238,338	7	16,684
30010800	7270	900	Werkleistungen durch Dritte		4,583	90	4,125	3,788	90	3,409	0,831	90	0,748
30020700			Zweckgebundene Gebarung Bundesschulen	*	7,709	3	0,231	7,709	3	0,231	6,603	3	0,198
			Summe UG30		**348,565**		**28,479**	**328,759**		**26,536**	**285,964**		**20,845**
			UG31										
31010100			Zentralstelle und Serviceeinrichtungen		60,546	20	12,109	66,021	20	13,204	54,289	20	10,858
31020100			Universitäten		4.361,536	50	2.180,768	4.095,202	50	2.047,601	3.833,872	50	1.916,936
31020100	7270	000	Werkleistungen durch Dritte		0,360	50	0,180	0,360	50	0,180	0,070	50	0,035
31020100	7348	788	Institute of Precision Medicine RRF		10,000	100	10,000	5,000	100	5,000			
31020100	7353	440	Klinischer Mehraufwand (Klinikbauten)		78,995	50	39,498	68,995	50	34,498	40,896	50	20,448
31020200			Fachhochschulen		383,333	14	53,667	376,057	14	52,648	328,808	14	46,033
31020300	7270	900	Werkleistungen durch Dritte		1,618	22	0,356	1,782	22	0,392	1,125	22	0,248
31030100			Projekte und Programme	*	2,515	100	2,515	2,783	100	2,783	2,823	100	2,823
31030100	7260	000	Mitgliedsbeiträge an Institutionen im Inland		0,073	100	0,073	0,171	100	0,171	0,068	100	0,068
31030100	7270	034	Ersatzmethoden zum Tierversuch		0,120	100	0,120	0,117	100	0,117	0,111	100	0,111
31030100	7270	900	Werkleistungen durch Dritte		9,546	100	9,546	10,030	100	10,030	3,372	100	3,372
31030100	7280	018	OeAD-Abwicklung		1,697	100	1,697	1,687	100	1,687	1,417	100	1,417
31030100	7280	788	Werkleistungen (Sonstige Leist. v. Dritten) RRF		0,835	100	0,835						
31030100	7411	069	OeAD Förderungen		17,136	100	17,136	17,036	100	17,036	8,140	100	8,140
31030100	7411	070	OeAD Begleitmaßnahmen		3,116	100	3,116	3,060	100	3,060	3,155	100	3,155
31030100	7413	788	Quantum Austria-RRF		11,110	100	11,110	21,000	100	21,000			
31030100	7662	311	Institut für höhere Studien und wiss. Forschung		0,001	100	0,001	0,040	100	0,040			
31030100	7665	007	Stiftung Dokumentationsarchiv		0,680	100	0,680	0,650	100	0,650	0,469	100	0,469
31030100	7679	120	Lfd. Transfers an sonstige juristische Personen		22,177	100	22,177	19,332	100	19,332	10,280	100	10,280
31030201			Zentralanstalt für Meteorologie und Geodynamik			31		26,047	31	8,075	25,402	31	7,875
31030202			Geologische Bundesanstalt			36		11,502	36	4,141	11,083	36	3,990
31030204			Forschungsinstitutionen	*		100		9,640	100	9,640	23,713	100	23,713
31030204	7270	031	Med Austron			100		1,740	100	1,740	1,498	100	1,498

b) Bundesbudget Forschung - Finanzierungsvoranschlag

(ausgen. die bereits im Abschnitt a) ausgewiesen sind)

VA-Stelle	Konto	UgI	Bezeichnung	Anm	Finanzierungsvoranschlag 2023			Finanzierungsvoranschlag 2022			Erfolg 2021		
					Insgesamt	hievon		Insgesamt	hievon		Insgesamt	hievon	
						%	Forschung		%	Forschung		%	Forschung
31030204	7332	352	FWF Programme			100		251,200	100	251,200	146,600	100	146,600
31030204	7332	452	FWF Geschäftsstelle			100		13,000	100	13,000	8,740	100	8,740
31030204	7332	552	FWF Begleitmaßnahmen					1,500	100	1,500	1,350	100	1,350
31030204	7340	004	ISTA			100		90,800	100	90,800	69,763	100	69,763
31030204	7340	006	ÖAW - LV			100		137,190	100	137,190	137,190	100	137,190
31030204	7340	010	ÖAW Beauftragungen und Programme			100			100			100	
31030204	7661	022	Ludwig-Boltzmann-Gesellschaft			100		12,331	100	12,331	7,263	100	7,263
31030204	7679	007	Verein der Freunde der Salzburger Stiftung			100		1,000	100	1,000	1,000	100	1,000
31030300			Basisfinanzierung von Institutionen	*	14,846	100	14,846						
31030300	7270	031	Med Austron		1,740	100	1,740						
31030300	7332	352	FWF Programme		255,600	100	255,600						
31030300	7332	452	FWF Geschäftsstelle		13,700	100	13,700						
31030300	7332	552	FWF Begleitmaßnahmen		1,500	100	1,500						
31030300	7332	788	Quantum Austria FWF Programme RRF		8,555	100	8,555						
31030300	7333	788	Quantum Austria FWF Geschäftsstelle RRF		0,500	100	0,500						
31030300	7340	004	ISTA		90,800	100	90,800						
31030300	7340	006	ÖAW - LV		138,190	100	138,190						
31030300	7340	020	GeoSphere Austria		33,328	34	11,332						
31030300	7661	022	Ludwig-Boltzmann-Gesellschaft		12,290	100	12,290						
31030300	7679	007	Verein der Freunde der Salzburger Stiftung		1,000	100	1,000						
			Summe UG31		**5.537,443**		**2.915,637**	**5.245,273**		**2.760,046**	**4.722,497**		**2.433,375**
			Summe BM für Bildung, Wissenschaft und Forschung		**5.886,008**		**2.944,116**	**5.574,032**		**2.786,582**	**5.008,461**		**2.454,220**
			BM für Klimaschutz, Umwelt, Energie, Mobil., Innov. u.Technologie										
			UG34										
34010200	7273	788	AWS Aufbau- und Resilienzfazilität RRF Abwicklung		0,161	100	0,161	0,200	100	0,200			
34010200	7340	100	Rat f. Forschung und Technologieentwicklung		0,900	100	0,900	1,800	100	1,800	1,800	100	1,800
34010200	7411	021	Important Projects of Common European Interest		35,521	100	35,521	24,700	100	24,700	11,739	100	11,739
34010200	7411	022	Important Projects of Common European Interest-Abw		0,229	100	0,229	0,050	100	0,050	0,043	100	0,043
34010200	7411	788	Lfd Transfers an verbundene Unternehmungen RRF		13,733	100	13,733	9,800	100	9,800			
34010200	7413	001	Austrian Institute of Technology AIT-Förderungen		0,010	100	0,010	0,010	100	0,010	0,032	100	0,032
34010200	7413	002	Austrian Institute of Technology AIT		65,000	90	58,500	63,700	90	57,330	58,675	90	52,808
34010200	7413	003	Nuclear Engineering Seibersdorf NES		7,790	30	2,337	7,510	30	2,253	6,664	30	1,999
34010200	7413	004	Silicon Austria Labs GmbH		26,431	100	26,431	24,115	100	24,115	17,956	100	17,956
34010200	7414	002	Austria Tech		1,150	100	1,150	0,850	100	0,850	0,878	100	0,878
34010200	7414	788	FFG Aufbau- und Resilienzfazilität RRF Abwicklung		0,078	100	0,078	0,200	100	0,200	0,051	100	0,051
34010200	7417	788	AWS Aufbau- und Resilienzfazilität RRF		20,528	100	20,528	9,800	100	9,800			
34010200	7660	075	F&T-Förderung		0,340	100	0,340	0,340	100	0,340	0,520	100	0,520
34010200	7662	341	Joanneum Research Forsch.ges.m.b.H(Techn.schwerp)		2,559	100	2,559	2,559	100	2,559	2,227	100	2,227
34010200	7666	005	Österreichisches Institut für Nachhaltigkeit			100			100			100	
34010200	7667	006	Sonstige gemeinnützige Einrichtungen		1,245	100	1,245	1,245	100	1,245	1,334	100	1,334

b) Bundesbudget Forschung - Finanzierungsvoranschlag

(ausgen. die bereits im Abschnitt a) ausgewiesen sind)

