Swiss Participation in the European Union's research and innovation programmes and initiatives

Facts and figures 2023

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Glossary

BBI	Bio-based Industries Joint Undertaking
CBE	Circular Bio-based Europe Joint Undertaking
CERN	European Organisation for Nuclear Research
CDP	Collaborative Doctoral Partnerships Programme
CLEANH2	Clean Hydrogen Partnership Joint Undertaking
COSME	Competitiveness of Enterprises and Small and Medium-sized Enterprises
COST	Cooperation in Science and Technology
CS2	Clean Sky Joint Undertaking
CSA	Coordination and Support Actions
CSCS	Swiss National Supercomputing Center
DEP	Digital Europe Programme
EAER	Federal Department of Economic Affairs, Education and Research
Eawag	Swiss Federal Institute of Aquatic Science and Technology
EC	European Commission
ECSC	European Coal and Steel Community
ECSEL	Electronic Components and Systems for European Leadership Joint Undertaking
EDCTP3	Global Health EDCTP3 Joint Undertaking
EEC	European Economic Community
EEA	European Economic Area
EIC	European Innovation Council
EIE	European Innovation Ecosystems
EIT	European Institute of Innovation and Technology
EMBL	European Molecular Biology Laboratory
Empa	Swiss Federal Laboratories for Materials Science and Technology
EPFL	Swiss Federal Institute of Technology Lausanne
ER	Europe's Rail Joint Undertaking
ERA	European Research Area
ERA-NET	European Research Area Network
ERC	European Research Council
ESA	European Space Agency
ESO	European Southern Observatory
ETH Domain	ETHZ, EPFL, Eawag, WSL, Empa, PSI
ETHZ	Swiss Federal Institute of Technology Zurich
EU	European Union
EURAD	European Joint Programme on Radioactive Waste Management
Euratom	European Atomic Energy Community
Euratom RTP	Euratom Research and Training Programme
EUROfusion	European Consortium for the Development of Fusion Energy
EuroHPC	High Performance Computing Joint Undertaking
F4E	Fusion for Energy
FCH2	Fuel Cells and Hydrogen Joint Undertaking
FET	Future and Emerging Technologies
FP	EU Framework Programme for Research and Innovation
GERD	Gross domestic expenditure on research and development
GDP	Gross domestic product

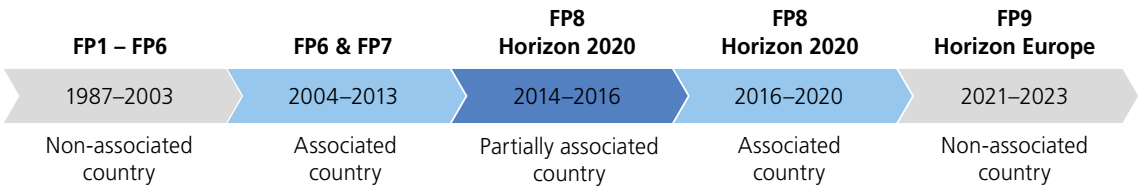
H2020	Horizon 2020
HEU	Horizon Europe
Horizon 2020 package	Horizon 2020, Euratom RTP and ITER
Horizon Europe package	Horizon Europe, Euratom RTP, ITER, and DEP
HPC	High Performance Computing
ICT	Information and Communication Technologies
IF	MSCA Individual Fellowships
IMI2	Innovative Medicines Initiative
INFRA	European Research Infrastructures
InstA	Institutional framework agreement between Switzerland and the EU
ITER	International Thermonuclear Experimental Reactor
ITN	MSCA Innovative Training Networks
JRC	Joint Research Centre of the European Commission
JTI	Joint Technology Initiative
JU	Joint Undertaking
KIC	(EIT) Knowledge and Innovation Community
KDT	Key Digital Technologies Joint Undertaking
MFF	Multiannual Financial Framework of the European Union
MSCA	Marie Skłodowska-Curie Actions
NGEU	NextGeneration EU
NMBP	Nanotechnologies, Advanced Materials, Advanced Manufacturing and Processing, and Biotechnology
NPO	Non-profit organisation
P2P	Public-to-Public Partnership
PF	MSCA Postdoctoral Fellowships
PPP	Public-Private Partnership
PSI	Paul Scherrer Institute
R&D	Research and Development
R&I	Research and Innovation
SEAWP	Spreading Excellence and Widening Participation
SERI	State Secretariat for Education Research and Innovation
SESAR	Single European Sky ATM Research Joint Undertaking
SDGs	Sustainable Development Goals
SME	Small and medium-sized enterprise
SNS	Smart Networks & Services Joint Undertaking
SNSF	Swiss National Science Foundation
SPC	Swiss Plasma Center
SSH	Social Sciences and Humanities
SWAFS	Science with and for Society
TEC	Treaty establishing the European Community
TFEU	Treaty on the Functioning of the European Union
UK	United Kingdom
UN	United Nations
WIDENING	Widening Participation and Spreading Excellence
WSL	Swiss Federal Institute for Forest, Snow and Landscape Research

1 Summary

This report provides a comprehensive picture of Switzerland's participation in the European Union's (EU) research and innovation (R&I) programmes and initiatives. It has been prepared as part of the regular reporting on Swiss participation in accordance with a mandate from the Swiss Parliament.[1] The previous report[2], published in 2018, described Swiss participation between 2014 and 2018 in the Horizon 2020 package which comprises the eighth EU Framework Programme for Research and Innovation (FP8) Horizon 2020, the Euratom Research and Training Programme (Euratom RTP) and the International Thermonuclear Experimental Reactor (ITER) research infrastructure. The present report provides a complete overview of Switzerland's participation in the Horizon 2020 package from 2014 to 2020. It also provides an interim assessment of Swiss participation in Horizon Europe (FP9), the Euratom RTP, ITER and the newly launched Digital Europe Programme (DEP) from January 2021 to October 2023, referred to as the Horizon Europe package. The report focuses on these four programmes and initiatives because Switzerland has participated in them in the past, is currently participating and/or is seeking to participate, as is reflected in the corresponding parliamentary decisions (see Footnote 1).

We are currently in the 9th generation of the framework programmes and participation in these programmes is one of the priorities of Swiss science and innovation policy. Both the participation opportunities for non-EU countries as well as Switzerland's participation have taken various forms in the past and present:

Figure 1.1 Switzerland's status in the framework programmes (FPs)



Source: SERI.

After participating as a non-associated country throughout FP1 to FP6, Switzerland became associated to FP6 for the first time in 2004 and was associated throughout FP7 until 2013 (Figure 1.1). At the start of Horizon 2020, Switzerland was considered a non-associated country until a partial association agreement was reached in September 2014. This lasted until 2016. From then on, Switzerland was considered an associated country until the end of Horizon 2020. Since the launch of Horizon Europe in 2021, Switzerland has had the status of a non-associated country, but is seeking association to Horizon Europe (FP9), the Euratom RTP, and the DEP, as well as participation in ITER. A consequence of the current non-associated status is that Switzerland can only participate in about two-thirds of the Horizon Europe calls and is excluded from participation in mono-beneficiary grants.

Development of Swiss participation: What - on a European level - began as joint research activities in the coal and nuclear industries in the 1950s has evolved into programmes and initiatives with a broad scope on research and innovation, aiming to tackle climate change and strengthen the EU's competitiveness and growth. Switzerland has a long tradition of research cooperation with the EU and its predecessors. It has contributed substantially to European R&I outside the EU structure since the 1950s, and before its participation in FP1 as a non-associated country. The framework programmes have grown in importance in Switzerland since, with the average yearly number of Swiss project participations increasing steadily between FP3 and FP8. The average yearly funds committed to Swiss institutions, i.e. the funds paid to Swiss institutions to carry out the work required for positively evaluated projects, have increased twice as fast as the average yearly budget of the framework programmes over the same time period.

[1] Horizon 2020 package: Art 1 (4) Federal decree of 10 September 2013, BBl 2013 7825; Horizon Europe package: Art 3 Federal decree of 16 December 2020, BBl 2021 73.

[2] SERI (2018): Swiss participation in European Research Framework Programmes – Facts and Figures 2018.

International collaboration: With institutions from nearly 180 countries participating in Horizon 2020, the framework programmes have become more accessible to non-EU countries all over the world and have developed into the largest international R&I cooperation programmes. In Switzerland, too, the importance of international R&I has been growing: between 2004 and 2019, contributions to Swiss partners participating in the FPs including Euratom RTP grew by almost 160%, whilst national R&D expenditure grew by 90%. In terms of international collaboration, Switzerland had the most joint projects with Germany for both Horizon 2020 and Horizon Europe. This was followed by France, the UK and Italy under Horizon 2020 and by Italy, Spain and France in Horizon Europe. However, in a development opposing the increasing openness of the framework programmes, in Horizon Europe, the European Commission (EC) has begun to selectively restrict the participation of non-EU countries in specific calls for proposals in areas such as quantum, high-performance computing and space to protect the strategic assets and interests of the EU and to preserve its autonomy and security. It should be noted that these areas are also not generally accessible to associated countries.

Overall Swiss participation: Comparing participation across countries, Switzerland was the associated country with the most project participations (4967) in Horizon 2020. It took eighth position overall in terms of committed funding, with CHF 3.043 billion in funding awarded, and ranked first among the associated countries. Switzerland also stood out in terms of its success rate, which measures how successful its researchers and innovators are in competing with others in the project approval process. This was mainly due to its success in the mono-beneficiary projects of the European Research Council (ERC) and the Marie Skłodowska-Curie Actions (MSCA), which made up a large share of Swiss participation. In fact, in a global comparison for Horizon 2020, Switzerland was the clear leader in terms of success rates for mono-beneficiary grants, with 16.7% of all project proposals approved. During Horizon Europe, Switzerland has so far recorded 1144 project participations and has awarded committed funding of CHF 564 million. Throughout the report, data relating to Horizon 2020 is distinguished from that relating to Horizon Europe, where the latter is available. It should be noted however that Horizon Europe data is preliminary and should be interpreted with care. The data is not yet complete for the first two years of the programme (2021 and 2022) and barely any data on 2023 calls for proposals are available.

Swiss participation by institutions: As far as the participation of Swiss institutions in Horizon 2020 is concerned, just over half of the Swiss participations were be attributed to institutions from the academic research sector (ETH Domain, universities and universities of applied sciences) as well as almost two-thirds of the awarded funding. A bit more than one-third of the Swiss participations in Horizon 2020 originated from to the private sector (SMEs and industry). Success rates varied by institution type as different sectors were active in different programme parts. For example, despite its large number of participations, the ETH Domain had a lower success rate than industry because its researchers applied more often for the more competitive mono-beneficiary grants. For Horizon 2020, the rate of project coordination roles and mono-beneficiary grants increased in comparison to FP7. For Horizon Europe, SMEs show the highest participation rate, closely followed by the ETH Domain. Universities of applied sciences have nearly doubled their participation rate from 4.2% in Horizon 2020 to 7.4% in Horizon Europe continuing the trend of increased participation from the previous FPs.

Swiss participation by programme area: Shifting the focus to the specific programmes and initiatives discussed in this report, Horizon 2020 and Horizon Europe have the highest budget share compared to the other elements in the Horizon 2020 and the Horizon Europe packages. These two programmes share the same objectives and scopes and are structured around three pillars. However, Horizon Europe adds some new elements such as the European Innovation Council (EIC) and the EU Missions. The highest budget share in both programmes is attributed to topics that address societal and global challenges, accounting for more than one-third of the total budget in Horizon 2020 and almost half in Horizon Europe. The Digital Europe Programme has been newly launched and incorporates part of the ICT focused research from previous FPs and aims to accelerate the digital transformation and promote technological independence through investment and innovation.

With regards to participation by individual programme areas, the instruments of the Marie Skłodowska-Curie Actions (MSCA) and the European Research Council (ERC), as well as the ICT and Health areas, accounted for most participations by Swiss institutions in Horizon 2020. The largest share of committed funding to Swiss institutions went to the ERC grants, due to the comparatively high grant amounts and high success of Swiss institutions, followed by the MSCA, ICT and Health. In almost all programme parts of Horizon 2020 the success rates of participants based in Switzerland were above average. This was particularly true in areas like the ERC and Future and Emerging Technologies (FET), where Swiss participants outperformed their peers by a large margin while also

being particularly active in those domains. For Horizon Europe, researchers and innovators in Switzerland show a comparatively high participation in the health domain, but also in industry, digital and space as well as projects related to climate, energy, food systems and environment.

Swiss participation in partnerships and missions: Looking at the European partnerships, in which the EC works with public and private partners to co-fund and co-programme specific areas of R&I, Swiss industry and SMEs had the highest participation rates in Horizon 2020. The health-focused partnership Innovative Medicines Initiative (IMI2) accounted for nearly half of the committed funding to Swiss institutions in partnerships in Horizon 2020. In Horizon Europe, Swiss SMEs continue to be very active in institutionalised partnerships. The most Swiss participations to date are recorded for the Key Digital Technologies (KDT) partnership. As a novelty under Horizon Europe, five EU missions have been launched to reach specific goals through R&I and public involvement by 2030. So far, the Soil Mission records the highest number of Swiss participations. Almost two thirds of the Swiss participants in missions are non-profit organisations and SMEs.

Swiss participation in excellent science instruments: The MSCA and the ERC both aim to promote excellence and fundamental science in either collaborative or mono-beneficiary projects. In the MSCA Innovative Training Networks (ITN) and Individual Fellowships (IF), applicants from Swiss institutions achieved higher success rates than average in Horizon 2020. These two instruments are also where most participations in MSCA from Switzerland are originating from. The largest number of Horizon 2020 MSCA fellows in Switzerland came from our neighbouring countries Italy, Germany and France followed by China, Spain and third countries like India, the US, Iran, Russia and Canada. In Horizon 2020, researchers in Switzerland excelled in all types of ERC grants, with some success rates almost double the average success rates. In Horizon 2020, most ERC grants awarded to researchers in Switzerland were ERC Starting Grants, together with a comparatively high share of ERC Advanced Grants. Most ERC grant recipients in Switzerland were found in the ETH Domain and the cantonal universities.

Swiss participation in Euratom RTP and ITER: Looking at the fission part of the Euratom Research and Training Programme (RTP) in Horizon 2020, Swiss institutions were strongly focused on projects regarding the safety of nuclear systems and radioactive waste (83.0% of a total of 53 participations), with the vast majority of Swiss participations being carried out by the ETH Domain. With regard to the fusion part of the programme, Switzerland has established itself through its facilities, skills and expertise as a leading partner in EUROfusion, the European Consortium for the Development of Fusion Energy, which implements Euratom's European Joint Programme in fusion research. The Swiss Plasma Center holds a strategic role in the implementation of the European Fusion Roadmap. From 2014 to 2020, Swiss research institutions and companies delivered a strong contribution to the realisation of ITER, the largest fusion device being built, through Switzerland's membership of Fusion for Energy. Due to Switzerland's non-association to Horizon Europe, participation of Swiss companies in the delivery of ITER is de facto interrupted since the end of 2020.

Transitional measures: As Switzerland is a non-associated country in Horizon Europe, some parts of the programme are inaccessible to Swiss institutions. Swiss partners can participate in about two-thirds of the calls, are however not funded through the EC. Similar to 2014, during Switzerland's partial association, the Swiss government has put in place transitional measures. These distinguish between accessible parts of the programme and inaccessible parts. For inaccessible calls alternatives are offered by augmenting national instruments or launching new ones. For accessible calls the Swiss government funds the costs of the Swiss partners directly.

Transitional measures are defined annually and have so far been implemented for the years 2021, 2022 and 2023. The funding available for these measures amounts to a total of CHF 1.851 billion for the years 2021–2023, with CHF 1.072 billion allocated to direct funding and CHF 779 million to measures for non-accessible programme parts. The preliminary data on the transitional measures show that the direct funding by the Swiss government is taking effect and that researchers and innovators in Switzerland continue to successfully participate in the collaborative projects that remain accessible. Furthermore, the instruments set up to provide alternatives for the non-accessible programme parts are met with great interest from the Swiss R&I community.