VA-Stelle	Konto	Ugl	Bezeichnung	Anm	Finanzierungsvoranschlag 2023			Finanzierungsvoranschlag 2022			Erfolg 2021		
					Insgesamt	hievon		Insgesamt	hievon		Insgesamt	hievon	
						%	Forschung		%	Forschung		%	Forschung
34010200	7668	040	Salzburg Research		0,410	100	0,410	0,410	100	0,410	0,293	100	0,293
34010200	7690	002	Preisverleihungen		0,005	100	0,005	0,005	100	0,005	0,015	100	0,015
34010300	7260	000	Mitgliedsbeiträge an Institutionen im Inland		0,180	100	0,180	0,180	100	0,180	0,188	100	0,188
34010300	7270	000	Werkleistungen durch Dritte		5,330	100	5,330	2,200	100	2,200	6,905	100	6,905
34010300	7280	030	FTI-Projekte, Beauftragungen an Dritte		0,500	100	0,500	0,500	100	0,500	0,369	100	0,369
34010300	7411	001	FFG - Basisprogramme		134,759	100	134,759	135,000	100	135,000	94,810	100	94,810
34010300	7411	002	FFG - FTI-Programme, Förderungen		175,155	100	175,155	178,655	100	178,655	144,450	100	144,450
34010300	7411	003	FFG - FTI-Programme (F&E-Dienstleist.,Sonst.WV)		10,000	100	10,000	9,066	100	9,066	2,290	100	2,290
34010300	7411	004	FFG - Administrative Kosten		23,156	100	23,156	21,775	100	21,775	19,093	100	19,093
34010300	7411	488	FFG Covid-19										
34010300	7412	001	Austria Wirtschaftsservice GmbH AWS - Förderungen		19,232	100	19,232	24,130	100	24,130	10,433	100	10,433
34010300	7412	003	Austria Wirtschaftsservice GmbH AWS - Admin.Kost.		2,268	100	2,268	2,370	100	2,370	2,348	100	2,348
34010300	7417	488	aws COVID-19 Startup Hilfsfonds (Abwicklung)		0,039	100	0,039	0,064	100	0,064	0,023	100	0,023
34010300	7432	030	FTI-Projekte, Förderungen		0,250	100	0,250	0,250	100	0,250	0,182	100	0,182
			Summe UG34		**546,959**		**535,006**	**521,484**		**509,857**	**383,318**		**372,786**
			UG41										
41010200	7330	080	Transferzahlungen an Klima- und Energiefonds	*	196,000	30	58,800	67,400	95	64,030	64,095	95	60,890
41020100	7270	000	Werkleistungen durch Dritte		3,444	50	1,722	3,030	50	1,515	31,176	50	15,588
41020100	7270	800	Dekarbonisierung/E-Mobilität		110,722	45	49,825	141,622	45	63,730	0,245	45	0,110
41020100	7270	801	E-Mobilität für alle: Urbane Elektromobilität		0,001	20		0,001	20			20	
41020100	7411	002	FFG - FTI-Programme, Förderungen		1,000	100	1,000	1,000	100	1,000		100	
41020100	7411	003	FFG - FTI-Programme (F&E-Dienstleist.,Sonst.WV)		0,010	100	0,010	0,010	100	0,010			
41020100	7411	004	FFG - Administrative Kosten		0,010	100	0,010	0,010	100	0,010		100	
41020100	7480	501	Progr.Kombinierter Güterverk.Straße-Schiene-Schiff		5,800	50	2,900	4,300	50	2,150	4,287	50	2,144
41020100	7660	000	Zuschüsse f. lfd. Aufwand an private Institutionen		1,030	95	0,979	1,030	95	0,979	0,200	95	0,190
41020100	7668	055	Technisches Museum Wien		0,601	80	0,481	0,601	80	0,481	0,060	80	0,048
41020402	7270	000	Werkleistungen durch Dritte		1,464	5	0,073	1,464	5	0,073	0,785	5	0,039
41020402	7270	006	Werkleistungen durch Dritte (zw)		1,500	5	0,075	1,500	5	0,075	1,533	5	0,077
			Summe UG41		**321,582**		**115,875**	**221,968**		**134,053**	**102,381**		**79,086**
			UG43										
43010200	7700	500	Investitionszuschüsse		345,117	1	3,451	95,314	1	0,953	53,600	1	0,536
43010300			Klima- und Energiefonds		355,360	2	7,107	143,400	4	5,736	90,320	12	10,838
43010500			Klima und Energie	*							76,618	1	0,766
43010500	7270	080	Forschungsaufwendungen		0,290	100	0,290	0,100	100	0,100	0,286	100	0,286
43010500	7420	021	Transferzahlungen an die UBA Ges.m.b.H								14,956	3	0,449
43020100	7270	080	Forschungsaufwendungen		0,155	100	0,155	0,155	100	0,155	0,173	100	0,173
43020100	7420	021	Transferzahlungen an die UBA Ges.m.b.H		14,956	3	0,449	14,956	3	0,449			
			Summe UG43		**715,878**		**11,452**	**253,925**		**7,393**	**235,953**		**13,048**
			Summe BM für Klimaschutz, Umwelt, Energie, Mobil., Innov. u.Technologie		**1.584,419**		**662,333**	**997,377**		**651,303**	**721,652**		**464,920**
			BM für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft										
			UG42										
42010100			Zentralstelle	*							0,502	100	0,502

b) Bundesbudget Forschung - Finanzierungsvoranschlag

(ausgen. die bereits im Abschnitt a) ausgewiesen sind)

VA-Stelle	Konto	Ugl	Bezeichnung	Anm	Finanzierungsvoranschlag 2023			Finanzierungsvoranschlag 2022			Erfolg 2021		
					Insgesamt	hievon		Insgesamt	hievon		Insgesamt	hievon	
						%	Forschung		%	Forschung		%	Forschung
42010200	7411	000	Lfd Transfers an verbundene Unternehmungen	*									
42010200	7411	027	Lfd Transfers an Ernährungsagentur-AGES								21,802	33	7,195
42010200	7411	029	Lfd Transf.an Bundesamt u. Forschungszentr.f.Wald								15,500	33	5,115
42020300			Forschung und Sonstige Maßnahmen	*							2,933	100	2,933
42020401			Landwirtschaftliche Schulen	*							69,272	23	15,933
42020402			Landwirtschaftliche Hochschule								5,662	3	0,170
42020403			Landwirtschaftliche Bundesanstalten								3,860	65	2,509
42020405			HBLA u. Forschungsanst. f. Landw. Ernähr., Lebensm.- u. Biotechn. Tirol	*									
42020501			HBLA für Wein- und Obstbau Klosterneuburg								10,800	30	3,240
42020502			Bundesamt für Weinbau								5,455	3	0,164
42020900	7411	002	FFG - FTI-Programme, Förderungen								14,544	100	14,544
42020900	7411	003	FFG - FTI-Programme (F&E-Dienstleist.,Sonst.WV)								2,915	100	2,915
42020900	7411	004	FFG - Administrative Kosten								0,605	100	0,605
42030101	7270	000	Werkleistungen durch Dritte								0,296	20	0,059
42030104			Forschung und Sonstige Maßnahmen Forst	*							0,512	100	0,512
42030104	7270	042	Werkverträge Waldfonds								4,007	100	4,007
42030204	7270	000	Werkleistungen durch Dritte	*							0,207	100	0,207
42030205			Bundesamt für Wasserwirtschaft								6,669	25	1,667
42030206			Siedlungswasserwirtschaft	*							0,598	100	0,598
42040100			Zentralstelle	*	5,197	100	5,197	4,464	100	4,464			
42040200	7411	027	Lfd Transfers an Ernährungsagentur-AGES	*	21,803	33	7,195	21,803	33	7,195			
42040200	7411	029	Lfd Transf.an Bundesamt u. Forschungszentr.f.Wald		17,500	33	5,775	15,500	33	5,115			
42040400	7411	002	FFG - FTI-Programme, Förderungen					1,473	100	1,473			
42040400	7411	003	FFG - FTI-Programme (F&E-Dienstleist.,Sonst.WV)					1,230	100	1,230			
42040400	7411	004	FFG - Administrative Kosten					1,000	100	1,000			
42040500			Land- und forstwirtschaftliches Schulwesen	*	95,583	22	21,028	87,050	22	19,151			
42050300	7660	022	Nationale Agrarmaßnahmen	*	0,054	100	0,054	0,054	100	0,054			
420504			Dienststellen Landwirtschaft		9,949	28	2,786	9,545	28	2,673			
42050400			Bundesamt für Weinbau	*	5,730	3	0,172	5,730	3	0,172			
42060100	7270	000	Werkleistungen durch Dritte		0,563			0,534					
42060200			Nationale und internat. Forstmaßnahmen	*	6,150	100	6,150	20,300	100	20,300			
42060400	7270	000	Werkleistungen durch Dritte	*	0,010	100	0,010	0,010	100	0,010			
42060500			Bundesamt für Wasserwirtschaft		7,980	25	1,995	6,300	25	1,575			
42060600			Siedlungswasserwirtschaft	*	0,850	100	0,850	0,800					
			Summe UG42		**171,369**		**51,212**	**175,793**		**64,412**	**166,139**		**62,875**
			Summe BM für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft		**171,369**		**51,212**	**175,793**		**64,412**	**166,139**		**62,875**
			Teil b -Summe		**9.276,288**		**4.051,205**	**8.522,961**		**3.784,525**	**7.569,407**		**3.169,543**
			Gesamtsumme Teil a + b		**9.411,514**		**4.174,391**	**8.638,694**		**3.889,019**	**7.680,034**		**3.269,575**

BUNDESVORANSCHLAG 2023

Detailübersicht Forschungswirksame Mittelverwendungen des Bundes

Anmerkungen

Allgemeine Anmerkungen

Hinweis: BVA 2022 ist auf Grund der zwei BFG-Novellen (BGBl. I Nr. 100/2022 und BGBl. I Nr. 66/2022) aktualisiert.
*) F& E Koeffizienten geschätzt

Die Detailübersicht Foschungswirksame Mittelverwendung des Bundes:

a) Beitragszahlungen aus Bundesmitteln an internationale Organisationen, die Forschung und Forschungsförderung (mit) als Ziel haben,

b) Bundesbudget-Forschung - Finanzierungsvorschlag (ausgen. die bereits im Abschnitt a) ausgewiesen sind)

Für die Aufstellung dieser Ausgaben ist in erster Linie der Gesichtspunkt der Forschungswirksamkeit maßgebend, der inhaltlich über den Aufgabenbereich 99 "Grundlagen-, angewandte Forschung und experimentelle Entwicklung" hinausgeht und auf dem Forschungsbegriff des Fascati-Handbuches der OECD beruht, wie er im Rahmen der forschungsstatistischen Erhebungen der STATISTIK AUSTRIA zur Anwendung gelangt.

Forschungswirksame Anteile bei den Bundesausgaben finden sich daher nicht nur bei den Ausgaben des Aufgabenbereiches 99 "Grundlagen-, angewandte Forschung und experimentelle Entwicklung" sondern auch in zahlreichen anderen Aufgabenbereichen.

Finanzierungsvoranschlag

VA-Stelle	Konto	Ugl	Anmerkung
			Parlamentsdirektion
02010500	7330	086	**) Forschungsanteil für den FV 2022 liegt bei 4,55%, für den FV 2021 bei 3,79% und für den Erfolg 2020 bei 4,50% (System rundet).*
			Bundeskanzleramt
10010402	7800	100	*) jährlicher Betrag des österreichischen Staatsarchivs an den Internationalen Archivbeirat (neu seit BVA 2020).
25010500	7420	313	*) Forschungsanteil liegt im BVA 2023 bei rd. 67,31 % (System rd. auf 67 %), im BVA 2022 bei rd. 74,47 % (System rd. auf 74 %) und im Erfolg bei 67,31 % (System rd. auf 67 %).
25010500	7270	006	*) Forschungsanteil liegt im BVA 2023 bei rd. 11,66 % (System rd. auf 12 %), im BVA 2022 bei rd. 74,27 % (System rd. auf 74 % und im Erfolg bei 91,74 % (System rd. auf 92 %).
25020100	7270	000	*) Forschungsanteil liegt im BVA2023 bei rd. 17,35 % (System rd. auf 17 %), im BVA 2022 bei 17,07 % (System rd. auf 17 %) und im Erfolg bei 4,39 % (System rd. auf 4 %).
25020200	7270	000	
			BM für Inneres
11010100	7270	900	*) Teilbetrag der Voranschlagsstelle.
11010200	7270	900	*) Teilbetrag der Voranschlagsstelle.
11020600			* Teilbetrag der Voranschlagsstelle
11020800	7270	900	*) Teilbetrag der Voranschlagsstelle.
18010100	7660	900	*) Aufgrund einer Budgetstrukturänderung wurde die Voranschlagsstelle 11030100 ab 2018 in die Voranschlagsstelle 18010100 überführt.
			*) Teilbetrag der Voranschlagsstelle.
18010100	7270	900	*) Teilbetrag der Voranschlagsstelle.
18010100	7672	009	*) Teilbetrag der Voranschlagsstelle
			Aufgrund Änderung der budgetären Zuordnung wurde der Asyl-, Migrations- und Integrationsfonds (AMIF) ab 2022 von der Voranschlagsstelle 18010100 in die Voranschlagsstelle 18010400 übergeführt.
18010400	7660	900	*) Teilbetrag der Voranschlagsstelle.
18010400	7672	009	*) Teilbetrag der Voranschlagsstelle
			Aufgrund Änderung der budgetären Zuordnung wurde der Asyl-, Migrations- und Integrationsfonds (AMIF) ab 2022 von der Voranschlagsstelle 18010100 in die Voranschlagsstelle 18010400 übergeführt.
18010400	7670	309	*) Teilbetrag der Voranschlagsstelle
			Aufgrund Änderung der budgetären Zuordnung wurde der Asyl-, Migrations- und Integrationsfonds (AMIF) ab 2022 von der Voranschlagsstelle 18010100 in die Voranschlagsstelle 18010400 übergeführt.
			BM für europäische und internationale Angelegenheiten
12020200	7800	102	
12020200	7800	101	
12020200	7840	000	IAEO
			BM für Justiz
13010100	6430	000	*) Studie zum Thema "Justizielle Verfahrenserledigung bei Partnergewalt" (Auftragnehmer: Instituts für Konfliktforschung (IKF), Auftragsvolumen 55.000 EUR, davon wurden 50 % vom BMI refundiert, 27.500 EUR im Jahr 2021 bezahlt, davon 13.750 EUR vom BMI refundiert (Auszahlungssumme ohne Refundierung ausgewiesen).
			*) Wissenschaftliche Begleitung der Evaluierung von Großverfahren (Auftragnehmer: Universität Wien), Auftragsvolumen 79.762,80 EUR, davon im Jahr 2021 bereits 28.447,89 EUR bezahlt und lt. Werkvertragsänderung 51.314,91 EUR voraussichtlich

			im Jahr 2023 fällig. *) Weiterentwicklung des justiziellen Teils des Sicherheitsberichts (Auftragnehmer: IRKS), Auftragsvolumen: 29.631 EUR im Jahr 2021 bezahlt, möglicher Folgeauftrag im Jahr 2023 iHv. 30.000 EUR. *) Evaluierung und Weiterentwicklung des LKZ-Systems (Leisuntgskennzahlen für die Erwachsenenschutzvereine); Auftragnehmer: IRKS; Auftragsvolumen: 85.260 EUR, in 3 Teilen in den Jahren 2020 bis 2022 zu je 28.420 EUR bezahlt). *) Studie zum Thema "Untersuchung Frauenmorde - eine quantitative und qualitative Analyse" (Auftragnehmer: IKF), Auftragsvolumen: 81.330 EUR, davon BMI entfallender Anteil iHv. 26.443,33 EUR im Jahr 2021 bezahlt. *) Erstellung "Rechtsextremismus-Bericht" (Auftragnehmer: DÖW - noch nicht fix), Auftragsvolumen: 100.000 EUR (noch nicht fix) jährlich für mindestens 4 Jahre voraussichtlich ab 2022), davon auf das BMJ zu leisten (= 50.000 EUR pro Jahr) *) Studie zum Thema "Vor dem Gesetz sind alle gleich ? Ein Projekt zur Sichtbarmachung von Diskriminierung und Ungleichheit von lesbischen, schwulen, bisexuellen, trans*, nichtbinären, intersexuellen und queeren Personen im Justizbereich" (Auftragnehmer: QWIEN - Zentrum für queere Geschichte, Auftragsvolumen: 30.000 EUR, Bezahlung in vier Raten, wobei 2 Raten im Jahr 2022 und 2 Raten im Jahr 2023 (=15.000 EUR) fällig werden. *) Studie zum Thema "Evaluierung des 2. Erwachsenenschutz-Gesetzes", Auftragsvolumen: 84.000 EUR, noch erfolgte kein Vertragsabschluss, voraussichtlich werden 42.000 EUR im Jahr 2022 und 42.000 EUR im Jahr fällig. *) Studie zum Thema "Internetbetrug" (Auftragnehmer: IRKS) 68.000 EUR voraussichtlich im Jahr 2023 fällig. *) Studie über die "Nachhaltigkeit der FJGH", Auftragsvolumen: nicht fix, Vertragsabschluss voraussichtlich im Jahr 2022 oder 2023
13030101	6430	000	*) * Studie iZm StVG-Novelle, Auftragsvolumen: 75.000 EUR
			BM für Landesverteidigung
14040100			*) Teilbetrag (eigene Fistl);
14050100	7270	900	*) Teilbetrag der Voranschlagsstelle.
14050100	7270	000	*) Teilbetrag der Voranschlagsstelle.
14070100	7270	900	*) Teilbetrag der Voranschlagsstelle
14070200			Teilbetrag (eigene Fistl)
			BM für Finanzen
15010100	7662	002	*) Forschungsanteil liegt bei 56 %.
15010100	7669	020	*) Teilbetrag der Voranschlagsstelle. Forschungsanteil liegt bei 27,361 % (System rundet).
15010100	7270	000	*) Teilbetrag der Voranschlagsstelle (System rundet: 37,13 %)
			BM für Arbeit und Wirtschaft
20010101	7340	302	*) Forschungsanteil liegt im BVA 2023 bei rd. 0,79 % (System rd. auf 1%), im BVA 2022 bei rd. 0,84 (System rd. auf 1%) und im Erfolg 2021: Forschungsanteil liegt bei 0,60 % (System rd. auf 0 %).
20010201	7270	006	*) Forschungsanteil liegt im BVA 2023 bei rd. 0,79 % (System rd. auf 1%), im BVA 2022 bei rd. 0,16 % (System rd. auf 0 %) und im Erfolg 2021 bei rd. 0,03 % (System rd. auf 0 %)
20010201	7668	900	*)Forschungsanteil liegt im BVA 2023 bei rd. 0,32 % (System rd. auf 0 %), im BVA 2022 bei rd. 0,36 % (System rd. auf 0 %) und im Erfolg 2021 bei rd. 0,22 % (System rd. auf 0%).
20010202	7270	000	*) Forschungsanteil liegt im BVA 2023 und im BVA 2022 bei rd. 1,23 % (System rd. auf 1 %) im Erfolg 2021 liegt bei 0,07 % (System rd. auf 0 %).
			BM für Bildung, Wissenschaft und Forschung
30010400	7800	000	*) Teilbetrag der VA-Stelle.
30010400			Teilbetrag der Voranschlagsstelle
30020700			Teilbetrag der Voranschlagsstelle
31030100			*) Der Restbetrag ergibt sich rechnerisch bei dieser VA-Stelle.
31030204			*) Der Restbetrag ergibt sich rechnerisch bei dieser VA-Stelle.
31030300			*) Der Restbetrag ergibt sich rechnerisch bei dieser VA-Anstelle.
			BM für Klimaschutz, Umwelt, Energie, Mobil., Innov. u.Technologie
41010200	7330	080	* KLIEN: ab 2016 werden bei dieser Post nur mehr F&E-Projekte finanziert; daher die Erhöhung von 39 auf 95 %.
43010500			*) Teilbetrag der VA-Stelle.
			BM für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft
42010100			*) DB-Alt 42010100/DB-Neu 42040100 Fistl 210 und 410 PS-Elemente 42P10101001 und 42P10101002 ab 2022 inkl. Forschung Präs. 8 (bisher DB 42020300).
42010200	7411	000	Finanzstellen 90306 (AGES) und 90309 (BFW).
			0 Finanzstellen 90306 (AGES) und 90309 (BFW).
42010200	7411	029	
42010200	7411	027	
42020202	7800	080	