2 The EU's research and innovation programmes and initiatives

The EU supports research and innovation (R&I) with diverse programmes and initiatives covering a broad range of areas and often implemented in synergy. These instruments complement national R&I funding and emphasise international collaboration and competition. This chapter gives an overview of the content of programmes and initiatives in which Switzerland has participated in the past, is currently participating and/or is seeking participation, before detailing Switzerland's participation status in the various programmes and initiatives in the following chapter. It shows how these programmes and initiatives have developed in terms of thematic focus, opportunities for (international) participation and financial development. This chapter also provides information on how the focus of the European R&I community evolved to include activities that span the entire innovation process and the entire career of individual researchers of all nationalities. We describe how the European R&I landscape has become increasingly international and interlinked, leading to a thirtyfold increase in the budget of the European Union's (EU) Framework Programmes for Research and Innovation (FPs) in the last half century.

2.1 An overview

Figure 2.1 displays the four programmes and initiatives we focus on in this report. This chapter briefly introduces each one of them.

Figure 2.1 Programmes and initiatives

EU Framework Programmes for Research and Innovation (FPs) • **Launched in:** 1984 • **Funding:** By far the largest share is funded through the long-term EU budget, the Multiannual Financial Framework (MFF)[3] and a small part through NextGeneration EU[4].	**Euratom Research and Training Programme (Euratom RTP)** • **Launched in:** 1958 • **Funding:** The programme is funded through the MFF.
International Thermonuclear Experimental Reactor (ITER) • **Launched in:** 2007 • **Funding:** The members of the ITER Organization (EU, China, India, Japan, Russia, South Korea and the USA) fund the construction of ITER.	**Digital Europe Programme (DEP)** • **Launched in:** 2021 • **Funding:** The programme is funded through the MFF.

Source: SERI.

[3] wwww.europarl.europa.eu > Other websites > At your service > Stay informed > Fact sheets on the European Union > How the European Union works > Financing > Multiannual financial framework (status: 01.10.2023).

[4] https://next-generation-eu.europa.eu (status: 01.10.2023).

2.1.1 EU Framework Programmes for Research and Innovation: The EU's main research and innovation funding instrument

The framework programmes (FPs) are the EU's main funding instrument for implementing its common research and innovation policy. This policy is legally embedded in the EU's former Treaties of Maastricht[5] and Amsterdam[6] and the currently valid Lisbon Treaty[7]. The importance of the FPs increased with the Lisbon Strategy agreed upon in 2000 and the subsequent establishment of the European Research Area (ERA). The ERA has the goal of creating a single, borderless market for research, innovation and technology among the participating countries and the FPs are the most important instrument for its implementation. The ninth FP, Horizon Europe, runs from 2021 to 2027.

The multi-annual framework programmes complement national research schemes and aim to promote excellent research and international cooperation at EU level and beyond. They provide incentives for cross-border research collaborations and cooperation between public institutions and industry actors. The FPs cover different types of funding opportunities in various R&I topics, including but not limited to digitalisation, life sciences, social sciences, humanities and the arts, or mobility initiatives for international exchange. The content of the FPs and their thematic focus are prepared by the European Commission (EC) with the aid of leading experts and in consultation with EU member states and to a certain extent with associated countries (see Section 2.4).

A whole range of funding instruments are implemented within each framework programme (for an overview of the current programme structure see Section 4.2). In general, the EC funds two types of research projects: i) collaborative projects: these support cooperation between different institutions (both for-profit and non-profit) from different fields and countries, and ii) mono-beneficiary projects, which support the excellence of individual researchers and innovators.

Each framework programme is divided into a number of work programmes in which the relevant calls for proposals as well as other budgetary actions are published. These work programmes typically cover a two- to three-year period. The EC publishes calls for proposals within defined thematic areas (top-down approach, mostly for collaborative projects), as well as calls without a given thematic focus (bottom-up approach, mostly for mono-beneficiary projects, career development and promoting mobility). EU research and innovation funding is awarded to the scientific institutions and companies based on the quality of their proposal as measured in terms of specific criteria such as technical and scientific excellence. There are no national quotas.

The framework programmes are open to legal entities established in an EU member state and, under certain conditions, also to those established outside the EU. There are rules governing participation, in particular regarding who has access to EU research funding and how the respective financial contribution to the EU is made. The FPs distinguish between three main categories of participating countries:

1. EU member states participate automatically in the FPs with all rights and obligations. They finance these programmes through their regular contribution to the EU budget. EU member states are represented in the steering and strategic committees of the FPs and the ERA and help determine the design and content of the respective calls for proposals.

2. Associated countries have concluded an agreement with the EU regarding their participation in a specific FP and contribute to the respective programme through a mandatory contribution to the EC. The level of this contribution is defined in the corresponding association agreement and was defined by a GDP key in the past. Participants from associated countries receive their funding directly from the EC (the mandatory contribution serves to cover their funding). Generally, associated countries have observer status in the steering and strategic committees of the FPs and the ERA and can influence the design and content of the calls for proposals.

[5] Treaty on European Union, signed at Maastricht on 7 February 1992, OJ C 191 of 29 July 1992, p.1.
This treaty modified the legal basis for the FP in the Treaty establishing the European Community (TEC).

[6] Treaty of Amsterdam amending the Treaty on European Union, the Treaties establishing the European Communities and certain related acts, OJ C 340 of 10 November 1997, p. 1.

[7] Consolidated version of the Treaty of the Functioning of the European Union, OJ C 202 of 7 June 2016, p. 47.
This treaty renamed the Treaty establishing the European Community (TEC) as the Treaty on the Functioning of the European Union (TFEU).

3. Non-associated countries do not pay a mandatory contribution to the EC and institutions established in these countries generally do not receive funding from the EC, with the exception of non-associated low- and middle-income countries that are automatically eligible for EC funding.[8] Non-associated countries can participate in most collaborative projects but must normally cover the costs of their participation themselves. Often national funding sources are used to cover the cost of these participations. In addition, certain programme instruments (for example mono-beneficiary projects) are not accessible to participants in non-associated countries. These countries can also not contribute to the design of research topics, as they are not members of the relevant committees.

2.1.2 Euratom Research and Training Programme: Research and training activities in the nuclear field

The European Atomic Energy Community (Euratom)[9] is one of the three historical communities of the EU (see Section 2.2). Although Euratom is managed by the same institutions as the EU and all EU member states are automatically members of Euratom, it is legally independent of the EU. In addition to its activities in regulating the peaceful use of nuclear technologies, Euratom has its own nuclear research and training programme: the Euratom Research and Training Programme (Euratom RTP). It complements the framework programmes in the field of nuclear research and covers the fields of nuclear fission and fusion for energy production, as well as non-energy applications of nuclear technologies, such as nuclear medicine. The Euratom RTP supports research activities undertaken by individual researchers, multi-partner consortia (collaborative projects) and activities carried out by the Joint Research Centre (JRC)[10].

The Euratom RTP has a different cycle than the FPs. It runs for a maximum of five years, while the FPs have been structured in seven-year cycles since 2007 (FP7). In order to synchronise the two programmes, each five-year programme for the Euratom RTP is followed by a two-year programme. The Euratom RTP uses the same rules for participation as Horizon Europe (FP9) with regard to the three main categories of participating countries (see Subsection 2.1.1).

2.1.3 International Thermonuclear Experimental Reactor (ITER): A research infrastructure to harness nuclear fusion energy

Worldwide research efforts in the field of nuclear fusion are mainly focused on the realisation of the international research infrastructure ITER that has been under construction in Cadarache, France, since 2007. ITER is a pioneering infrastructure project to design, build and operate the largest experimental thermonuclear reactor ever constructed. It aims to demonstrate the benefits of nuclear fusion as a future source of clean, sustainable energy. Nuclear fusion is expected to provide a substantial contribution to meeting the energy needs of a CO_2-neutral and environmentally conscious society. The reactor is due to start operating in 2025, and it is scheduled to run nuclear breakthrough experiments (i.e. experiments with a net energy gain) from 2035.

The ITER members, namely the EU, China, India, Japan, Russia, South Korea and the USA fund the construction and operational costs and will share the experimental results and any intellectual property generated by the project. At the European level, the Joint Undertaking for ITER, named Fusion for Energy (F4E) is responsible for coordinating and delivering the European contribution to the construction of ITER. F4E was established in 2007 under the Euratom Treaty.

[8] https://ec.europa.eu > Funding, Tenders > Tender opportunities > Find calls for tender > Funding & tender opportunities (SEDIA) > SUPPORT > Guidance & Manuals > Reference documents > Filter by programme > Horizon Europe (HORIZON) > Guidance > HE List of eligible countries (status: 01.10.2023).

[9] Established under the Treaty establishing the European Atomic Energy Community of 25 March 1957: Consolidated version of the Treaty establishing the European Atomic Energy Community (Euratom Treaty), OJ C 203 of 7 June 2016, p. 1.

[10] The JRC is the EC's science and knowledge service, set up under Article 8 of the Euratom Treaty. It conducts research on behalf of the EC in order to provide independent scientific advice and support to EU policy. The JRC's work contributes to the strategic direction and implementation of the research and innovation programmes (the FPs and the Euratom research and training programme) by means of its direct actions.

2.1.4 Digital Europe Programme (DEP): Research programme to promote Europe's digital capacity

The Digital Europe Programme (DEP) was introduced in 2021 as a complement to the framework programmes and runs in parallel to Horizon Europe. The aim of this new programme is to support the transformation of the EU's society and economy in selected key digital areas and to fund projects to bridge the gap between research in digital technology and market uptake in that area.

The DEP is implemented mainly through coordinated and strategic co-funding of research with participating states in the areas of supercomputing, artificial intelligence, cybersecurity, advanced digital skills and the semiconductor sector. It further aims at a widespread use of digital technologies in business and society, mainly through the build-up of digital innovation centres. The DEP also complements and supports Horizon Europe in other aspects of digital transformation and uses the same rules for participation as Horizon Europe regarding the three main categories of participating countries (see Subsection 2.1.1).

2.2 How it all started – the establishment of the framework programmes

This section takes a brief historical look at the beginnings of transnational R&I funding in Europe, dating back to the 1950s.[11] The development of the FPs themselves are covered in Section 2.3.

Emerging from the idea of ensuring peace in Europe after World War II and preventing future military conflicts, the first predecessor of today's EU, the European Coal and Steel Community (ECSC)[12] was founded in 1952, followed by the founding of the European Atomic Energy Community (Euratom) and the European Economic Community (EEC)[13] in 1958 (Fig. 2.2). Although the goals of these European Communities were primarily economic and political, research activities were supported from the beginning, as science and technology were important aspects of European rebuilding after the war. At this time, research supported by the aforementioned three communities (Community research) was limited to the fields of coal and nuclear energy on the legal basis of the ECSC and the Euratom treaty respectively, as the Treaty of Rome (EEC treaty) did not explicitly include R&I.

Between the 1950s and 1970s, a range of intergovernmental initiatives and structures were created among European countries outside the Community framework, to promote research cooperation across national borders in various fields. These included the international research organisations European Organisation for Nuclear Research (CERN) in 1954 and the European Southern Observatory (ESO) in 1962. Cooperation in Science and Technology (COST), the funding organisation for research and innovation networks, was established in 1971, the European Molecular Biology Laboratory (EMBL) in 1974 and the intergovernmental organisation European Space Agency (ESA) in 1975. It is important to note that most of these organisations include countries (often as founding members) like Switzerland and Israel, that did not become part of the EU later on. Section 3.1 further discusses Switzerland's participation in these organisations.

[11] For more information on the establishment and evolution of the EU framework programmes for research and innovation, see European Parliament, Directorate-General for Parliamentary Research Services, Reillon, V. (2017). EU framework programmes for research and innovation: evolution and key data from FP1 to Horizon 2020 in view of FP9: in-depth analysis, Publications Office. This publication served as a source of information for Sections 2.2 and 2.3.

[12] Established under the Treaty establishing the European Coal and Steel Community of 18 April 1951. The ECSC Treaty entered into force on 23 July 1952 and is no longer in force today.

[13] Established under the Treaty establishing the European Economic Community of 25 March 1957. The EEC Treaty was signed in Rome, alongside the Euratom Treaty. They are sometimes referred to as the 'Treaties of Rome', while the 'Treaty of Rome' designates the EEC Treaty. The Treaties of Rome entered into force on 1 January 1958.

Figure 2.2 Timeline: Treaties, European Communities and a selection of European organisations, initiatives and programmes

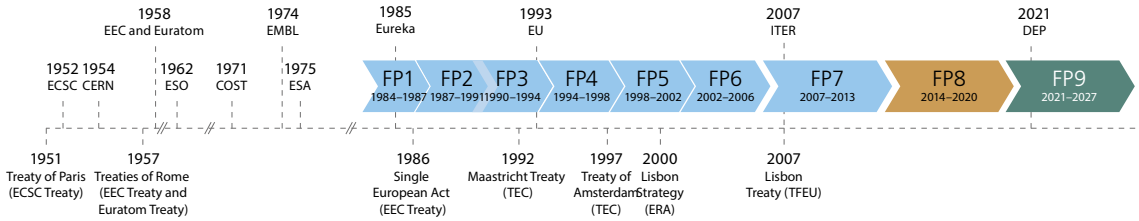


Fig. 2.2: For treaties, the year of signature is shown.

Source: SERI.

Outside of the aforementioned intergovernmental research organisations, the first Community research programme was adopted in 1973 on the basis of a broad application of Article 235 of the Treaty of Rome. Over the following ten years, more than 25 research programmes were approved by the Council in fields such as energy, materials, resources, environment and health. In the early 1980s, the Commission recognised the need for a 'true Community strategy' for research and proposed the FP as a strategic instrument to manage the adoption of research programmes.[14] A Council resolution[15] in 1983 then introduced the 'Framework Programmes for Community research, development and demonstration activities' with the aim of creating one single package for all R&I activities, covering both the Community research activities under the Treaty of Rome and the research programme under the Euratom Treaty. A year later, in 1984, the first framework programme was launched. While the first framework programme was running, Eureka, a new intergovernmental initiative to support public and private partners in technical development, was established as an agreement between 17 countries and the Commission in 1985 to complement Community programmes.

2.3 From fundamental research to activities covering the entire innovation process

Over the years, the scientific focus and structure of the framework programmes changed in line with the EU's political strategies. The FPs have evolved from the 'Framework Programmes for Community research' supporting fundamental research in specific fields to the 'EU Framework Programmes for Research and Innovation' covering the entire innovation process, supporting careers in science, funding basic research as well as market-oriented research and innovation.

In line with this expansion, the budget of the framework programmes (always including the contributions to the Euratom RTP in this report) have steadily increased over time (Fig. 2.3). Whereas the budget for FP1 (1984–1987) was set at EUR 3.3 billion (expressed in European Currency Units at the time since the euro was not introduced until 1999), the budget for Horizon Europe (FP9; 2021–2027) has risen to EUR 109[16] billion when including Euratom RTP, ITER, DEP, top-ups from NextGeneration EU (NGEU) and unused funds from FP8.

[14] Scientific and technical research and the European Community: proposals for the 1980s, Commission of the European Communities, COM (81) 574 fin. of 12 October 1981.

[15] Council resolution of 25 July 1983 on framework programmes for Community research, development and demonstration activities and a first framework programme 1984 to 1987, OJ C 208 of 4 August 1983, p.1. Entered into force in 1984, repealed on 31 December 1987.

[16] The official budget breakdown for programme parts and the yearly breakdown stem from two different sources (Horizon Europe website vs. MFF) that result in a difference of about EUR two billion in the total amount budgeted for Horizon Europe.