42020300			PDP-Element 42P101010001 (bzw. 42 P101010001 und 42P101020001 bis 2020).
			*42020300 PSP-Element 42P101010001 bis 2021; ab 2022 bei 42040100 bzw. 42050300
			*42050300 PSP-Element 42P101010001; ab 2022 (bisher bei DB 42020300)
42020401			*) Finanzstellen 22010 (Francisco-Josephinum), 22013 (Raumberg-Gumpenstein), 22016 (Gartenbau); 22112 (alpenl. Milchw.)
42020403			
42020405			*) ab 2021 bei DB 42020401.
42030104			*) PSP-Element 42P101010001 und 42P10102002 sowie 0,025 E.€.
42030204	7270	000	*)PSP-Element 42P101010001.
42030206			Teilbetrag des DB; lt. Mitteilung der Förderungsabwicklungsstelle.
42040100			*) PSP-Element 42P101010001
42040200	7411	027	*42040200 Finanzstellen 90306 (AGES) und 90309 (BFW)
42040500			*4242040500
			Finanzstellen 22010 (Francisco-Joseph.), 22013 (Raumberg-Gump.), 22016 (Gartenbau), 22112 (alpenl. Milchw.; ab 2021) -23
			%; Finanzstelle 22014 (Hochschule) -3%, Finanzstelle 30812 (Klosterneuburg) -30%
42050300	7660	022	PSP-Element 42P101010001
42050400			*) Finanzstelle 25010 (BAB) - 65 %, Finanzstelle 30811 (BA Weinbau) - 3 %
42060200			*42060200 PSP-Element 42P101010001
42060400	7270	000	*/42060400 PSP-Element 42P101010001
42060600			*442060600 Teilbetrag des DB; lt. Mitteilung der Förderungsabwicklungsstelle

Ergebnisvoranschlag

VA-Stelle	Konto	Ugl	Anmerkung
			Keine Anmerkungen erfasst.

Table A V-5: Federal expenditure 2006 to 2023 on research and research promotion by socio-economic objectives

Breakdown of Annex T of the Auxiliary Documents and the "Detailed overviews of the research-related appropriation of federal funds" (part a and part b) for the Federal Finances Acts (BGF)

Reporting years		Total federal expenditure for R&D	of which for												
			Promotion of research covering the earth, the seas, the atmosphere and space	Promotion of agriculture and forestry	Promotion of trade, commerce and industry	Promotion of energy production, storage and distribution	Promotion of the transport, traffic and communications	Promotion of schools and education	Promotion of the health care system	Promotion of the social and socio-economic development	Promotion of environmental protection	Promotion of urban and spatial planning	Promotion of national defence	Promotion of other objectives	Promotion of general knowledge advancement
2006 [1]	in 1000 €	1,697,550	76,887	57,698	411,462	20,951	42,795	18,997	379,776	81,812	53,279	9,602	126	–	544,165
	in %	*100.0*	*4.5*	*3.4*	*24.2*	*1.2*	*2.5*	*1.1*	*22.4*	*4.8*	*3.1*	*0.6*	*0.0*	–	*32.2*
2007 [2]	in 1000 €	1,770,144	80,962	64,637	435,799	28,001	40,013	19,990	373,431	90,639	56,075	9,673	27	894	570,003
	in %	*100.0*	*4.6*	*3.7*	*24.6*	*1.6*	*2.3*	*1.1*	*21.1*	*5.1*	*3.2*	*0.5*	*0.0*	*0.1*	*32.1*
2008 [3]	in 1000 €	1,986,775	87,751	66,273	525,573	24,655	39,990	37,636	422,617	90,879	57,535	12,279	142	–	621,445
	in %	*100.0*	*4.4*	*3.3*	*26.5*	*1.2*	*2.0*	*1.9*	*21.3*	*4.6*	*2.9*	*0.6*	*0.0*	–	*31.3*
2009 [4]	in 1000 €	2,149,787	104,775	66,647	538,539	32,964	47,300	42,581	456,544	97,076	67,985	14,522	133	–	680,721
	in %	*100.0*	*4.9*	*3.1*	*25.1*	*1.5*	*2.2*	*2.0*	*21.2*	*4.5*	*3.2*	*0.7*	*0.0*	–	*31.6*
2010 [5]	in 1000 €	2,269,986	103,791	67,621	587,124	39,977	56,969	50,648	472,455	99,798	67,114	12,792	123	–	711,574
	in %	*100.0*	*4.6*	*3.0*	*25.9*	*1.8*	*2.5*	*2.2*	*20.8*	*4.4*	*3.0*	*0.6*	*0.0*	–	*31.2*
2011 [6]	in 1000 €	2,428,143	107,277	63,063	613,692	41,294	54,043	59,479	510,359	115,792	77,578	20,170	99	–	765,297
	in %	*100.0*	*4.4*	*2.6*	*25.3*	*1.7*	*2.2*	*2.4*	*21.0*	*4.8*	*3.2*	*0.8*	*0.0*	–	*31.6*
2012 [7]	in 1000 €	2,452,955	103,432	60,609	607,920	55,396	47,934	65,537	499,833	121,570	86,776	20,338	120	–	783,490
	in %	*100.0*	*4.2*	*2.5*	*24.8*	*2.3*	*2.0*	*2.7*	*20.4*	*5.0*	*3.5*	*0.8*	*0.0*	–	*31.8*
2013 [8]	in 1000 €	2,587,586	108,966	70,897	641,851	76,014	53,713	83,087	542,560	117,714	83,556	21,985	280	–	786,963
	in %	*100.0*	*4.2*	*2.7*	*24.9*	*2.9*	*2.1*	*3.2*	*21.0*	*4.5*	*3.2*	*0.8*	*0.0*	–	*30.5*
2014 [9]	in 1000 €	2,647,489	113,173	60,714	689,214	64,582	64,675	81,354	566,058	119,780	48,381	22,639	961	–	815,958
	in %	*100.0*	*4.3*	*2.3*	*26.0*	*2.4*	*2.4*	*3.1*	*21.4*	*4.5*	*1.8*	*0.9*	*0.0*	–	*30.9*
2015 [10]	in 1000 €	2,744,844	124,648	58,414	678,572	122,624	51,785	78,241	584,254	128,733	49,176	26,817	1,949	–	839,631
	in %	*100.0*	*4.5*	*2.1*	*24.7*	*4.5*	*1.9*	*2.9*	*21.3*	*4.7*	*1.8*	*1.0*	*0.1*	–	*30.5*
2016 [11]	in 1000 €	2,875,706	131,240	60,828	747,264	122,903	46,654	82,610	592,407	135,709	49,586	28,435	2,610	–	875,460
	in %	*100.0*	*4.6*	*2.1*	*26.0*	*4.3*	*1.6*	*2.9*	*20.6*	*4.7*	*1.7*	*1.0*	*0.1*	–	*30.4*
2017 [12]	in 1000 €	2,889,779	144,552	70,329	728,136	106,887	68,214	74,493	609,919	159,300	45,228	35,171	4,899	9,730	832,921
	in %	*100.0*	*5.0*	*2.4*	*25.2*	*3.7*	*2.4*	*2.6*	*21.1*	*5.5*	*1.6*	*1.2*	*0.2*	*0.3*	*28.8*
2018 [13]	in 1000 €	2,913,369	147,535	69,753	752,214	107,966	69,823	75,212	615,795	158,546	45,196	35,534	5,245	8,955	821,595
	in %	*100.0*	*5.1*	*2.4*	*25.8*	*3.7*	*2.4*	*2.6*	*21.1*	*5.4*	*1.6*	*1.2*	*0.2*	0.3	*28.2*
2019 [14]	in 1000 €	3,009,644	160,949	70,930	780,351	92,750	82,573	75,403	609,233	172,216	48,224	30,273	5,466	–	881,276
	in %	*100.0*	*5.3*	*2.4*	*25.9*	*3.1*	*2.7*	*2.5*	*20.2*	*5.7*	*1.6*	*1.0*	*0.2*	–	*29.4*
2020 [15]	in 1000 €	3,287,074	157,168	76,088	838,117	147,692	86,093	66,989	644,298	187,622	124,921	31,374	4,817	–	921,895
	in %	*100.0*	*4.8*	*2.3*	*25.5*	*4.5*	*2.6*	*2.0*	*19.6*	*5.7*	*3.8*	*1.0*	*0.1*	–	*28.1*
2021 [16]	in 1000 €	3,269,575	163,626	89,873	837,528	132,915	103,738	67,038	674,093	186,386	68,642	33,272	5,149	–	907,315
	in %	*100.0*	*5.0*	*2.7*	*25.6*	*4.1*	*3.2*	*2.1*	*20.6*	*5.7*	*2.1*	*1.0*	*0.2*	–	*27.7*
2022 [17]	in 1000 €	3,889,019	180,341	111,405	1,027,875	164,415	164,284	76,534	773,753	212,437	77,449	35,657	6,345	–	1,058,524
	in %	*100.0*	*4.6*	*2.9*	*26.4*	*4.2*	*4.2*	*2.0*	*19.9*	*5.5*	*2.0*	*0.9*	*0.2*	–	*27.2*
2023 [17]	in 1000 €	4,174,391	194,695	103,265	1,149,584	173,275	163,444	81,765	840,042	223,069	91,776	37,886	7,237	–	1,108,353
	in %	*100.0*	*4.7*	*2.5*	*27.4*	*4.2*	*3.9*	*2.0*	*20.1*	*5.3*	*2.2*	*0.9*	*0.2*	–	*26.6*