Figure 2.3 Annual budgets of the framework programmes (in EUR billion, at current prices)

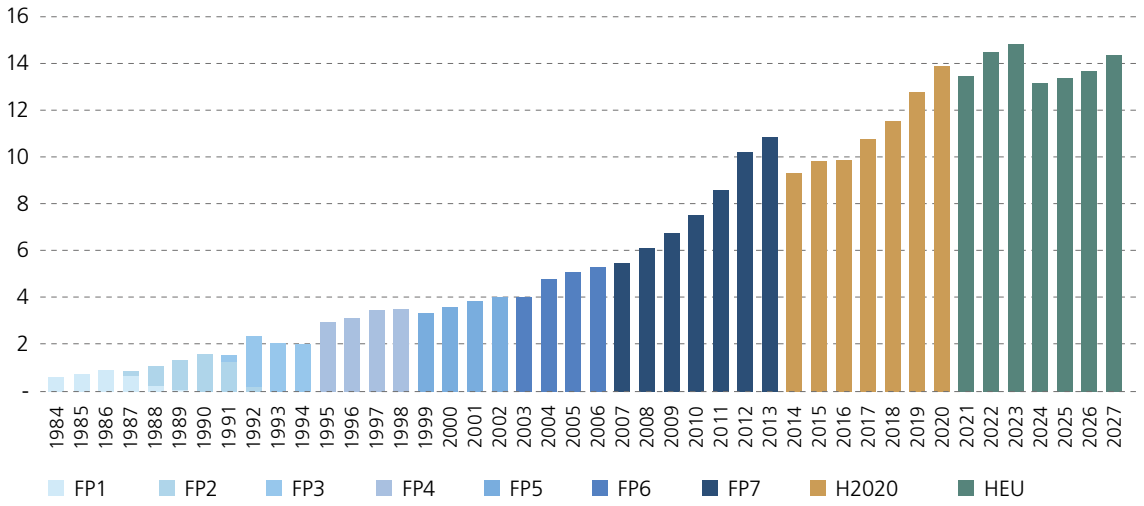


Fig. 2.3: The bars denote yearly breakdown of the budget of the different framework programmes in EUR billion.
Sources: EC and SERI.

The following overview of all framework programmes (including the three related programmes and initiatives Euratom RTP, ITER and DEP) details this thematic development from industrial competitiveness to today's focus on innovation, tackling climate change, helping to achieve the United Nation's (UN) Sustainable Development Goals (SDGs) and aiming to enhance the EU's competitiveness and growth. This changing focus is also illustrated in Figure 2.4, which shows the amount of funding dedicated to the various topic areas.

FP1 (1984–1987): Research for industrial competitiveness

Both FP1 and FP2 had a strong focus on promoting early-stage research prior to market entry to strengthen industrial competitiveness. Although most programmes were organised in a top-down fashion, bottom-up activities were already taking place at that time, e.g. in the area of mobility for researchers. FP1 ran for a four-year period and had a budget of EUR 3.3 billion. It covered the following fields: energy (50% of the budget), information and communication technologies (ICT, 25%), industry and materials (11%) and life sciences and the environment (12%).

FP2 (1987–1991): Support for SMEs and international cooperation

The Single European Act (SEA)[17], signed in 1986, embedded research policy in the Treaty of Rome, providing a clear legal framework for the adoption of the FPs. The prioritisation of research fields was substantially changed compared to FP1. ICT now received 42% of the total budget of EUR 5.4 billion, while energy's share dropped to 22%. Industry and materials nearly doubled their share and new specific programmes were added, such as support for SMEs and international cooperation.

FP3 (1990–1994): Research addressing technological challenges

FP3 introduced the concept of multi-disciplinarity and the approach of addressing technological challenges. ICT continued to be the largest research area, although its budget share decreased by 4% compared to FP2. The importance of the energy sector continued to decrease, while the relative share of life sciences increased. Hence, FP3 continued to focus on exact and natural sciences. The budget increased to EUR 6.6 billion.

[17] Single European Act, OJ L 169 of 29 June 1987, p.1.

FP4 (1994–1998): Research supporting the objectives of the EU

FP4 was a major leap forward with respect to its predecessors. With the adoption of the Maastricht Treaty in 1992, the FPs were transformed into financial tools for EU[18] research activities and their scope was extended to objectives pursued by the EU.[19] This meant a shift from the previous focus on R&I activities promoting technical achievements to addressing societal challenges and supporting a broader range of activities in the innovation process. FP4 was also a significant step forward in financial terms, doubling the budget to EUR 13.1 billion compared to the previous programme (Fig. 2.3). Almost 90% of the budget was allocated to six thematic areas in the field of research and technology development (ICT, industry, environment, life sciences, non-nuclear energy and transport). In addition to these topics, which had already been included in previous FPs, targeted socioeconomic research was introduced. Furthermore, three horizontal programmes were implemented with a focus on international cooperation, dissemination and exploitation of results and a greater promotion of researcher training and mobility (now called Marie Skłodowska-Curie Actions, MSCA).

FP5 (1998–2002): Support for large collaborative projects

FP5 differed little from its predecessor and the overall budget of EUR 14.9 billion increased slightly compared to FP4 (Fig. 2.3). In terms of content, it was reduced to four thematic programmes or challenges and the three horizontal programmes from FP4 were retained under different names. Compared to projects in the previous FPs, the size of some collaborative projects increased substantially over the course of the programme, with some involving more than 80 partners. There were sometimes large differences in the distribution of funds among project partners, with those performing more important tasks receiving an accordingly higher share of the budget.

Figure 2.4 Relative development of the thematic priorities of the framework programmes

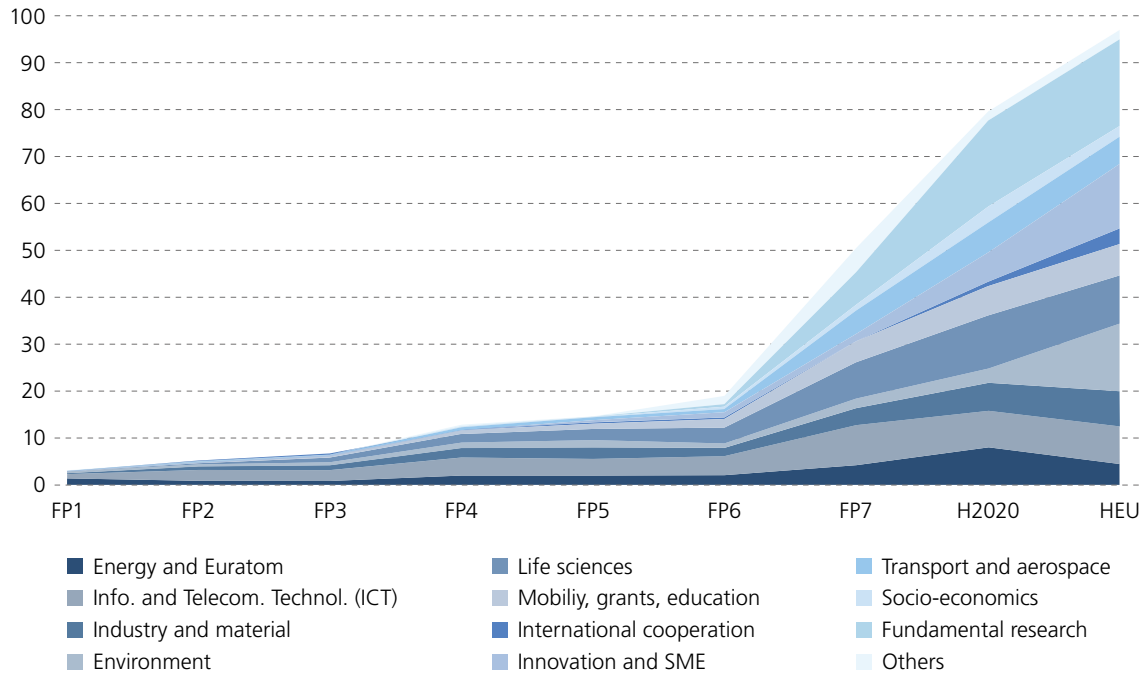


Figure Fig. 2.4: The figure shows how the budgets (in EUR billion) of the framework programmes are divided into different thematic priorities and how they have developed over time.

Sources: EC and SERI.

[18] The European Union was formally established when the Maastricht Treaty came into force on 1 November 1993.

[19] European Parliament, Directorate-General for Parliamentary Research Services, Reillon, V. (2017). EU framework programmes for research and innovation: evolution and key data from FP1 to Horizon 2020 in view of FP9: in-depth analysis, Publications Office.

FP6 (2002–2006): Focus on the implementation of the European Research Area (ERA)

The Treaty of Amsterdam (amending the Maastricht Treaty) was signed in 1997 and provided the legal basis for FP6 and FP7. While FP5 was still in progress, the concept of the European Research Area (ERA) was developed and integrated into the Lisbon Strategy, which was adopted by the Council of the European Union in 2000. With the ERA concept the EU set itself the goal 'to become the most competitive and dynamic knowledge-based economy in the world'[20]. The subsequent FPs served to implement this EU research policy. A reassessment of the structure and content of the research activities and a subsequent development of new instruments followed. FP6 had a budget of EUR 19,1 billion, which was mostly allocated to research activities in seven thematic priority areas. Those largely covered the same areas as the thematic programmes under FP5, including ICT, health, sustainable development and transport. The previous horizontal programmes (established in FP4 and continued in FP5) such as the MSCA now served to support the implementation of the ERA. To strengthen the foundation of the ERA, coordination with national programmes was implemented through the creation of public-to-public partnerships (P2P), such as the ERA-NETs (European Research Area Networks) and Article 169 (now Art. 185 TFEU) partnerships. Additionally, various public-private partnerships (PPP) were launched involving industry, researchers and public stakeholders from EU member states and associated countries.[21]

FP7 (2007–2013): Promotion of fundamental research and innovation activities

FP7 introduced major changes and broadened the scope of the framework programme to exploratory research and innovation activities. It was also the first FP with a duration of seven instead of five years. The budget was set at EUR 55.6 billion (excluding ITER), double that of FP6 after factoring in the new duration of seven years. This also reflects the higher priority that the EU was giving to research (Fig. 2.3). FP7 was organised around four main programme areas and greatly simplified to be more effective and accessible to researchers. Bottom-up fundamental research was strongly promoted with the establishment of the European Research Council (ERC). In terms of content, the importance of the thematic programmes (health, food, ICT, environment, energy, transport, space and security) was slightly downgraded. Furthermore, fusion research was strengthened within the Euratom RTP in view of supporting the realisation of ITER and preparing for its operation. FP7 was designed to bring together the research activities of EU member states, associated countries and the private sector into one single ERA. For this purpose, it facilitated the coordination with national research programmes by promoting and coordinating P2Ps and by launching the European Joint Technology Initiatives (JTIs) as public-private partnerships.

FP8 or Horizon 2020 (2014–2020): Introduction of activities covering the entire innovation process (see Section 4.1)

The Lisbon treaty, which entered into force in late 2009, provided the legal basis for the subsequent FPs. It broadened the objectives of EU research policy and continued to shift the focus from industrial competitiveness to the implementation of the ERA concept. The thematic priorities for Horizon 2020 were adopted from its predecessor but organised differently around three main pillars: Excellent Science, Industrial Leadership and Societal Challenges. The budget increased by about 50% compared to FP7 and amounted to EUR 82 billion (including ITER). The budget share of the thematic programmes further declined, from 62% under FP7 to 54%, for the benefit of fundamental research (ERC, from 14% to 16% of the total budget). Horizon 2020 placed greater importance on innovation through the formal inclusion of the European Institute of Innovation and Technology (EIT)[22], which was previously financed outside the FP, and the launch of two large-scale pilot projects known as Flag-ship Initiatives for Future and Emerging Technologies (FET Flagships).

[20] Presidency conclusions, Lisbon European Council, 23 and 24 March 2000. See: www.consilium.europa.eu > European Council > Conclusions > European Council - Lisbon, 23-24 March 2000 (status: 01.10.2023).

[21] Including the European technology platforms (ETP), which were the first form of EU public-private partnerships in research. Some of the ETPs were restructured as Joint Technology Initiatives (JTI) in FP7, which were implemented by establishing joint undertakings (JU) under Art. 171, now Art. 187 TFEU.

[22] Based in Budapest (Hungary), the EIT enables the launch of Knowledge and Innovation Communities (KICs), designed to boost the EU's innovative capacity by strengthening cooperation between research institutions, universities and industry.

FP9 or Horizon Europe (2021–2027): R&I to tackle climate change, help achieve the UN SDGs and boost the EU's competitiveness and growth (see Section 4.2)

With a budget of EUR 109 billion when including Euratom RTP, ITER, DEP, top-ups from NGEU and unused funds from FP8, FP9 is the largest research and innovation funding programme in the world and the most ambitious programme in the history of the EU. It is again divided into three main pillars. The Excellent Science pillar continues to be advanced by the ERC and MSCA, with a share of 23% of the total budget (Fig. 4.6). The second pillar, Global Challenges and European Industrial Competitiveness, has a 49.2% share. It builds on the Societal Challenges pillar Horizon 2020, and is divided into six different thematic areas (clusters). This part of the programme aims to develop knowledge and solutions for the implementation of the UN's Sustainable Development Goals. The third pillar, Innovative Europe, seeks to strengthen knowledge-based innovations. It includes the EIT and the newly established European Innovation Council (EIC) and receives 12.5% of the total budget. Furthermore, the different types of partnerships have been restructured and are implemented under pillars II and III.

2.4 Extending participation to non-EU countries

As described in the previous chapter, the framework programmes have evolved substantially in terms of thematic focus, diversity of funding instruments and budget. Equally important, by opening up participation to countries around the world, the FPs have become the largest international cooperation programme in research and innovation, with institutions from nearly 180 countries participating in Horizon 2020.[23] An important objective of the FPs is to facilitate international cooperation, networking and mobility among R&I actors. This international openness has become decisive for the success of the programmes, mainly due to the following factors:

- International participation heightens competition and thus fosters scientific excellence.
- In view of global challenges like climate change, COVID-19 and the threat to security posed by cross-border conflicts, international cooperation in research and innovation is crucial for finding solutions.
- Excellent research and innovation know no borders and thrive in an environment of global competition and collaborative networking.

International cooperation has been part of the programmes horizontal activities since the beginning (especially through mobility initiatives), and countries outside of the European Community were able to participate in FP1. The ECSC, the first predecessor of today's EU, had only six members (France, Germany, Italy, Belgium, the Netherlands and Luxembourg) and non-member countries participating in FP1 were mostly countries that are now members of the EU. However, over the years, the FPs have become more inclusive and accessible to non-EU countries all over the world, with different rules for participation and funding being applied to different categories of countries (EU member states, associated countries and non-associated countries; see Section 2.1).

As later members of the European Economic Area (EEA), Norway (1987) and Iceland (1994) were the first countries to associate to FP1 and FP4, respectively. In 1996 Israel became the first country outside the European continent to be associated to the framework programme. When FP5 allowed the association of EU candidate countries for the first time, ten central and eastern European countries became associated along with Cyprus. Most of the countries associated to the programmes today followed during FP6 and FP7 (Fig. 2.5). Among them were Croatia (2006), Turkey (2007) and several Balkan countries including Macedonia and Serbia (2007), as well as Albania and Montenegro (2008). Switzerland first became associated during FP6 (2004). The EU's R&I cooperation with its neighbours focused on fostering integration into or alignment with the ERA, including through their association to the FPs. Furthermore, since FP7 the strategic orientation of the FPs has increasingly been geared towards solving global challenges. Openness to and engagement with the world has therefore become an EU priority in order to produce excellent science and technology, bring research results to the market faster and create new business opportunities for R&D-intensive industries. International agreements with China and South American countries were also concluded. In FP8 (Horizon 2020) international cooperation was seen as a cross-cutting priority and international project collaboration was increasingly encouraged. Tunisia (2016), for example, became the first and the only African and the only Arab country associated to Horizon 2020.

[23] Source: eCORDA.

Under the current FP9 (Horizon Europe), the trend of promoting international cooperation continues (Fig. 2.5). Besides the categories from previous FPs, the regulation of Horizon Europe introduced a new specific country category[24] for this purpose (letter d in the list below), offering the following categories for association:

a. European Free Trade Association (EFTA) members which are members of the European Economic Area (EEA).

b. Acceding countries[25], candidate countries and potential candidates.

c. European neighbourhood policy countries.

d. Non-EU countries and territories that fulfil a set of criteria related to their economic, political and research and innovation systems.

Non-EU countries not belonging to categories a, b or c can for the first time become associated to the programme if they meet certain standards, such as having a good capacity in science, technology and innovation. Category d was applied for the first time with the association of New Zealand (2023), and association negotiations are also taking place with Canada and South Korea. The United Kingdom (UK) has belonged to this category since it left the EU and will formally become associated to Horizon Europe on 1 January 2024. Switzerland currently belongs to this category as well, without being associated at the moment.

Figure 2.5 Map with EU member states and associated countries in Horizon Europe (status 01.01.2024)

Fig. 2.5: Map of all EU member states (in dark green) and countries associated to Horizon Europe (in light green).
Source: EC and SERI.

[24] Art. 16 (1) Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021 establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination, and repealing Regulations (EU) No 1290/2013 and (EU) No 1291/2013, OJ L 170 of 12 May 2021, p.1.

[25] https://neighbourhood-enlargement.ec.europa.eu > Enlargement > Glossary > Acceding countries (status: 01.10.2023).

In a development opposing the increasing openness of the FPs overall, in Horizon Europe the European Commission (EC) has begun to selectively restrict the participation of non-EU countries in specific calls for proposals in order to protect the strategic assets and interests of the EU and to preserve its autonomy and security. Hence, the former vision for the EU to create 'open innovation, open science and being open to the World'[26], was adapted to a European Union 'that should stay "open to the world" yet be vigilant and ready to respond to foreign interference'[27]. Restricted areas include quantum, space and high-performance computing-technologies that the EU considers to be strategically important. Further research areas may be included in the future.

Key messages from Chapter 2

► The framework programmes have their origin in joint research activities in the coal and nuclear industries in the 1950s. They have evolved into R&I programmes with a broad scope on research and innovation, tackling climate change, and enhancing the EU's competitiveness and growth.

► The importance of the framework programmes has grown over the years, resulting in a thirty-fold increase in their budget over the last half century.

► The framework programmes have become more accessible to non-EU countries all over the world and have developed into the largest international R&I cooperation programme, with institutions from nearly 180 countries participating in Horizon 2020.

► In Horizon Europe, the European Commission has begun to selectively restrict the participation of non-EU countries in specific calls for proposals in order to protect the strategic assets and interests of the EU and to preserve its autonomy and security.

[26] European Commission, Directorate-General for Research and Innovation, (2015). Open innovation, open science, open to the world: a vision for Europe, Publications Office.

[27] European Commission, Directorate-General for Research and Innovation, (2022). Tackling R&I foreign interference: staff working document, Publications Office of the European Union, Publication Office.

3 Switzerland and the EU's research and innovation programmes and initiatives

After describing the development of the framework programmes on an EU level, this chapter outlines the significance of the FPs for Switzerland over time. The overview is based on the political and historical background of Switzerland's participation in the FPs, the Euratom RTP, ITER and the DEP, as well as the development of its participation over the last 30 years.

The promotion of research and innovation (R&I) is considered central to increasing competitiveness, sustainable growth and prosperity in Switzerland. In particular, cooperation within Europe and with the EU is an important component of Switzerland's international strategy in the area of education, research and innovation.[28] Accordingly, Switzerland has cultivated a long tradition of research cooperation with the EU and its predecessor organisations and seeks association to the current FP Horizon Europe, the Euratom RTP and the DEP, as well as the status of a participating state in ITER. This chapter focuses on these four programmes and initiatives.

Figure 3.1 Switzerland's participation in the EU's programmes and initiatives

EU Framework Programmes for Research and Innovation (FPs)

Participation: Switzerland has participated in the FPs in various forms since 1987 (see Section 3.2):

1987–2003, FP1–FP6	Non-associated country
2004–2013, FP6–FP7	Associated country
2014–2016, FP8: H2020	Partially associated country
2017–2020, FP8: H2020	Associated country

Current status: Non-associated country in FP9: Horizon Europe since its start in 2021.

Euratom Research and Training Programme (Euratom RTP)

Participation: Switzerland has been associated to different parts of the programme since 1978.

1978–2003	Associated to fusion activities of the programme
2004–2020	Associated to both fusion and fission parts of the programme.

Current status: Non-associated country since 2021.

International Thermonuclear Experimental Reactor (ITER)

Participation: Switzerland has been a participating state in the ITER research infrastructure since its establishment in 2007.

Current status: Non-participating state since 2021.

Digital Europe Programme (DEP)

Participation: Switzerland has not yet been associated to the DEP since its establishment in 2021.

Current status: Non-associated country since 2021.

Funding for all four programmes and initiatives: Switzerland provides funding for the participation of its research and innovation actors regardless of its association status:

- As an associated country, Switzerland paid a mandatory contribution to the EU covering the funding granted to Swiss participants.
- In non-associated country mode, researchers and innovators in Switzerland are funded directly by the Swiss government.

Source: SERI.

[28] SERI (2018): Switzerland's International Strategy on Education, Research and Innovation, Strategy of the Federal Council.

3.1 How it all started – cooperation between Switzerland and the EU in the field of R&I

Today's cooperation between Switzerland and other European countries in the field of R&I has a long institutional tradition that predates the EU. Figure 3.2 shows Switzerland's participation in initiatives, programmes and organisations outside the structure of the framework programmes (and thus the EU) written in green. The foundation was laid in 1954 with the establishment of CERN, the world's largest research centre for particle physics, near Geneva. In 1978, Switzerland concluded a perpetual cooperation agreement with Euratom in the field of controlled nuclear fusion and plasma physics. This agreement was the starting point for Switzerland's participation in the Euratom RTP.[29]

Figure 3.2 Timeline: Switzerland's participation in European organisations, initiatives and programmes

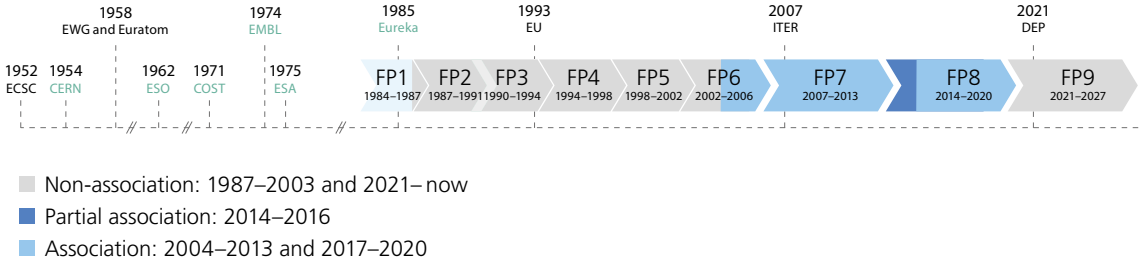


Fig. 3.2: Organisations, initiatives and programmes with current Swiss participation outside the structure of the FPs and the EU are written in green.

Source: SERI.

During the 1960s and 1970s, Switzerland joined most newly established intergovernmental research programmes and research infrastructures. It became a member of the European Southern Observatory (ESO) in 1962, and was a founding member of the European Molecular Biology Laboratory (EMBL) in 1974 and the European Space Agency (ESA) in 1975. Switzerland was also one of the founding countries of the intergovernmental initiatives COST (1971) and Eureka (1985), both of which continue to make an important contribution to European networking opportunities for Swiss researchers (COST) and SMEs (Eureka). With this Switzerland was contributing to R&I in Europe long before the first framework programme was launched and is continuing to do so.

3.2 Development of Switzerland's participation

Shortly after the creation of the framework programmes in 1984 (see Section 2.2), Switzerland and the European Communities (now the EU) concluded a framework agreement on scientific and technological cooperation in 1986[30], which explicitly envisaged Switzerland's participation in the FPs and other programmes and initiatives and is still valid today. Since 1987, researchers and innovators from Swiss universities and the private sector have thus been participating in FP projects according to Switzerland's association status, with a steady increase in participation numbers and funding committed to Swiss institutions.

[29] The perpetual cooperation agreement was replaced in 2014 by the Horizon 2020 Association Agreement (SR 0.424.11).

[30] Framework agreement of 8 January 1986 on scientific and technical cooperation between the Swiss Confederation and the European Communities (SR 0.420.518).

The left-hand panel of Figure 3.3 shows the average yearly number of Swiss project participations per framework programme. The right-hand panel of Figure 3.3 similarly illustrates the average yearly funding committed to Swiss institutions in each FP. The total number of Swiss project participations and the total funding committed to Swiss institutions have increased steadily with every FP, as seen in Figure 3.3, mirroring the growing FP budget (Fig. 2.3). Since 1992 a total of 15 748 project participations and CHF 7.9 billion in funding have been recorded for researchers and innovators in Switzerland. During FP3, Swiss participations averaged 100 per year with CHF 25.4 million in committed funding; under FP8, these numbers had increased to an average of 710 yearly participations and average committed funding of CHF 434.6 million per year. This represents a sevenfold increase in Swiss participations between FP3 and FP8 and a 17-fold increase in the average annual funding committed to Swiss institutions, whereas the average annual FP budget increased ninefold in the same period (see Section 2.3). Note that the sharp increase in Swiss participations and committed funding between FP3 and FP4 as well as F6 and FP7 corresponds to a (almost) doubling of the budget between the respective two programme generations.

Although this report and Figure 3.3 show the participation figures for Swiss partners in Horizon Europe, this information is not entirely comparable to the previous FPs. Due to the current non-association, Swiss partners are ineligible for approximately one-third of the calls, including areas where researchers based in Switzerland have traditionally excelled, such as ERC grants. Furthermore, the data itself is currently incomplete as it is a combination of publicly available data and data from funding requests to SERI, neither of which yet contain all calls from 2021–2023 (see Section 9.1). In fact, due to the time it takes from the evaluation of a call and the conclusion of the corresponding grant agreement, almost no data on calls from 2023 are included in this report.

Considering that researchers in Switzerland can participate in about two thirds of the calls in Horizon Europe the participation numbers so far are comparable, if not higher, than under Horizon 2020. These figures indicate that direct funding from the Swiss government's transitional measures is taking effect and that researchers and innovators in Switzerland are continuing to participate successfully in collaborative projects.

Figure 3.3 Average yearly number of Swiss participations and funding committed to Swiss institutions per framework programme

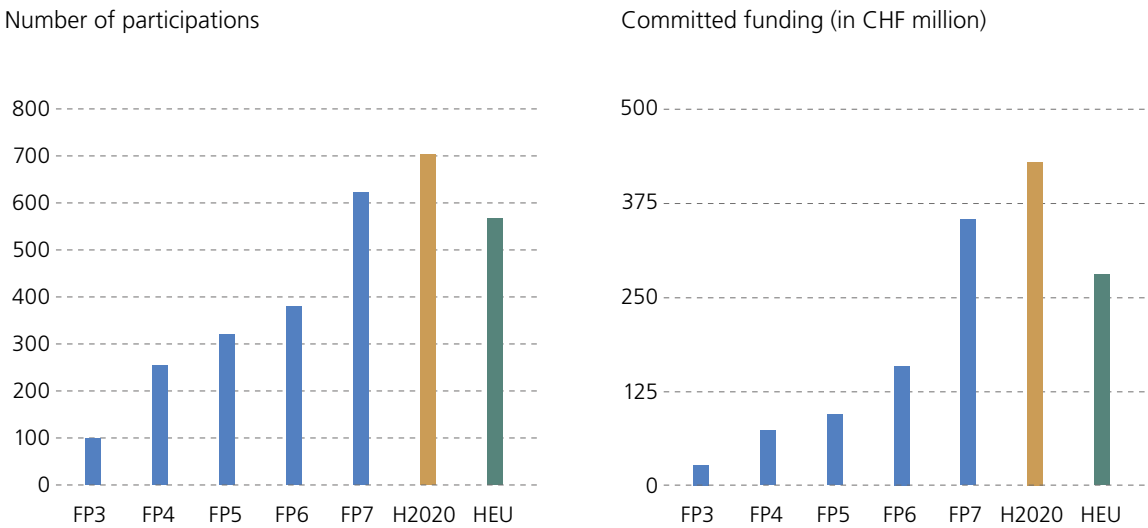


Fig. 3.3.: Left-hand panel: the bars show the average yearly number of Swiss participations in each framework programme, including Euratom indirect actions. Note that the jump between FP6 and FP7 corresponds to the doubling of the FP's budget between those two programme generations. This similarly holds for the steep increase between FP3 and FP4. The data on HEU is still incomplete and should therefore be viewed with caution (see discussion in text). Right-hand panel: the bars show the average yearly committed funding to Swiss participants in each framework programme generation, including Euratom indirect actions.

Sources: EC and SERI.

Political events have influenced how and to what extent Swiss participations in the FPs have been possible. The following overview details how participation opportunities for researchers and innovators in Switzerland have been shaped by Switzerland's status in the FPs, the Euratom RTP, ITER and DEP, as a non-associated, partially associated or associated country.

1987–2003	From FP1 until mid-FP6	Non-association

Political context: The above-mentioned framework agreement on scientific and technological cooperation between Switzerland and the European Communities was signed during FP1, providing Switzerland access to the FPs as a non-associated country starting in 1987. The first projects with Swiss participation began in 1988. At that time, funding was provided by the project participants' own resources; the Swiss government started providing funding in 1992. For this reason, the data on very early participation is incomplete, and correspondingly Figure 3.3 covers the period from 1992 onward. Although Swiss participants had limited participation rights, non-associated countries were able to take on project coordination roles. In 1999, Switzerland and the EU signed a research agreement[31] governing Switzerland's participation in the FPs as an associated country as part of a package of seven bilateral agreements. These agreements are also known as the Bilateral Agreements I and were approved by the Swiss electorate in 2000 and entered into force in 2002. However, the research agreement only resulted in a Swiss association in 2004 (i.e. during FP6), as FP5 ended in 2002 and the research agreement has to be renewed for every new FP.[32]

Participation in numbers: From FP3 to FP5, the total number of projects with Swiss participation and the total funding committed to Swiss institutions increased steadily, in line with the overall budget of the FPs.

2004–2013	From mid-FP6 until FP7	Association

Political context: In January 2004, the newly negotiated research agreement came into force and opened the door for Switzerland's association to FP6 and the Euratom RTP. Switzerland participated in these programmes with associated country status for the first time. Association entailed a mandatory contribution from the Swiss government to the EC, which was used to fund the participation of researchers and innovators in Switzerland. Furthermore, Switzerland was now entitled to be represented on the various programme and steering committees, which gave direct access to information and involvement in developing the programme and shaping future FPs and the ERA. In 2007, the agreement between Switzerland and the EU was renewed and allowed for association to FP7, which so far is the only FP in which Switzerland has held associated country status for the entire duration of the programme.

Considering the perpetual collaboration agreement in the field nuclear fusion research signed in 1978 and its association to the Euratom RTP, Switzerland joined the European Joint Undertaking for ITER and the Development of Fusion for Energy (F4E) as a full member in 2007, the year they were established. This allowed Switzerland to participate in ITER governance with the same rights as EU member states. It also enabled Swiss research institutions and companies to take part in the full spectrum of F4E and ITER Organization operational activities, providing a unique opportunity to showcase their skills and know-how in one of the world's largest international research collaborations (see Section 2.1).

Participation in numbers: With association to FP6 in 2004 and throughout the duration of FP7, Swiss participation and awarded funding continued to increase compared to FP5. FP6 saw a total of 1916 participations and CHF 796 million in awarded funding, and in FP7 these figures grew to 4382 participations and CHF 2.503 billion in funding.