Date: March 2023. Source: Statistics Austria.

1) Annex T of the Auxiliary Document for the Federal Finances Act 2008 (BFG 2008), Cash Flow Statement. Revised data. 2) Annex T of Auxiliary Document for the Federal Finance Act 2009, Cash Flow Statement. 3) Annex T of Auxiliary Document for the Federal Finance Act 2010, Cash Flow Statement. 4) Annex T of Auxiliary Document for the Federal Finance Act 2011, Cash Flow Statement. 5) Annex T of Auxiliary Document for the Federal Finance Act 2012, Cash Flow Statement. 6) Annex T of Auxiliary Document for the Federal Finance Act 2013 (Cash Flow Budget), Cash Flow Statement. Revised data. 7) Supplement T of the Working Document to the Federal Finance Act 2014 (Cash Flow Budget), Cash Flow Statement. 8) Annex T of Auxiliary Document for the Federal Finance Act 2015 (Cash Flow Budget), Cash Flow Statement. Revised data. 9) Federal Finance Act 2016, Detailed overview of research-related appropriation of federal funds, Cash Flow Statement. 10) Federal Finance Act 2017, Detailed overview of research-related appropriation of federal funds, Cash Flow Statement. Revised data. 11) Federal Finance Act 2018, Detailed overview of research-related appropriation of federal funds, Cash Flow Statement. 12) Federal Finance Act 2019, Detailed overview of research-related appropriation of federal funds, Cash Flow Statement. Revised data. 13) Federal Finance Act 2020, Detailed overview of research-related appropriation of federal funds, Cash Flow Statement. 14) Federal Finance Act 2021, Detailed overview of research-related appropriation of federal funds, Cash Flow Statement. Revised data. 15) Federal Finance Act 2022, Detailed overview of research-related appropriation of federal funds, Cash Flow Statement. 16) Federal Finance Act 2023, Detailed overview of research-related appropriation of federal funds, Cash Flow Statement.17) Federal Finance Act 2023, Detailed overview of research-related appropriation of federal funds, Cash Flow Budget, Finanzierungsvoranschlag.

Table A V-6: Federal expenditure 2023 on research and research promotion by socio-economic objectives and ministry

Breakdown of the annual values 2023[1)] of the "Detailed overview of research-related appropriation of federal funds" in the Federal Finance Act (BFG) 2022 (part a and part b)

Ressorts		Total federal expenditure for R&D	of which for													
			Promotion of research covering the earth, the seas, the atmosphere and space	Promotion of agriculture and forestry	Promotion of trade, commerce and industry	Promotion of energy production, storage and distribution	Promotion of the transport, traffic and communications	Promotion of schools and education	Promotion of the health care system	Promotion of the social and socio-economic development	Promotion of environmental protection	Promotion of urban and spatial planning	Promotion of national defence	Promotion of other objectives	Promotion of general knowledge advancement
BKA[2)]	in 1000 €	2,216	–	–	–	–	2	–	–	1,916	–	298	–	–	–
	in %	*100.0*	–	–	–	–	*0.1*	–	–	*86.5*	–	*13.4*	–	–	–
BMKÖS	in 1000 €	51,221	5,358	–	–	–	–	–	–	14,519	–	–	–	–	31,344
	in %	*100.0*	*10.5*	–	–	–	–	–	–	*28.3*	–	–	–	–	*61.2*
BMEIA	in 1000 €	3,683	–	–	–	1,127	–	–	–	2,556	–	–	–	–	–
	in %	*100.0*	–	–	–	*30.6*	–	–	–	*69.4*	–	–	–	–	–
BMAW	in 1000 €	288,209	1,561	1,561	220,506	16,429	1,463	–	25,000	6,723	12,429	–	98	–	2,439
	in %	*100.0*	0.5	0.5	76.7	5.7	0.5	–	8.7	*2.3*	4.3	–	0.0	–	0.8
BMBWF	in 1000 €	2,984,798	151,506	43,887	560,966	41,589	59,694	80,714	768,010	172,510	42,386	35,855	3,488	–	1,024,193
	in %	*100.0*	*5.1*	*1.5*	*18.8*	*1.4*	*2.0*	*2.7*	*25.7*	*5.8*	*1.4*	*1.2*	*0.1*	–	*34.3*
BMF	in 1000 €	36,236	1,205	1,392	4,588	349	555	736	5,404	15,399	404	329	–	–	5,875
	in %	*100.0*	*3.3*	*3.8*	*12.7*	*1.0*	*1.5*	*2.0*	*14.9*	*42.6*	*1.1*	*0.9*	–	–	*16.2*
BMI	in 1000 €	1,574	–	–	–	–	–	–	–	1,574	–	–	–	–	–
	in %	*100.0*	–	–	–	–	–	–	–	*100.0*	–	–	–	–	–
BMJ	in 1000 €	173	–	–	–	–	–	–	–	173	–	–	–	–	–
	in %	*100.0*	–	–	–	–	–	–	–	100.0	–	–	–	–	–
BMK	in 1000 €	738,972	33,353	7,902	363,124	113,781	101,730	–	34,943	3,146	36,557	1,404	344	–	42,688
	in %	*100.0*	*4.5*	*1.1*	*49.2*	*15.4*	*13.8*	–	*4.7*	*0.4*	*4.9*	*0.2*	0.0	–	*5.8*
BMLV	in 1000 €	4,830	–	–	–	–	–	–	–	–	–	–	3,307	–	1,523
	in %	*100.0*	–	–	–	–	–	–	–	–	–	–	*68.5*	–	*31.5*
BML	in 1000 €	52,975	1,712	48,523	400	–	–	315	–	1,734	–	–	–	–	291
	in %	*100.0*	*3.2*	*91.6*	*0.8*	–	–	*0.6*	–	*3.3*	–	–	–	–	*0.5*
BMSGPK	in 1000 €	9,504	–	–	–	–	–	–	6,685	2,819	–	–	–	–	–
	in %	*100.0*	–	–	–	–	–	–	*70.3*	*29.7*	–	–	–	–	–
Total	**in 1000 €**	**4,174,391**	**194,695**	**103,265**	**1,149,584**	**173,275**	**163,444**	**81,765**	**840,042**	**223,069**	**91,776**	**37,886**	**7,237**	**–**	**1,108,353**
	in %	***100.0***	***4.7***	***2.5***	***27.4***	***4.2***	***3.9***	***2.0***	***20.1***	***5.3***	***2.2***	***0.9***	***0.2***	**–**	***26.6***

Date: March 2023

Source: Statistics Austria.