[31] Agreement of 21 June 1999 between the Swiss Confederation and the European Communities on scientific and technological cooperation (with Annexes and Final Act) (SR 0.420.513.1). The agreement can be found here: www.fedlex.admin.ch > Systematische Rechtssammlung > 0.4 Schule - Wissenschaft – Kultur > 0.42 Wissenschaft und Forschung > 0.420.513.1 Abkommen vom 21. Juni 1999 zwischen der Schweizerischen

[32] The research agreement is the only sectoral agreement within the Bilateral Agreements I that – due to the time limited programmes – must be renewed regularly. For more information see: www.eda.admin.ch > Foreign policy > > Switzerland and Europe > Switzerland's policy on the European Union > European policy > Bilateral approach > Bilateral agreements I (1999) > Research (status: 01.10.2023).

2014–2016	Part of FP8 or Horizon 2020 (see Section 4.1)	Partial association

Political context: Association was also envisaged for FP8. However, due to the political events following the popular vote in Switzerland in favour of the federal popular initiative against mass immigration in early 2014 and Switzerland's subsequent non-signing of the Croatia Protocol, the EU initially prevented Switzerland from associating to Horizon 2020. As a consequence, the country's status was unclear during the first half of 2014 until Switzerland and the EC were able to reach an agreement on partial association. The agreement was applied retroactively from September 2014 until the end of 2016, when it was replaced by an association agreement. The partial association meant that Switzerland was considered associated to parts of the programme and held the status of a non-associated country for all other parts (see Section 4.1). The agreement on partial association also replaced the 1978 perpetual collaboration agreement between Switzerland and Euratom in the field of nuclear fusion (see Section 3.1) and for the first time governed Swiss participation in the Euratom RTP and the financial aspects of Switzerland's participation in the activities of F4E, particularly ITER (see FP7 above). The grouping of Horizon 2020, the Euratom RTP and ITER is referred to in Switzerland as the Horizon 2020 package (see Section 2.2).

Participation in numbers: The suspension of the negotiations on Switzerland's association to Horizon 2020 led to uncertainty among researchers in Switzerland and in Europe regarding the participation possibilities under this new status. In addition, before the agreement on partial association was reached, Switzerland was considered a non-associated country and was therefore excluded from certain programme parts, namely mono-beneficiary projects. These uncertainties and the limited access to certain programme parts in the first year resulted in a temporary reduction of the share of Swiss project participations and the funding committed to Swiss institutions at the beginning of Horizon 2020 compared to the start of FP7.

2017–2020	Part of FP8 or Horizon 2020 (see Section 4.1)	Association

Political context: The partial association agreement between Switzerland and the EC remained in place until the end of 2016. Switzerland again obtained association to Horizon 2020 from the beginning of 2017 and for the remaining duration of the programme, as a result of the decisions taken by Parliament in December 2016 regarding the implementation of the mass immigration initiative.

Participation in numbers: From 2016 onwards, the number of participations and funds committed to Swiss institutions increased again and the participation shares were comparable to FP7. Considering the whole duration of Horizon 2020, researchers and innovators in Switzerland were very successful in competing for EC research funding with a total of 4967 project participations and contributions of CHF 3.043 billion.

2021–2023	Part of FP9 or Horizon Europe (see Section 4.2)	Non-association

Political context: During the initial phase of Horizon Europe, Switzerland, like all other countries associated to Horizon 2020, had 'to be associated' status, which allowed researchers and innovators to submit proposals as if they were located in an associated country, pending the conclusion of the association negotiations. However, after extended negotiations on the institutional framework agreement (InstA) between Switzerland and the EU, the Swiss government decided in May 2021 not to sign the institutional agreement with the EU.[33] The EU was quick to link Switzerland's association to political developments in unrelated areas by tying market access (InstA) and cooperation agreements (association to Horizon Europe) and has consequently considered Switzerland as a non-associated country in Horizon Europe, the Euratom RTP and DEP.

[33] www.admin.ch > Documentation > Press releases > No signing of Swiss–EU institutional agreement (status: 01.10.2023).

Furthermore, in the absence of an association to the Euratom RTP, the EU no longer considers Switzerland a participating state in F4E activities, suspending de facto Switzerland's participation in ITER. Since in Switzerland the participation in Horizon Europe, the Euratom RTP, DEP and ITER is treated within the same legislative and budgetary process, these four programmes and initiatives are referred to as the Horizon Europe package.

It remains the Swiss government's declared goal that Switzerland gets associated to the Horizon Europe package as soon as possible, and Switzerland is ready for negotiations. The Swiss government wants to continue the proven bilateral path with the EU in order to maintain good, stable and mutually beneficial relations.

Participation in numbers: Due to the non-association, the participation possibilities for researchers and innovators in Switzerland are limited to about two thirds of the calls (see Section 4.2). The Swiss government has therefore set up transitional measures which replace calls that are inaccessible as well as provide direct funding for calls which are open to Swiss participants (see Section 4.3). The participation figures in Figure 3.3 only take into account accessible calls, which consist entirely of collaborative projects. Considering the restricted access, the participation in collaborative projects so far exceeds the corresponding numbers in Horizon 2020.

3.3 Parallel development of national research funding

The framework programmes are an important tool for encouraging and enabling international cooperation alongside Switzerland's membership in a number of international research organisations (e.g. CERN, ESO). They complement the Swiss government's national R&I expenditure, which forms the backbone of Swiss R&I funding together with spending by the cantons as well as R&D investment by the private sector.

Table 3.1 compares the national R&D expenditure alongside the funding of the framework programmes. For the latter we distinguish two aspects: the mandatory contribution paid to the EU and the funding in turn committed to Swiss partners. These do not necessarily align since the mandatory contribution was historically determined by a GDP key, whilst the contributions committed to Swiss partners depend on their success in the respective calls. We show a number of reference years, each representing one generation of FP, starting from FP6 where association was possible for the first time. These reference years have been chosen to represent a 'typical' programme year, avoiding the start and end years where participations fluctuate substantially. It should be noted that we have omitted the latest FP, Horizon Europe, from this list. Due to the current non-association, Switzerland is funding its participants directly for those parts of the programme that are accessible and provides alternatives for all other programme parts (see Section 4.3). Therefore, the numbers regarding funding would be of limited comparability.

The national funding in 2019 increased by 90% in comparison to 2004, in line with the growing importance placed on a strong research and innovation sector. In the same time the mandatory contributions to the EC have risen reflecting the rising budget of each programme generation. Importantly, the funding won by researchers and innovators in Switzerland increased by 159% between 2004 and 2019. This steep increase in comparison to the national funding highlights the growing importance of international research collaboration.

Table 3.1 Comparison of Swiss R&D expenditure and funding related to the FPs (in CHF million)

FP	Year	R&D expenditure of Swiss government	EC contribution	Funding committed to Swiss institutions
FP6	2004	2 483	199	194
FP6	2006	2 658	219	242
FP7	2010	3 515	309	417
FP7	2012	3 870	452	381
FP8	2017	4 484	442	394
FP8	2019	4 714	562	502

Sources: EC, SERI and FFA.

Key messages from Chapter 3

► Switzerland's contribution to R&I in Europe has a long tradition and started long before the first FP was launched.

► The average yearly number of Swiss project participations increased sevenfold between FP3 and FP8 and the average yearly funding committed to Swiss institutions increased 17-fold, whereas the average yearly FP budget increased ninefold in the same period.

► The importance of international R&I in Switzerland has increased over the last decade: between 2004 and 2019 the growth in contributions to Swiss partners participating in the FPs including Euratom was at almost 160% whilst national R&D expenditure grew by 90%.

► Political events and circumstances have affected Swiss participation in the framework programmes, the Euratom RTP, ITER and DEP.

► The Swiss government's aim is to associate to Horizon Europe, the Euratom RTP and DEP, as well as becoming a participating state in ITER.

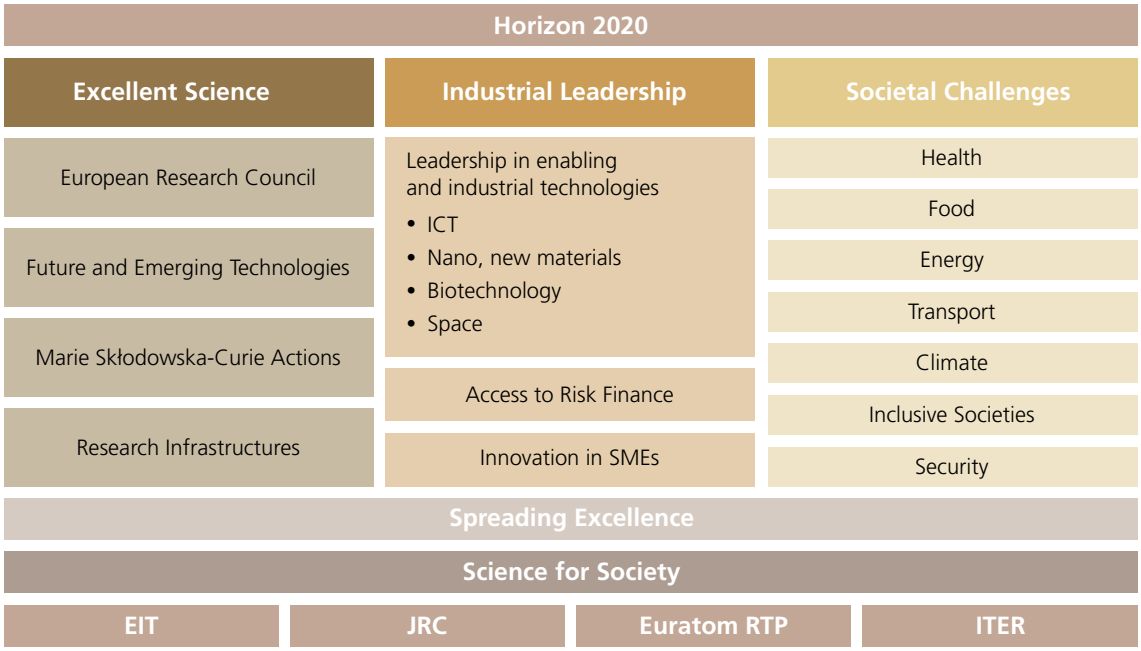
4 Switzerland in the Horizon 2020 and Horizon Europe packages

Following the 2018 edition of the report 'Swiss participation in the framework programmes'[34], this report contains final data on Swiss participation in the entire Horizon 2020 package (2014–2020) as well as data on the first period (until October 2023) of the Horizon Europe package (2021–2027). Data on the Swiss participation in Horizon 2020 and Horizon Europe are presented from Chapter 5 onwards. The current chapter explains in more detail the structure and budget distribution of these two programmes as well as the possibilities for Swiss participation in each programme part.

4.1 Structure of the Horizon 2020 package and Switzerland's status

Horizon 2020 was the EU's eighth EU Framework Programme for Research and Innovation (FP) and ran from 2014 to 2020 with a budget of EUR 82 billion, including funding for Euratom and ITER.[35] FP8, Euratom and ITER together are referred to in Switzerland as the Horizon 2020 package. Compared to the previous generations of FPs, Horizon 2020 significantly streamlined organisational aspects by placing all EU programmes and initiatives relating to research and innovation under a single roof (Fig. 4.1). The programme covered the three policy priorities 'Excellent Science', 'Industrial Leadership' and 'Societal Challenges', each of them corresponding to one of three pillars, as well as the two specific objectives 'Spreading Excellence' and 'Science for Society'. In the following the aim of each programme part and the participation opportunities for researchers in Switzerland are discussed. Figure 4.2 summarizes the budget breakdown for the Horizon 2020 package.

Figure 4.1 Structure of the Horizon 2020 package.



Sources: EC and SERI

[34] SERI (2018): Swiss participation in European Research Framework Programmes – Facts and Figures 2018.

[35] The official budget breakdown for programme parts and the yearly breakdown stem from two different sources (information from the EC budget team vs. Horizon 2020 website) that result in a difference of about EUR 4 billion in the total amount budgeted for Horizon 2020.

Pillar I: Excellent Science	EUR 24.4 billion or 29.7% of total budget of the Horizon 2020 package

Pillar I promoted excellent fundamental and pioneering research in Europe by incorporating two important funding instruments. Firstly, the ERC, which was only founded in 2007 but had already established a strong reputation, awarded large grants for highly competitive mono-beneficiary research projects across all disciplines to scientists at more advanced stages of their careers. Secondly, the MSCA provided important training and mobility opportunities for young researchers. In addition, in pillar I funding was awarded to cross-disciplinary collaborations in innovative fields of research with a view to develop future technologies (the Future and Emerging Technologies FET flagships) and to high-quality research infrastructures for the common use of scientists within Europe and beyond.

At the start of Horizon 2020 in 2014, participants in Switzerland were excluded from certain ERC grants and certain MSCA instruments because participation in mono-beneficiary calls was not possible for countries with non-associated status. This led to Swiss researchers missing two ERC calls (ERC Starting and Consolidator Grants) in 2014. In view of the great importance of ERC grants for research in Switzerland, the Swiss government mandated the Swiss National Science Foundation (SNSF) to introduce transitional measures for the missed calls. As soon as the partial association for pillar I had been reached at the end of 2014, participants in Switzerland could apply to all calls for proposals of pillar I, including the ERC and MSCA calls, and were funded by the EC if evaluated positively.

Pillar II: Industrial Leadership	EUR 17.0 billion or 20.7% of total budget of the Horizon 2020 package

Pillar II sought to further invest in research and development in key areas of industry such as information and communication technologies, nanotechnologies, advanced materials, biotechnology, advanced manufacturing and processing and space research. In addition, it offered access to risk finance and included financial measures focused specifically on SMEs in order to help their establishment in the market. Furthermore, in 2017 the EIC was established, which combined various innovation funding schemes (e.g. the Fast Track to Innovation pilot programme).

Participants in Switzerland had the status of non-associated country participants in all calls for proposals under pillar II until the end of 2016. This meant that in case of a positive evaluation by the EC, their participation in a collaborative project was directly funded by the Swiss government until 2016. This status resulted in Swiss institutions being excluded from the pillar II mono-beneficiary grants relating to risk finance and from the SME instrument until 2017, when Switzerland became associated to Horizon 2020 and participation in all projects was again funded via the mandatory contribution to the EC.

Pillar III: Societal Challenges	EUR 29.7 billion or 36.1% of total budget of the Horizon 2020 package

With the highest budget share in Horizon 2020 (Fig. 4.2), measures in pillar III were focused on societal issues where solutions require interdisciplinary cooperation. Pillar III was structured into seven thematic areas: health; food, agriculture and fisheries; energy; transport; environment (including climate change); inclusive societies; and security.

As in the case of pillar II, Switzerland was considered a non-associated country until the end of 2016. Hence, researchers and innovators in Switzerland were able to join collaborative projects with partners from EU member states or associated countries, but did not receive funding through the EU. Instead, the Swiss government provided direct funding for Swiss partners in approved collaborative projects (in the same way as project participation was funded prior to 2004). After 2016 and with the association agreement in place, Swiss participants were again funded by the EC.

Specific objectives: Spreading Excellence and Science for Society	EUR 1.3 billion or 1.6% of total budget of the Horizon 2020 package

Under Horizon 2020 measures were implemented to reach specific objectives, such as the 'Spreading Excellence and Widening Participation' programme. These were targeted at, in terms of research and innovation, lower-performing EU member states, in order to tackle internal performance disparities.

The 'Science with and for Society' programme originated from the Horizon 2020 objective of the same name. Its goal was to move forward areas such as citizen science, gender equality, science education as well as ethics and research integrity.

During the period of partial association between 2014 and 2016, Switzerland was able to participate in the Spreading Excellence and Science for Society programmes with associated country status. Positively evaluated projects were thus funded by the EC for the entire duration of Horizon 2020.

Euratom Research and Training Programme (Euratom RTP)	EUR 2.4 billion or 2.9% of total budget of the Horizon 2020 package

The Euratom RTP 2014–2018 and its extension in 2019–2020 ran as a complementary funding programme to Horizon 2020 with the same rules for participation. The general objective of the programme was 'to pursue nuclear research and training activities with an emphasis on continuous improvement of nuclear safety, security and radiation protection, notably to potentially contribute to the long-term decarbonisation of the energy system in a safe, efficient and secure way'[36]. The programme was implemented through nuclear actions of the JRC and activities were carried out by consortia consisting of industry, academia and research and development organisations with financial support from the EC.

Switzerland took part in the Euratom RTP as an associated country for the entire duration of Horizon 2020.

[36] Council Regulation (Euratom) No 1314/2013 of 16 December 2013 on the Research and Training Programme of the European Atomic Energy Community (2014–2018) complementing the Horizon 2020 Framework Programme for Research and Innovation.

ITER	EUR 3.0 billion or 3.5% of total budget of the Horizon 2020 package

Launched in 2007, the construction of ITER continued during the 2014–2020 period. Most of the civil construction work had been completed and the project advanced to the device's assembly phase. The manufacturing of challenging and technically complex first-of-a-kind components proved to be feasible. The installation of the 23 000-tonne tokamak in its pit and the equipment installation in the surrounding building progressed.[37]

Switzerland participated in the realisation of ITER under the umbrella of the EU as a full member of the European Joint Undertaking for ITER and F4E for the entire duration of Horizon 2020. Switzerland's financial contribution was covered in the Horizon 2020 and Euratom association agreement between Switzerland and the EU (see Section 3.3).

Further programmes and initiatives	EUR 4.6 billion or 5.6% of total budget of the Horizon 2020 package

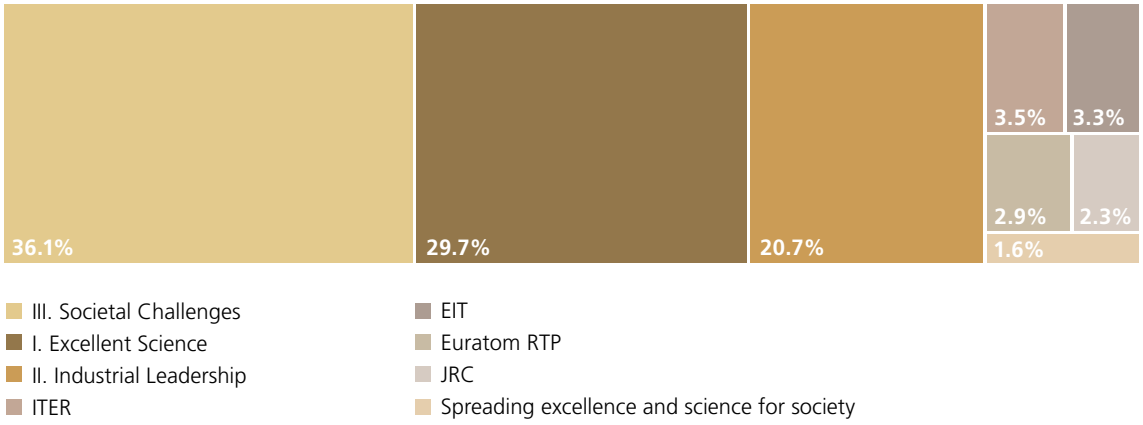
Under Horizon 2020, funding was also provided to additional programme components including the non-nuclear activities of the JRC and the European Institute of Innovation and Technology (EIT), which was previously financed outside the framework programme.

Furthermore, Horizon 2020 contributed to the budgets of numerous other research and innovation programmes, such as COST, the public-to-public (P2P) and public-private partnerships (PPP) including the initiatives under Art. 185 and Art. 187 TFEU (see Subsection 5.2.1) and the Competitiveness of Enterprises and Small and Medium-sized Enterprises programme (COSME, formerly CIP).

During the entire duration of Horizon 2020, Switzerland's participation in COST actions allowed researchers in Switzerland to continue benefitting from access to international networks in various research fields. In all other initiatives, Switzerland counted as a non-associated country until the end of 2016 and as an associated country only from 2017. Here, the conditions already described under pillars II and III applied.

[37] https://commission.europa.eu > Strategy and policy > EU budget > Performance and reporting > Programme Performance Statements > ITER – Performance > Budget performance – outcomes (status: 01.10.2023).

Figure 4.2 Breakdown of Horizon 2020 package budget by programme area (in %)



Sources: EC and SERI

One of the main goals of Horizon 2020 was to bring about the Innovation Union[38], a key objective in the EU's Europe 2020 policy strategy[39] for the subsequent years. Its aim was to encourage innovative research ideas and their implementation in the form of marketable products and services. This should lead to greater European competitiveness, employment and prosperity. As a result, Horizon 2020 covered nearly the entire value-added chain from fundamental research through applied research to technological development. The increase in funding with respect to previous framework programme generations was a reflection of the growing importance of research. Knowledge, technology and innovation were seen as the EU's main strengths and the foundation for growth and employment.

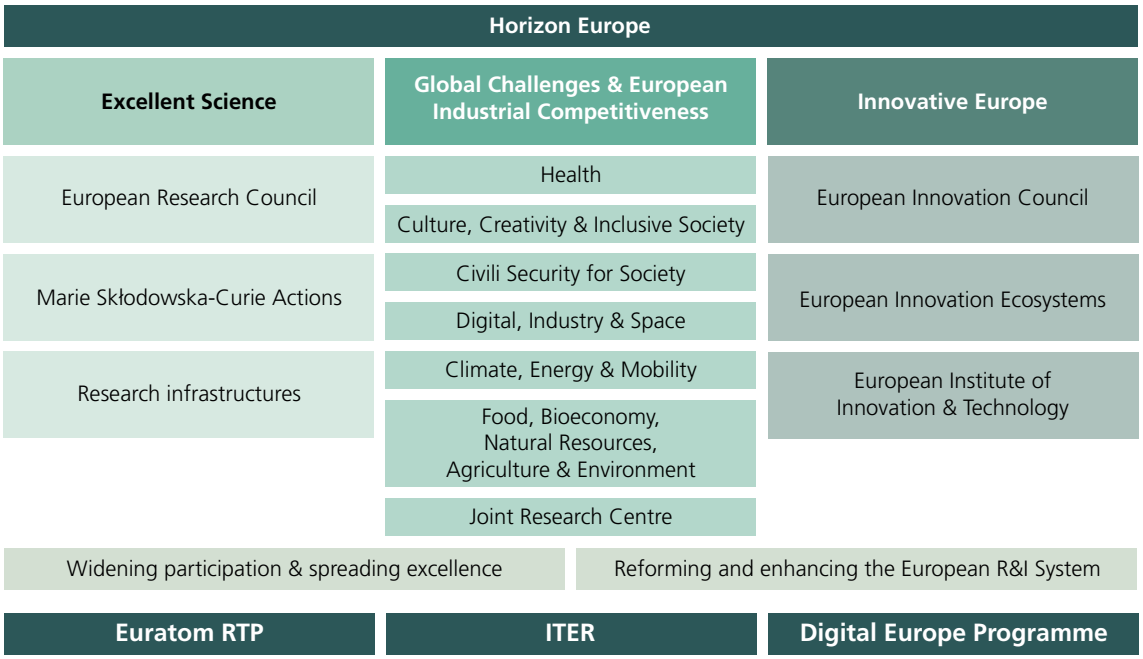
4.2 Structure of the Horizon Europe package and Switzerland's current status

The Horizon Europe package with a budget of EUR 109 billion includes the current and ninth FP Horizon Europe, Euratom RTP, ITER and the DEP and runs from 2021 to 2027. As stated by the EC, the new FP aims to strengthen the EU's science and technology base by investing more in highly qualified workers and cutting-edge research to help drive forward the EU's strategic priorities. This is also reflected in the restrictions that are placed on certain calls for proposal in the areas of quantum, space and high-performance computing, with the aim of achieving strategic independence in the respective research areas. Furthermore, importance is still put on solving global challenges (called societal challenges in Horizon 2020) and – in line with the UN's Sustainable Development Goals – an additional focus is put on topics related to the green and digital transformations. Like Horizon 2020, Horizon Europe is structured into three pillars, as shown in Figure 4.3, but adds new elements and introduces simplifications. The opportunities for participation for Swiss researchers are detailed in Figures 4.4 and 4.5 and in the following paragraphs, while Figure 4.6 summarises the budget breakdown for the Horizon Europe package.

[38] Europe 2020 Flagship Initiative Innovation Union, European Commission, COM (2010) 546 of 6 October 2010.

[39] Europe 2020. A strategy for smart, sustainable and inclusive growth, European Commission, COM (2010) 2020 of 3 March 2010.

Figure 4.3 Structure of Horizon Europe package



Source: EC.

Pillar I: Excellent Science	EUR 25.0 billion or 23.0% of total budget of the Horizon 2020 package

As in the previous FP Horizon 2020, pillar I aims to strengthen and expand the excellence of the EU's science base and comprises three funding schemes: the ERC, which continues to fund investigator-driven competitive research in all fields on the basis of scientific excellence; the MSCA, which aim to equip researchers with new knowledge and skills through mobility and training; and the Research Infrastructures, which seek to integrate and interconnect research infrastructures.

Most instruments in pillar I are mono-beneficiary calls (including ERC and MSCA), which are non-accessible for Swiss participation due to the current status as a non-associated country (see Fig.4.4). As an alternative, the Swiss government has introduced transitional measures from 2021 (see Section 4.3).

Figure 4.4 Eligibility and funding of Swiss participations in Horizon Europe package 2023[40]

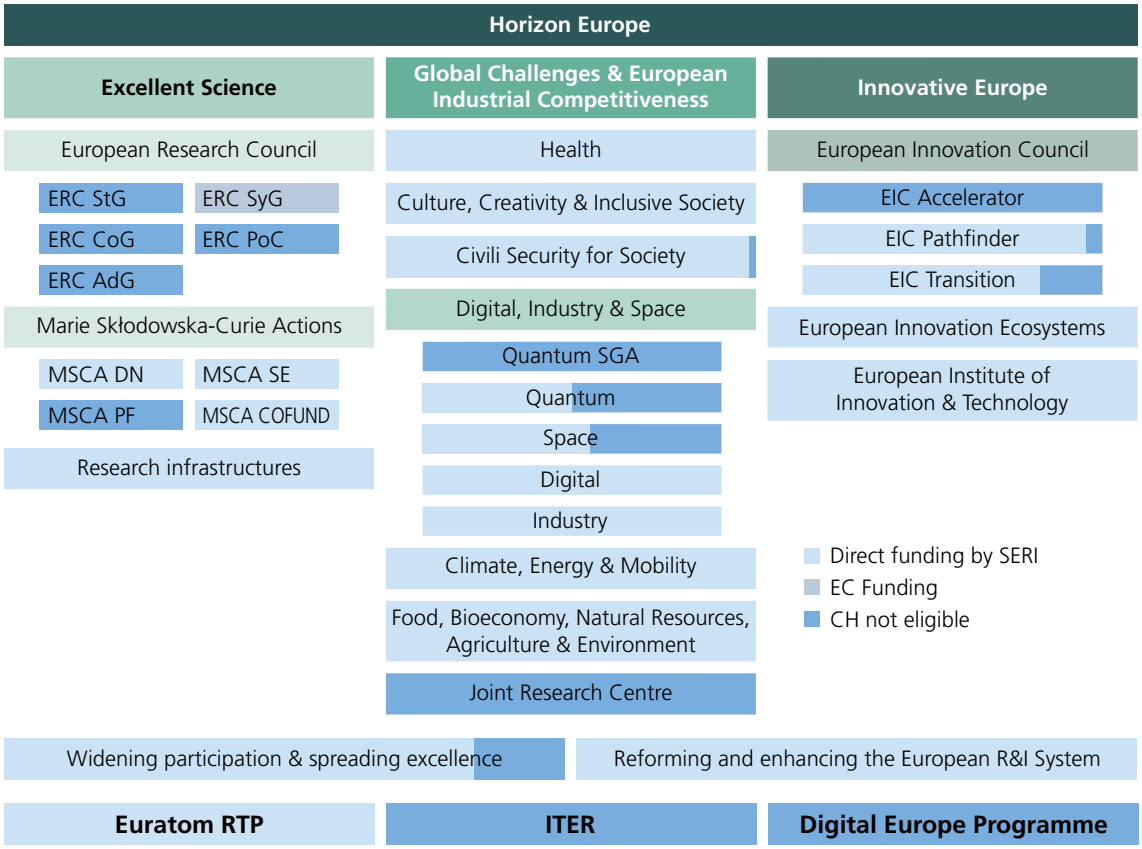


Fig. 4.4: We illustrate the programme areas of the Horizon Europe package where a participation for researchers and innovators is possible and where participants in Switzerland are not eligible. Based on the available budget in the 2023 work programmes.

Sources: EC and SERI.

[40] Not all exclusions are based on the current status as a non-associated third country (for example EIC Pathfinder, EIC Transition and Widening Participation and Spreading Excellence).

Pillar II: Global Challenges and European Industrial Competitiveness	EUR 53.5 billion or 49.2% of total budget of the Horizon Europe package

With almost half of the total budget allocated to this pillar, pillar II has the largest share of the funding of the programme (Fig. 4.6). Similar to pillar III in Horizon 2020, it is divided into different thematic areas and focuses entirely on collaborative research projects, i.e., projects carried out jointly by various project partners from different countries. Pillar II is organised into six clusters, each of which has a specific thematic focus and aims at boosting key technologies to strengthen the EU's technological and industrial capacities.

Further to this, the non-nuclear activities of the JRCs, which provide independent scientific and technical support to policymakers in the EU and its member states, are newly included in pillar II.

A new element in this pillar encompasses the EU-wide mission areas (see Section 7.3), which are designed to find solutions to some of the major problems of our time (such as cancer and climate change) and to advance the strategic priorities of the EU and the achievement of the SDGs through ambitious and applied long-term research and innovation. Citizens, stakeholders, the European Parliament and EU member states are involved in these mission areas to increase the visibility of research and innovation and make science more inclusive.

Another new element in pillar II is the European Partnerships, which are established under the six clusters (with some exceptions including EuroHPC, which is part of the DEP, and the EIT KICs which are integrated in pillar III) and have steadily grown in number and relevance since their introduction. These partnerships aim to facilitate cooperation between the EC and private and/or public partners in order to address some of Europe's most pressing challenges through joint research and innovation initiatives and to modernise industry. A distinction is made between co-programmed, co-financed and institutionalised partnerships (see Section 7.2).

Researchers and innovators in Switzerland can participate in most collaborative calls for proposals in pillar II as so-called 'associated partners'. Given Switzerland's status as a non-associated third country, they are funded directly by the Swiss government if the project proposal is positively evaluated by the EC (Fig. 4.5). The extent of participation for non-associated third countries in Horizon Europe is, however, limited in two ways. First, as of this programme generation, participants from non-associated countries are unable to coordinate projects, a role that Swiss partners have held frequently in previous FPs. Second, the EU has introduced restrictions on participation for associated and non-associated third countries for some calls in strategic areas such as quantum, high-performance computing and space.

Because there is currently no association agreement, Switzerland is also excluded from the relevant activities of the JRC including the Collaborative Doctoral Partnerships Programme (CDP). Participation in the EU Missions and the institutionalised partnerships is possible, with the exception of EuroHPC, as outlined in Figure 4.5. The participation possibilities for the other types of partnerships are described in Subsection 7.2.2.