1) Cash Flow Budget.

2) Including the highest executive bodies

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Table A V-7: General research-related higher education institutions expenditures by the Federal Government 2000–2023[1] "General University Funds"[1]

Years	General University Funds	
	Total	R&D
	in € million	
2000	1,956.167	842.494
2001	2,008.803	866.361
2002	2,104.550	918.817
2003	2,063.685	899.326
2004	2,091.159	980.984
2005	2,136.412	1,014.543
2006	2,157.147	1,027.270
2007	2,314.955	1,083.555
2008	2,396.291	1,133.472
2009	2,626.038	1,236.757
2010	2,777.698	1,310.745
2011	2,791.094	1,388.546
2012	2,871.833	1,395.130
2013	3,000.004	1,453.596
2014	3,059.949	1,481.744
2015	3,117.320	1,509.576
2016	3,262.376	1,610.742
2017	3,319.288	1,638.460
2018	3,294.879	1,658.500
2019	3,488.597	1,755.220
2020	3,698.739	1,859.785
2021	3,894.654	1,957.235
2022	4,191.895	2,109.617
2023	4,471.429	2,250.984

Date: March 2023. Source: Statistics Austria.

1) 2000–2023: Based on Annex T of the Auxiliary Document and the "Detailed overview of research-related appropriation of federal funds" for the Federal Finances Acts (BFG).

Table A V-8: Research promotion schemes and contracts awarded by Federal Government in 2022, by sector/area of performance and awarding ministry

Analysis of the federal research database[1] without "major" global financing[2]

Ministries	Partial amounts 2022	of which awarded to																			
		Higher education sector					State sector							Private non-profit sector			Business enterprise sector					
		Universities (incl. teaching hospitals)	Universities of the Arts	Universities of Applied Sciences	Other higher education sector[3]	Combined	Federal institutions (outside the higher education sector)	AIT Austrian Institute of Technology (AIT)	Austrian Academy of Sciences (OeAW)	Private non-profit facilities mostly run on public financing	Ludwig Boltzmann Gesellschaft	Other public sector[4]	Combined	Private non-profit facilities	Individual researchers	Combined	Institutes' sub-sector "Kooperativer Bereich") incl. competence centres	Company R&D sub-sector ("Firmeneigener Bereich")	Combined	Austrian Science Fund (FWF)	Austrian Research Promotion Agency (FFG).	Abroad
	in €	in %																			
BKA	721,045	*48.1*	–	–	–	*48.1*	*11.5*	–	–	*18.1*	–	*9.1*	*38.7*	*3.5*	*4.2*	*7.7*	–	*1.7*	*1.7*	–	–	*3.8*
BMA	82,328	*21.9*	–	–	–	*21.9*	–	–	–	*78.1*	–	–	*78.1*	–	–	–	–	–	–	–	–	–
BMAW	1,270,377	*14.6*	–	–	–	*14.6*	–	–	–	*47.0*	–	–	*47.0*	*7.4*	–	*7.4*	*4.1*	*26.9*	*31.0*	–	–	–
BMBWF	52,200,895	*5.5*	–	–	–	*5.5*	*2.3*	*0.1*	–	*10.9*	–	*3.4*	*16.7*	*2.0*	*0.2*	*2.2*	*0.1*	*2.5*	*2.6*	–	*0.9*	*72.1*
BMDW	605,745	*29.7*	–	*2.5*	–	*32.2*	–	–	–	*39.5*	–	*0.8*	*40.3*	*1.9*	–	*1.9*	*9.9*	*5.1*	*15.0*	–	–	*10.6*
BMEIA	886,101	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*100.0*	*100.0*	–	–	–
BMF	4,862,199	*0.9*	–	–	–	*0.9*	*33.3*	–	–	*19.2*	–	–	*52.5*	*0.1*	*1.0*	*1.1*	–	*1.6*	*1.6*	–	*41.7*	*2.2*
BMI	1,100,025	*8.2*	–	–	–	*8.2*	–	–	–	*60.9*	–	–	*60.9*	–	–	–	–	*9.1*	*9.1*	–	–	*21.8*
BMJ	153,420	–	–	–	–	–	–	–	–	*72.6*	–	–	*72.6*	*27.4*	–	*27.4*	–	–	–	–	–	–
BMK	1,645,645	*19.1*	–	–	–	*19.1*	*2.9*	–	–	*45.7*	–	–	*48.6*	*7.2*	–	*7.2*	*14.8*	*3.8*	*18.6*	–	*6.5*	–
BML	10,771,746	*68.7*	–	–	–	*68.7*	*24.7*	*1.7*	–	*2.5*	–	–	*28.9*	*0.2*	–	*0.2*	*0.6*	*1.6*	*2.2*	–	–	–
BMLRT	1,866,425	*65.3*	–	*0.9*	–	*66.2*	*12.5*	*3.8*	–	*10.4*	–	–	*26.7*	*1.3*	–	*1.3*	*1.6*	*4.2*	*5.8*	–	–	–
BMLV	1,507,997	*7.8*	–	–	–	*7.8*	*3.2*	*3.8*	*0.5*	–	–	*10.7*	*18.2*	–	*3.2*	*3.2*	*6.5*	*31.3*	*37.8*	–	*10.6*	*22.4*
BMSGPK	2,154,296	*11.2*	–	–	–	*11.2*	*69.1*	–	–	*13.7*	–	–	*82.8*	*1.6*	–	*1.6*	–	*4.4*	*4.4*	–	–	–
Total	**79,828,244**	***16.3***	**–**	***0.1***	**–**	***16.4***	***9.2***	***0.5***	**–**	***12.5***	**–**	***2.5***	***24.7***	***1.8***	***0.3***	***2.1***	***0.8***	***4.5***	***5.3***	**–**	***3.4***	***48.1***

Date: April 2023. Source: Statistics Austria.

1) Data as of 17 March 2023. 2) i.e. excluding institutional funding where funding amounts exceed €500,000. 3) Private universities, university colleges of teacher education, testing agencies at technical federal colleges and other institutions categorised within the higher education sector. 4) State, local and chamber institutions as well as facilities of social insurance institutions.

Table A V-9: Research promotion schemes and contracts awarded by the Federal Government in 2022, by socio-economic objectives and awarding ministry

Analysis of the federal research database[1] without "major" global funding [2]