Figure 4.5 Eligibility and funding of Swiss participations in Horizon Europe package 2023, pillar II

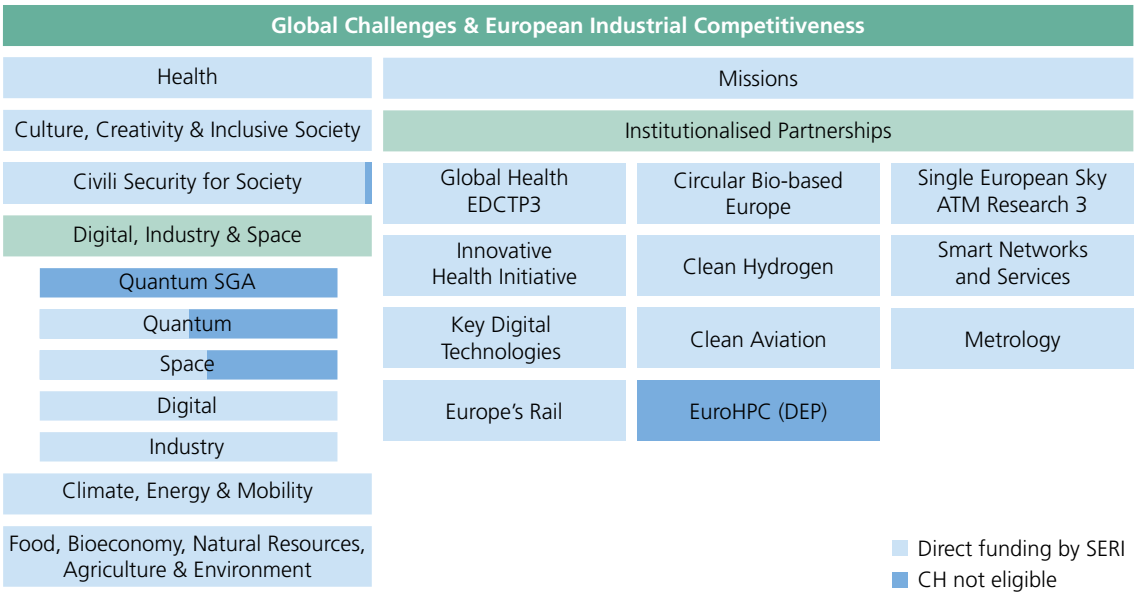


Fig. 4.5: We illustrate the areas of pillar 2 where a participation for researchers and innovators is possible and where participants in Switzerland are not eligible. Based on the available budget in the 2023 work programmes.

Sources: EC and SERI.

Pillar III: Innovative Europe	**EUR 13.6 billion or 12.5% of total budget of the Horizon Europe package**

The third pillar aims at advancing the EU's capabilities in science-based innovation, with a major role given to the EIC. It is now an integral part of Horizon Europe, with its own governance structures and research funding instruments that are laid out in a separate work programme. This pillar contributes to the development of the entire European innovation landscape. On the one hand this is done by promoting the role of the EIT, which, compared to Horizon 2020, is now integrated in the pillar structure of Horizon Europe. On the other hand, the European Innovation Ecosystems (EIE) serves to better connect innovation ecosystems at the European, national and regional levels and therewith complement the actions of the EIC and the EIT.

Just as outlined in pillar II, researchers and innovators in Switzerland are also eligible to participate in calls for collaborative projects from pillar III as associated partners and are directly funded by the Swiss government if the EC evaluates the project positively. They are, however, excluded from the mono-beneficiary calls of the EIC and from some calls in areas of strategic importance for the EU that form part of this pillar. Similarly, as for non-accessible instruments from pillar I, the Swiss government has introduced transitional measures for these parts of the programme (see Section 4.3).

Transversal components: Widening Participation and Reforming the European R&I-System	EUR 3.4 billion or 3.1% of total budget of the Horizon Europe package

Under Horizon Europe, the EC funds projects to strengthen R&I across Europe through the transversal component Widening Participation and Spreading Excellence, as was the case for Horizon 2020. It aims to build and strengthen R&I capacities in so-called widening countries, which had a low participation rate in previous FPs.[41]

The second transversal component, Reforming and Enhancing the European R&I System, can be compared to the former specific objective Science for Society and aims to increase support to EU member states in their efforts to make the most of their national R&I potential and promote an ERA where researchers, scientific knowledge and technology circulate freely.

As shown in Figure 4.4, the calls for proposals of these programmes are generally open to the participation of non-associated countries and are funded directly by the Swiss government when positively evaluated by the EC. The few restrictions are not due to the non-association, but because Switzerland is not a widening country.

Euratom Research and Training Programme (Euratom RTP)	EUR 2.0 billion or 1.8% of total budget of the Horizon Europe package

The Euratom RTP 2021–2025 builds on its predecessor and focuses on the continuous improvement of nuclear safety, security and radiation protection, as well as on the maintenance and further development of existing nuclear expertise. In addition, it complements the objectives of Horizon Europe in terms of energy transition by contributing to the implementation of the European fusion roadmap.[42] The mobility of researchers in the nuclear field is newly supported through the MSCA. A significant part of the research is implemented through three co-funded European Partnerships.

Switzerland has not been associated to the Euratom RTP since 2021. However, researchers and innovators based in Switzerland can participate in collaborative projects open to non-associated third countries and receive funding directly from the Swiss government in the framework of the transitional measures.

[41] www.era-learn.eu > Support for Partnerships > Additional Activities & Cross Cutting Issues > Openness & Transparency > Widening and Inclusiveness (status: 01.10.2023).

[42] https://commission.europa.eu > Strategy and policy > EU budget > Performance and reporting > Programme Performance Statements > Euratom Research and Training – Performance (status: 01.10.2023).

ITER	EUR 5.6 billion or 5.2% of total budget of the Horizon Europe package

The ITER facility is expected to enter into operation and deliver its first experimental results by 2025. The EU continues its involvement, including the procurement of equipment, installation, general, technical, and administrative support for the construction phase, as well as participation in commissioning and operations.[43] These contributions are delivered through the F4E Joint Undertaking as the European domestic agency for ITER.

In the absence of an agreement associating Switzerland to the Euratom RTP and regulating the Swiss contribution to the F4E activities, Switzerland's participation in ITER has been interrupted since 2021. The EU currently does not consider Switzerland a participating state in ITER. Swiss companies and research institutions can only respond to the calls for proposals and calls for tenders launched by F4E and the ITER Organization if the required competencies are not available from these organisations' member countries. Some Swiss research institutions benefit from collaboration agreements with F4E and the ITER Organization at an institutional level to conduct common research projects of mutual interest. SERI provides funding to those institutions within the framework of the transitional measures.

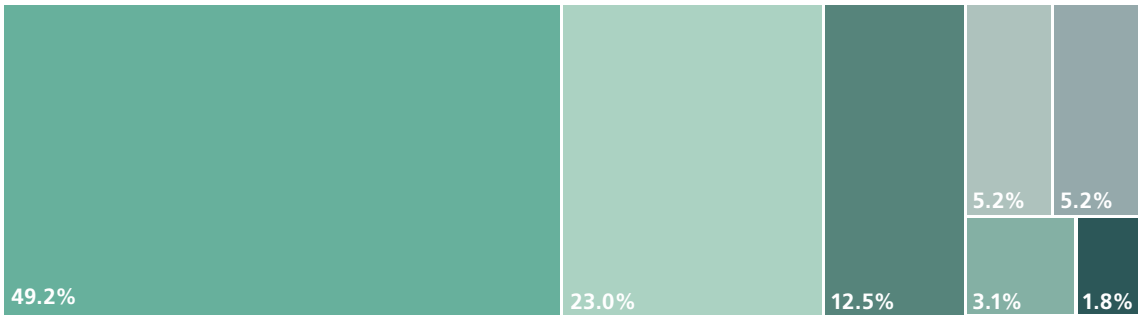
Digital Europe Programme (DEP)	EUR 5.7 billion or 5.2% of total budget of the Horizon Europe package

The DEP is a new funding programme that supports the EU's objectives with respect to the green and digital transitions. The programme aims to support and accelerate the digital transformation, improve European competitiveness in the digital economy and promote technological independence through investment and innovation. To this end, the DEP includes thematic areas like information and communication technologies that were previously funded under Horizon 2020. It focuses on funding for projects in five crucial areas, known as specific objectives: supercomputing, artificial intelligence, cybersecurity, advanced digital skills and ensuring the wide use of digital technologies across the economy and society.

Since the start of the DEP in 2021, researchers and innovators in Switzerland have not been eligible to participate in the programme since countries not associated to the DEP are in general not eligible to participate in the projects. In exceptional cases and provided that their participation is deemed 'essential' for the achievement of the programme objectives, entities established in Switzerland may participate. The Swiss government provides direct funding in these cases. It has also introduced transitional measures in the areas of high-performance computing and semiconductor technologies, which are non-accessible to third countries due to strategic exclusions (see Section 4.3).

[43] https://commission.europa.eu > Strategy and policy > EU budget > Performance and reporting > Programme Performance Statements > ITER – Performance (status: 01.10.2023).

Figure 4.6 Breakdown of Horizon Europe package budget by programme areas (in %)



Source: EC and SERI.

4.3 Transitional measures for the Horizon Europe package

In order to efficiently and effectively compensate for Switzerland's current non-associated status in the Horizon Europe package, the Swiss government decided on transitional measures for the 2021, 2022 and 2023 calls for proposals. The funds that Parliament allocated at the end of 2020[44] for the mandatory contribution to the Horizon Europe package are used for this purpose. The transitional measures amount to over CHF 1.851 billion for 2021, 2022 and 2023. This represents a similar level of funding that would have been paid out to project participants in Switzerland if the country were associated to the Horizon Europe package. There are two types of transitional measures, as also detailed in Figure 4.7:

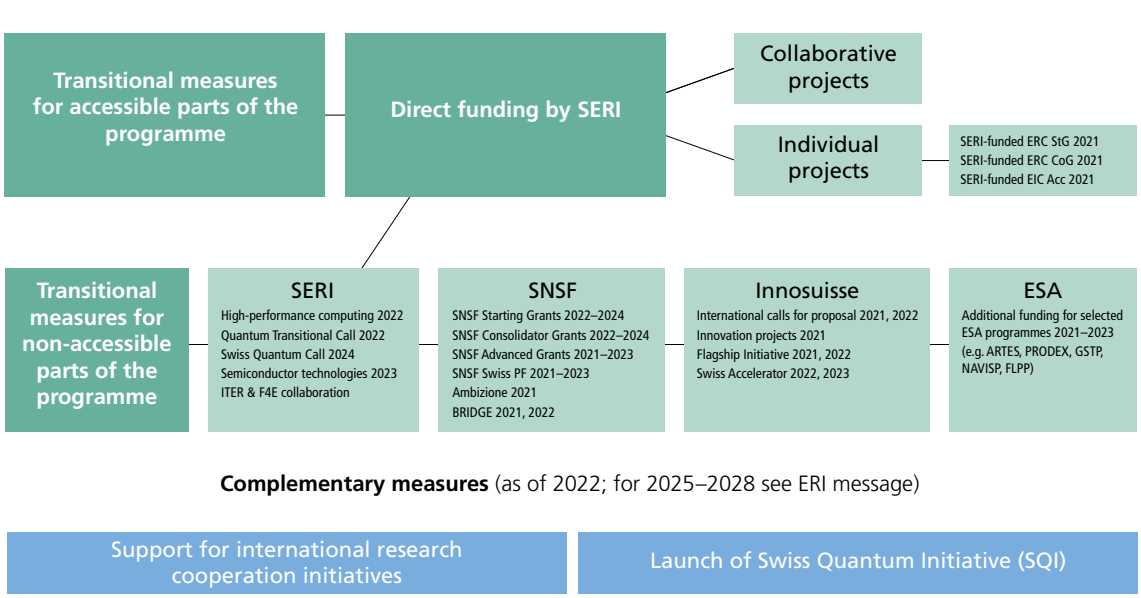
- **Transitional measures for accessible parts of the programme:** SERI provides direct funding to researchers, innovators and companies in Switzerland to enable them to take part in collaborative projects by covering their project costs. Project participants receive the same funding as if Switzerland were an associated country. However, the funding is provided directly by SERI rather than being channelled through the EU. This mechanism ensures that researchers and innovators in Switzerland can continue to take part in international projects of the Horizon Europe package and remain strong project partners for their European colleagues. At the same time, they are able to conduct cutting-edge research together and maintain an international network.

- **Transitional measures for non-accessible parts of the programme:** For non-accessible calls for proposals, SERI provides funding through temporary instruments that are implemented either by SERI itself, the SNSF, Innosuisse, the European Space Agency (ESA) or others. Where possible, these measures are based on the calls for proposals of the Horizon Europe package and are designed in such a way as to ensure that there are no funding gaps for the participants. This should result in optimal support for researchers and innovative companies in Switzerland.

Complementary measures were initiated in order to strengthen the Swiss research and innovation area independently of Switzerland's association status. They are intended to diversify and strengthen the international activities of researchers, innovators and companies in Switzerland in areas where they excel. These measures can be scaled up depending on developments over the next few years. They include support for bilateral and multilateral research cooperation with countries in and outside Europe in research areas of strategic importance for Switzerland. They also cover the launch of a national quantum initiative to establish and expand infrastructures and technology platforms in a nationally coordinated manner.

[44] Federal decree of 16 December 2020, BBl 2020 4845.

Figure 4.7 Overview of transitional and complementary measures



Source: EC and SERI.

The goal of these transitional measures is not to fundamentally replace participation in the Horizon Europe package with national programmes. Instead, the Swiss government is devising various measures to provide alternative funding opportunities until an association can be achieved. All of the measures mentioned above should help Switzerland to remain a leader in research and innovation in Europe and worldwide. The Swiss government, the Federal Department of Economic Affairs, Education and Research (EAER) and SERI are committed to ensuring that this status can be further consolidated and that researchers and innovative companies in Switzerland enjoy the best possible general conditions.

As shown in this report, although Switzerland is currently not an associated country and therefore does not have full access to all instruments, researchers and innovators in Switzerland continue to successfully take part in accessible calls for collaborative projects of the Horizon Europe package. In doing so, they make extensive use of the direct funding provided to them by the Swiss government. The transitional measures have thus been very effective. Nevertheless, Switzerland's rapid association to the Horizon Europe package 2021–2027 remains the Swiss government's declared goal, so that researchers and innovators in Switzerland gain access to all parts of the programme and can continue to be a strong and competitive partner in the European research and innovation landscape.

Key messages from Chapter 4

► Horizon 2020 and Horizon Europe have broadly the same objectives and scopes and are both structured around three pillars. However, Horizon Europe adds some new elements such as the European Innovation Council and the EU Missions.

► The pillars addressing Societal and Global Challenges have the highest budget share, accounting for more than a third of the total budget in Horizon 2020 and almost half in Horizon Europe, followed by Promoting Excellence in Science.

► The Digital Europe Programme incorporates part of the ICT-focused research from previous framework programmes and aims to accelerate the digital transformation and promote technological independence through investment and innovation.

► Possibilities for Swiss participation in the different programmes and initiatives of the Horizon 2020 and the Horizon Europe packages vary depending on Switzerland's association status. The Swiss government covers non-accessible programme parts through transitional measures.

5 Participation in the Horizon 2020 and Horizon Europe packages by country

This chapter looks at Switzerland's success in Horizon 2020 and Horizon Europe compared to other participating countries. For this the two key indicators are the number of project participations and the amount of awarded funding. Analysis of the Horizon 2020 data also includes the number of project coordination roles, participation in mono-beneficiary projects, as well as success rates. The role as a coordinator is relevant for collaborative projects where one of the project partners acts as an initiator and overall lead of the proposal and then the project itself. Coordinating projects was possible throughout Horizon 2020 but with the current non-association to Horizon Europe researchers and innovators in Switzerland have been precluded from this role. In the case of mono-beneficiary projects the grant recipient is automatically categorised as coordinator.

When interpreting data on participation in Horizon Europe it is important to keep two caveats in mind:

- Due to the current non-association, Swiss partners are ineligible for approximately one-third of the calls, including in areas where researchers based in Switzerland have traditionally excelled, such as ERC grants. This means that when comparing number of participations or committed funding the Swiss figures will not be directly comparable to other countries with full access to all calls.