Ministries		Partial amounts 2022	of which for											
			Promotion of research covering the earth, the seas, the atmosphere and space	Promotion of agriculture and forestry	Promotion of trade, commerce and industry	Promotion of energy production, storage and distribution	Promotion of the transport, traffic and communications	Promotion of schools and education	Promotion of the health care system	Promotion of the social and socio-economic development	Promotion of environmental protection	Promotion of urban and spatial planning	Promotion of national defence	Promotion of other objectives
BKA	in €	721,045	–	–	–	–	–	–	–	721,045	–	–	–	–
	in %	*100.0*	–	–	–	–	–	–	–	*100.0*	–	–	–	–
BMA	in €	82,328	–	–	–	–	–	–	–	82,328	–	–	–	–
	in %	*100.0*	–	–	–	–	–	–	–	*100.0*	–	–	–	–
BMAW	in €	1,270,377	–	–	–	–	–	–	10,000	1,054,627	–	175,000	–	30,750
	in %	*100.0*	–	–	–	–	–	–	*0.8*	*83.0*	–	*13.8*	–	*2.4*
BMBWF	in €	52,200,895	7,964,922	–	–	–	–	52,190	7,525,795	3,066,166	228,669	–	–	33,363,153
	in %	*100.0*	*15.3*	–	–	–	–	*0.1*	*14.4*	*5.9*	*0.4*	–	–	*63.9*
BMDW	in €	605,745	–	–	–	64,474	–	4,935	5,000	325,380	–	–	–	205,956
	in %	*100.0*	–	–	–	*10.6*	–	*0.8*	*0.8*	*53.8*	–	–	–	*34.0*
BMEIA	in €	886,101	–	–	–	–	–	–	–	886,101	–	–	–	–
	in %	*100.0*	–	–	–	–	–	–	–	*100.0*	–	–	–	–
BMF	in €	4,862,199	–	–	100,000	–	–	–	–	2,686,477	–	44,400	–	2,031,322
	in %	*100.0*	–	–	*2.1*	–	–	–	–	*55.2*	–	*0.9*	–	*41.8*
BMI	in €	1,100,025	–	–	–	–	–	–	–	1,084,625	–	–	–	15,400
	in %	*100.0*	–	–	–	–	–	–	–	*98.6*	–	–	–	*1.4*
BMJ	in €	153,420	–	–	–	–	–	–	–	153,420	–	–	–	–
	in %	*100.0*	–	–	–	–	–	–	–	*100.0*	–	–	–	–
BMK	in €	1,645,645	–	–	642,049	–	–	–	115,458	–	302,221	36,417	–	549,500
	in %	*100.0*	–	–	*39.0*	–	–	–	*7.0*	–	*18.4*	*2.2*	–	*33.4*
BML	in €	10,771,746	5,066,640	4,856,597	50,000	–	–	–	13,500	312,500	75,000	397,509	–	–
	in %	*100.0*	*47.0*	*45.1*	*0.5*	–	–	–	*0.1*	*2.9*	*0.7*	*3.7*	–	–
BMLRT	in €	1,866,425	150,000	1,111,221	134,878	–	–	–	26,657	219,723	68,146	155,800	–	–
	in %	*100.0*	*8.0*	*59.6*	*7.2*	–	–	–	*1.4*	*11.8*	*3.7*	*8.3*	–	–
BMLV	in €	1,507,997	47,000	–	231,240	–	–	–	–	11,500	–	–	857,742	360,515
	in %	*100.0*	*3.1*	–	*15.3*	–	–	–	–	*0.8*	–	–	*56.9*	*23.9*
BMSGPK	in €	2,154,296	10,160	150,000	–	–	–	–	241,049	1,753,087	–	–	–	–
	in %	*100.0*	*0.5*	*7.0*	–	–	–	–	*11.2*	*81.3*	–	–	–	–
Total	**in €**	**79,828,244**	**13,238,722**	**6,117,818**	**1,158,167**	**64,474**	**-**	**57,125**	**7,937,459**	**12,356,979**	**674,036**	**809,126**	**857,742**	**36,556,596**
	in %	***100.0***	***16.6***	***7.7***	***1.5***	***0.1***	**-**	***0.1***	***9.9***	***15.5***	***0.8***	***1.0***	***1.1***	***45.7***

Date: April 2023. Source: Statistics Austria.

1) Data as of 17 March 2023. 2) i.e. excluding institutional funding where funding amounts exceed €500,000

Table A V-10: An international comparison of research and experimental development (R&D) in 2020

Country	Gross domestic expenditure on R&D in % of GDP	Funding of gross domestic expenditure on R&D through		Employees in R&D in full-time equivalents	Gross domestic expenditure on R&D of the			
		government	business		Business enterprise sector	Higher education sector	Govern-ment sector	Private non-profit sector
		in %			in % of gross domestic expenditure on R&D			
Austria	**3.20** [3)]	**33.3** [3)]	**49.8** [3)]	**82,053** [e)]	**69.5** [e)]	**22.4** [e)]	**7.5** [e)]	**0.6** [e)]
Belgium	3.35 [e)]	17.8 [2)]	64.3 [2)]	96,828 [e)]	73.9 [e)]	16.9 [e)]	8.3 [e)]	0.9 [e)]
Bulgaria	0.85	25.3	35.4	26,085	67.5	6.1	25.7	0.7
Croatia	1.24	36.9	37.6	15,517	47.9	32.2	19.9 [d)]	.
Cyprus	0.84	35.5	38.0	2,231	44.3	36.1	6.2	13.5
Czech Republic	1.99	34.0	35.6	80,958	61.0	21.6	17.1	0.3
Denmark	2.96	28.7 [p)2)]	59.6 [p)2)]	62,049 [p)]	61.6	34.6	3.4	0.4
Estonia	1.75	37.0	50.1	6,449	55.0	33.6	9.8	1.6
Finland	2.91	27.7	56.0	53,519	67.0	24.6	7.6	0.8
France	2.30	31.5	56.8	470,586 [e)p)]	66.0	20.3	11.7	2.0
Germany	3.13 [e)]	29.7 [e)]	62.6 [e)]	733,831	66.6 [e)]	18.7	14.6 [d)]	.
Greece	1.51	42.7	39.9	58,103	46.1	31.8	21.5	0.6
Hungary	1.59	32.5	50.2	59,628	76.5 [d)]	13.0 [d)]	9.9 [d)]	.
Ireland	1.23 [e)]	22.6 [2)]	62.8 [2)]	32,757 [e)]	73.8 [e)]	22.6 [e)]	3.6	.
Italy	1.51	33.7	52.8	342,286	61.8	23.1 [e)]	13.2	1.9
Latvia	0.69	38.1	27.0	6,559	30.9	50.2	18.8	.
Lithuania	1.14	29.1	37.3	14,245	47.0	37.2	15.8	.
Luxembourg	1.09 [e)]	43.2 [2)]	51.3 [2)]	5,782	49.9	24.2 [e)]	25.9 [e)]	.
Malta	0.65	30.3	60.2	1,840	63.5	35.7	0.9	.
Netherlands	2.31	30.3	56.9	166,422	66.6	27.8	5.6 [d)]	0.0 [d)]
Poland	1.39	39.0	50.6	173,392	62.8	34.9	2.0	0.2
Portugal	1.61	37.3	52.2	66,044	57.0	36.0	4.9	2.1
Romania	0.47	32.9	55.6	33,189	59.0	8.8	31.9	0.3
Slovakia	0.90	39.6	43.7	22,405	54.1	26.2	19.7	0.0
Slovenia	2.14	25.1	49.5	16,833	73.3	12.2	13.8	0.7
Spain	1.41	38.5	49.2	231,769	55.6	26.6	17.5	0.3
Sweden	3.49	24.2 [2)]	62.4 [2)]	95,463	72.3	23.1	4.4	0.1 [e)]
EU-27 countries [e)]	**2.30**	**30.2**	**57.9**	**2,956,824**	**.**	**.**	**.**	**.**
Bosnia and Herzegovina	0.20	45.0	29.4	2,020	38.6	56.5	4.9	0.0
Great Britain	1.76 [p)2)]	25.9 [1)]	54.8 [1)]	486,088 [p)2)]	68.0 [p)2)]	23.1 [p)2)]	6.6 [p)2)]	2.3 [p)2)]
Iceland	2.47	30.4	38.6	3,172 [1)]	67.9	28.7	3.4	.
Montenegro	0.50 [1)]	49.0 [1)]	37.8 [1)]	685 [2)]	13.8 [2)]	36.5 [2)]	49.7 [2)]	0.1 [2)]
North Macedonia	0.37	47.4	22.3	2,029	25.7	63.6	9.6	1.1
Norway	2.24	46.1	44.5	48,947	54.3	33.2	12.4	.
Serbia	0.91	43.4	2.1	21,063	39.0	31.7	29.3	0.0
Switzerland [2)]	3.15	27.4	64.7	85,853	67.5	28.9	0.9	2.7
Turkey	1.09	28.4	57.2	199,371	64.8	28.4	6.8	.
Japan	3.26	15.2 [e)]	78.3	911,620 [d)]	78.7	11.7	8.3	1.4
People's Republic of China (without Hong Kong)	2.40	19.8	77.5	5,234,508	76.6	7.7	15.7	.
Russia [2)]	1.04	66.3	30.2	753,796	60.7	10.6	28.3	0.4
South Korea	4.80	22.4	76.6	545,435	79.1	9.0	10.1	1.8
USA	3.42 [d)]	20.1 [d)]	66.3	.	75.3	11.3 [d)]	9.5	4.0 [d)e)]

d) Different definition. e) Estimated values. p) Preliminary values.

1) 2018. 2) 2019. 3) Statistics Austria; according to R&D global estimate 2023.

Full-time equivalent = person-year.

Source: Eurostat (date: March 2023), Statistics Austria.

Table A V-11: FWF: Shares of new approvals by discipine (Austrian Systematics of the Sciences 2012, 3-digit level), 2020–2022

Subject	2020		2021		2022	
	in %	in € million	in %	in € million	in %	in € million
101 Mathematics	10.96	26.70	9.03	23.11	6.76	18.45
102 Computer science	5.52	13.45	6.82	17.48	6.73	18.37
103 Physics, astronomy	10.62	25.87	9.67	24.77	14.81	40.43
104 Chemistry	5.73	13.96	5.03	12.88	4.94	13.50
105 Geosciences	2.31	5.62	3.32	8.50	3.06	8.35
106 Biology	20.82	50.73	17.51	44.84	22.25	60.73
107 Other natural sciences	0.17	0.41	0.45	1.14	0.26	0.70
201 Construction engineering	0.40	0.98	0.46	1.17	0.81	2.21
202 Electrical engineering, electronics, information technology	0.51	1.25	1.03	2.63	1.18	3.22
203 Mechanical engineering	0.39	0.96	0.41	1.04	0.43	1.18
204 Chemical process engineering	0.04	0.09	0.33	0.83	0.00	0.00
205 Materials engineering	0.55	1.34	0.37	0.95	0.61	1.67
206 Medical engineering	0.24	0.57	0.40	1.03	0.29	0.80
207 Environmental engineering, applied geosciences	0.28	0.69	0.67	1.73	0.52	1.42
208 Environmental biotechnology	0.03	0.08	0.02	0.06	0.04	0.10
209 Industrial biotechnology	0.39	0.96	0.79	2.02	0.30	0.81
210 Nanotechnology	0.89	2.16	0.38	0.97	0.47	1.29
211 Other technical sciences	0.49	1.19	0.37	0.95	0.28	0.76
301 Medical-theoretical sciences, pharmacy	9.21	22.45	10.43	26.72	8.84	24.14
302 Clinical medicine	4.06	9.90	6.35	16.26	3.70	10.10
303 Health sciences	0.82	2.00	1.42	3.63	0.67	1.82
304 Medical biotechnology	0.33	0.81	0.77	1.97	0.54	1.47
305 Other human medicine, health sciences	0.14	0.33	0.19	0.50	0.15	0.41
401 Agriculture, forestry and fisheries	0.72	1.74	0.41	1.06	0.42	1.14
402 Animal breeding, animal production	0.26	0.63	0.17	0.45	0.20	0.55
403 Veterinary medicine	0.23	0.57	0.15	0.38	0.52	1.43
404 Agricultural biotechnology, food biotechnology	0.00	0.00	0.15	0.39	0.00	0.00
405 Other agricultural sciences	0.14	0.34	0.50	1.29	0.09	0.24
501 Psychology	2.19	5.35	1.86	4.76	1.46	3.99
502 Economics	3.35	8.17	1.22	3.12	0.81	2.21
503 Educational sciences	0.34	0.83	0.55	1.41	0.28	0.75
504 Sociology	2.29	5.58	2.74	7.02	1.88	5.13
505 Law	0.54	1.31	0.24	0.60	0.44	1.20
506 Political sciences	0.53	1.30	1.30	3.32	0.74	2.01
507 Human geography, regional geography, spatial planning	0.44	1.07	0.48	1.23	0.54	1.48
508 Media and communication sciences	0.61	1.49	0.68	1.75	0.72	1.98
509 Other social sciences	0.16	0.40	0.40	1.03	0.27	0.73
601 History, archaeology	3.77	9.19	3.26	8.34	2.15	5.87
602 Linguistics and literature	4.17	10.15	3.20	8.20	2.95	8.04
603 Philosophy, ethics, religion	2.52	6.13	2.53	6.47	3.66	10.00
604 Arts	1.67	4.07	2.78	7.11	3.62	9.87
605 Other humanities	1.14	2.79	1.17	3.00	1.63	4.44
Total	**100.00**	**243.62**	**100.00**	**256.08**	**100.00**	**272.97**

Source: FWF.

Table A V-12: FFG: Total funding by topic area of the funding, 2020–2022*

	2020		2021		2022	
	in %	Total funding in €	in %	Total funding in €	in %	Total funding in €
Energy / Environment	9.4%	79,573,131	12.9%	119,172,134	16.9%	153,853,727
ICT	46.8%	396,614,618	34.9%	321,193,889	31.2%	284,419,282
Life Sciences	9.3%	78,533,794	7.9%	72,710,703	5.8%	53,287,258
Mobility	9.3%	78,784,707	14.9%	137,107,232	19.1%	174,499,640
Production	15.0%	127,074,998	18.5%	170,137,223	16.2%	147,792,134
Security	1.9%	16,018,545	1.6%	15,119,705	1.8%	16,535,208
Other	7.3%	61,469,210	8.4%	77,255,998	7.7%	70,590,149
Space	1.1%	8,980,403	0.9%	7,845,899	1.2%	11,062,823
Total	**100.0%**	**847,049,406**	**100.0%**	**920,542,783**	**100.0%**	**912,040,221**

* Approved funding, excluding commissions. In contrast to the table in the FTB 2022, this table shows the total funding and not the present values. Therefore, the values for the years 2020 and 2021 differ.

Source: FFG funding statistics, 11 April 2023.

Table A V-13: aws: Shares of new approvals by funding topic (industry), 2020–2022

Subject area, subject fields or industry	2020		2021		2022	
	in %	in € million	in %	in € million	in %	in € million
Services	20.9	215.2	19.0	242.1	31.4	330.8
Energy and water supply, waste water	0.6	6.3	0.8	9.6	1.4	15.0
Trade, maintenance, repair	15.5	159.8	15.4	195.9	14.6	154.0
Food products, beverages, tobacco	9.8	101.3	11.9	151.7	8.5	89.5
Manufacturing	41.9	431.8	42.3	537.7	32.5	342.2
Other industries	2.6	26.4	2.7	34.2	2.3	24.3
Tourism	5.2	53.2	4.6	59.0	5.6	58.7
Transport and communication	1.2	12.8	1.4	18.3	1.4	14.4
Not classified	2.3	23.2	1.9	23.9	2.4	25.6
Total	**100.0**	**1,030.0**	**100.0**	**1,272.4**	**100.0**	**1,054.5**

Source: aws.

Table A V-14: aws: Shares of new approvals by company size, 2020–2022

Organisation type	2020		2021		2022	
	in %	in € million	in %	in € million	in %	in € million
Sole proprietorships	19.1	196.9	14.4	183.1	9.3	97.8
Microenterprises	21.6	222.9	23.8	302.6	17.5	184.7
Small enterprises	23.7	244.4	24.1	307.2	24.9	262.2
Medium-sized enterprises	18.7	192.1	19.7	250.5	28.5	300.7
Large enterprises	14.6	150.8	16.1	205.3	17.4	183.6
Not classified	2.3	22.9	1.9	23.7	2.4	25.5
Total	**100.0**	**1,030.0**	**100.0**	**1272.4**	**100.0**	**1,054.5**

Source: aws.

Table A V-15: CDG: CD Laboratories by thematic cluster, 2020–2022

Thematischer cluster	Number of CD Labora-tories 2020	Budget 2020 in €	Number of CD Labora-tories 2021	Budget 2021 in €	Number of CD Labora-tories 2022	Budget 2022 in €
Chemistry	7	1,986,190.85	6	2,212,353.95	7	2,788,834.97
Life Sciences and Environment	17	6,414,637.72	16	6,047,240.37	13	6,213,453.47
Mechanical and instrument engineering	6	1,927,796.21	6	1,684,571.80	5	1,307,450.17
Materials and substances	17	5,363,538.27	17	5,858,582.12	18	6,049,085.07
Mathematics, informatics, electronics	26	7,412,099.68	26	9,450,809.87	30	11,328,284.72
Medicine	16	3,167,882.56	14	3,632,533.39	16	3,591,014.41
Economics, Social Sciences and Law	2	410,286.65	2	432,315.61	1	301,091.33
Total	**91**	**26,682,431.94**	**87**	**29,318,407.10**	**90**	**31,579,214.14**

Note: Budget data 2022 are plan data as of 31 December 2022. Source: CDG.

Table A V-16: CDG: JR centres by thematic clusters, 2020–2022

Thematic cluster	Number of JR centres 2020	Budget 2020 in €	Number of JR centres 2021	Budget 2021 in €	Number of JR centres 2022	Budget 2022 in €
Chemistry	1	71,804.74	–	–	–	–
Life Sciences and Environment	3	690,596.60	3	893,961.37	4	1,031,298.00
Mechanical and instrument engineering	2	173,871.70	1	253,228.98	1	229,500.00
Materials and substances	1	159,722.00	1	177,875.08	–	–
Mathematics, computer science, electronics	7	1,446,837.80	7	1,655,455.39	8	2,097,690.55
Medicine	1	394,790.62	1	265,209.53	1	–
Economics, Social Sciences and Law	2	463,943.79	2	538,183.29	2	504,865.25
Total	**17**	**3,401,567.25**	**15**	**3,783,913.64**	**16**	**3,863,353.80**

Note: Budget data 2022 are plan data as of 31 December 2022. Source: CDG.