- The data itself is currently incomplete as it is a combination of publicly available data and data from funding requests to SERI, neither of which yet contain all calls from 2021–2022 (see Section 9.1). Due to the time it takes from the evaluation of a call to the conclusion of the corresponding grant agreement, almost no data on calls from 2023 are included in this.

5.1 International comparison

A total of 178 992 project participations have been recorded for the completed Horizon 2020 programme, whereas 53 257 project participations have been recorded for the currently running Horizon Europe programme (as of October 2023). Project participation in this context means 'number of actors participating in Horizon 2020 or Horizon Europe projects'. If a country has two or more participating institutions in a project, those are counted individually. The number of participations therefore differs from the number of projects.

As shown in Figure 5.1, countries with a larger population accounted for the most participations in both programmes. Germany and Spain accumulated over 20% of project participations. In Horizon 2020 they were followed by France, the United Kingdom and Italy. These large countries also topped the rankings of FP7.[45] Notably, project participations from the United Kingdom have nearly halved during Horizon Europe, most likely reflecting the uncertainties related to the UK's association status in the first three programme years.

During Horizon 2020, Switzerland was the associated country with the most project participations (4967), ahead of Norway (3296) and Israel (2034). Switzerland's share in total participations on the other hand has been declining over the course of the programme generations, dropping from 3.2% in FP7 to 2.8% in Horizon 2020 to 2.1% in Horizon Europe. Several factors are likely driving this trend. As the framework programmes became accessible and attractive to more and more countries, the total number of participations was distributed across more countries, such that the share of participations of previously participating countries declined. In the case of Switzerland, its association status and resulting exclusions from parts of the programme at the beginning of Horizon 2020 and again since the start of Horizon Europe also play a part. About one third of Horizon Europe calls are currently inaccessible to researchers and innovators based in Switzerland. Furthermore, the participation rates for Horizon Europe are likely incomplete (see Section 9.1).

[45] Detailed data on Switzerland's participation in FP7 can be found in the previous edition, SERI (2018): Swiss participation in European Research Framework Programmes – Facts and Figures 2018.

Figure 5.1 Participation in Horizon 2020 and Horizon Europe, by country

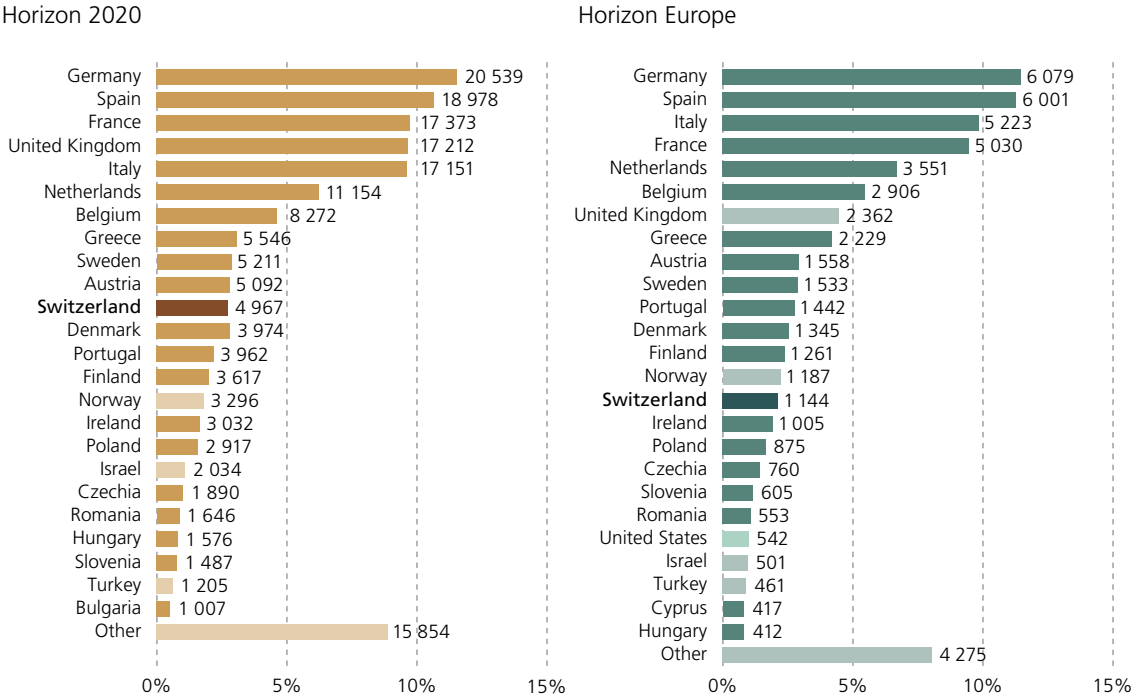


Fig. 5.1: The x-axis denotes the participation rate for a given country, meaning the number of participations in a particular country divided by the total number of participations, while the bars are labelled with the number of participations by country. Only countries with at least 1000 participations are shown for Horizon 2020 and at least 400 participations for Horizon Europe.

Sources: EC and SERI.

Figure 5.2 shows the number of project participations in Horizon 2020 and Horizon Europe per 1000 researchers for countries above a certain threshold of number of participations (at least 1000 project participations in Horizon 2020 or 400 in Horizon Europe).[46] For countries with few project participations, this may result in a high incidence if the researcher population is also low. Those countries are therefore not comparable to the majority of participating countries. Cyprus for example is above the threshold in the Horizon Europe data, where it leads the ranking with 257 participations per 1000 researchers (not shown in Figure 5.2) – far ahead of second-place Slovenia with 55 participations per 1000 researchers. Countries with such small number statistics are not discussed in the following.

The incidence ranking in Figure 5.2 is no longer dominated by EU member states with the largest populations. Slovenia and Greece had the highest number of project participations compared to the number of researchers in their respective countries, showing the highest incidence in both Horizon 2020 (159 and 157 project participations per 1000 researchers) and Horizon Europe (55 and 50 project participations per 1000 researchers). Spain and Italy have a relatively low density of researchers and remain towards the top of the ranking, while countries with a larger research community such as France, Germany and the United Kingdom have slid to the bottom. Switzerland with a relatively large research community is ranked eighth in Horizon 2020 with 110 project participations per 1000 researchers, which translates to around 1 project participation per 100 researchers. It remains ahead of Norway while no data on the number of researchers was available for Israel. In Horizon Europe, Switzerland slides down to 15th place. This is likely linked to Switzerland's exclusion from programme parts in which researchers based in Switzerland traditionally perform strongly. It should be noted that the incidence rate of participations per researcher may be an interesting but skewed statistic: increasingly large parts of the framework programmes for R&I are geared towards participation by the private sector and focus on innovation. Not all employees working on those projects are classified as researchers.

[46] The Eurostat data used (indicator TSC00004, in fulltime equivalents) categorises professionals as researchers whenever they are 'engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned'.

Figure 5.2 Participation in Horizon 2020 and Horizon Europe, by country, per 1000 researchers

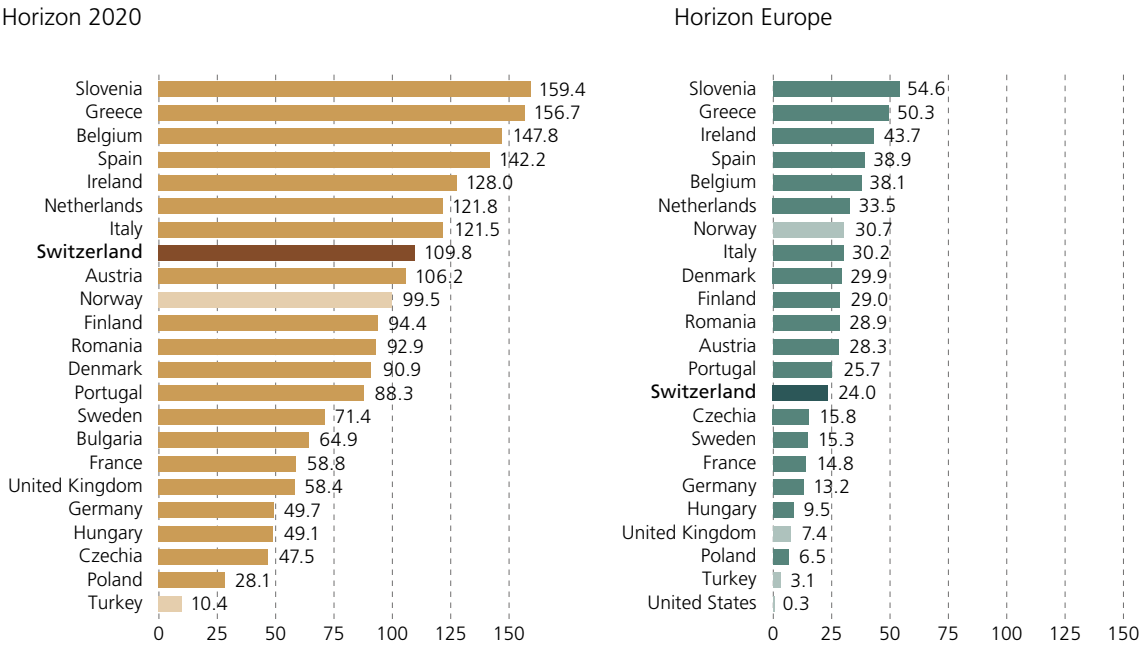


Fig. 5.2: The x-axis and bars show the number of participations per 1000 researchers in a country. Only countries with at least 1000 participations are shown for Horizon 2020 and at least 400 participations for Horizon Europe. Israel is not shown here since no data was available on its number of researchers. The number of researchers is defined as the average number of researchers in a country throughout Horizon 2020 and Horizon Europe.

Sources: EUROSTAT, EC and SERI.

As previously mentioned all collaborative projects include a special role for the project coordinator, who initiates and leads the overall project. Figure 5.3 shows a comparison of the total number of project coordination roles in collaborative projects across selected participating countries (left-hand side, light coloured bars) as well as the number of project coordination roles per 1000 researchers (right-hand side, light coloured bars) in Horizon 2020. In terms of the number of coordination roles Spain, Germany, Italy, France and the United Kingdom are leading the ranking, each coordinating more than 1500 projects during Horizon 2020. The Netherlands follows in sixth position, with 996 (6.6%) coordination roles. Switzerland ranks 16th, with 277 coordination roles (1.8%). Norway coordinated 312 projects and Israel 124. When looking at the number of coordination roles per 1000 researchers, Greece leads with 16 coordination roles per 1000 researchers. Ireland, Spain, Italy, Belgium and the Netherlands all tally more than 10 coordination roles per 1000 researchers. Switzerland is in 13th place with 6 coordination roles per 1000 researchers, narrowly ahead of large countries like the United Kingdom, France and Germany. As previously discussed, both of these indicators (number of coordination roles and number of coordination roles per 1000 researchers) have to be interpreted with care. The total number favours larger countries, whereas the researcher population might not include all persons participating in framework programmes and favours countries with a very small researcher population in comparison to the number of participations.

Whilst the above discussion focused on collaborative projects, in mono-beneficiary projects the principal investigator assumes the role of the coordinator by definition. The number of principal investigators in mono-beneficiary projects is also shown in Figure 5.3 (dark bars), where the left-hand side again shows the total number and the right-hand side puts it in relation to the researcher population of each country. Totalling 3843 mono-beneficiary grants, the United Kingdom's share of 18.6% places it far ahead in the ranking, followed by Spain with 2395 mono-beneficiary grants (11.6%). Researchers from Switzerland have been awarded a total of 1141 mono-beneficiary grants (5.5%). In terms of number of mono-beneficiary grants per 1000 researchers Switzerland emerges as the clear leader with 25 mono-beneficiary grants per 1000 researchers. Second in the ranking is Ireland with 20 mono-beneficiary grants, followed by Denmark with nearly 20. The United Kingdom is in sixth position with 13 mono-beneficiary grants. Most of the mono-beneficiary grants are either ERC grants or MSCA fellowships, both being awarded to excellent individual researchers. The above ranking shows Switzerland's strength in this area.

Horizon Europe data are not shown here because given Switzerland's status as a non-associated country, participants based in the country are excluded from coordinating projects and from competing for mono-beneficiary grants

Figure 5.3 Number of coordination roles and mono-beneficiary grants in Horizon 2020, by country

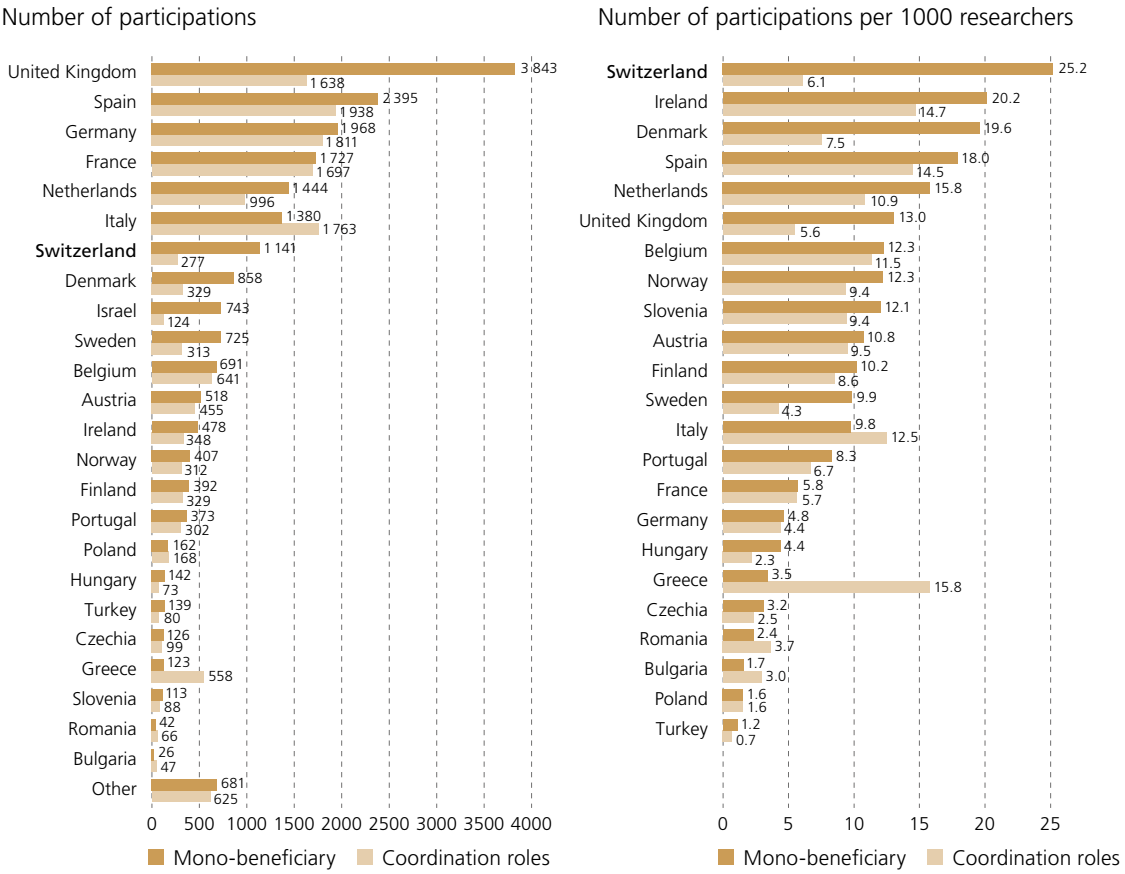


Fig. 5.3: The left-hand panel shows the number of coordination roles in collaborative projects / mono-beneficiary grants by country. The right-side panel shows the number of coordination in collaborative projects / mono-beneficiary grants divided per 1000 researchers in a given country. Israel is not shown on the right-hand panel since no data was available on its number of researchers. The number of researchers is defined as the average number of researchers in a country throughout Horizon 2020. Only countries with at least 1000 participations are shown.

Sources: EUROSTAT, EC and SERI.

Similar to the absolute number of project participations, the larger European countries dominate when it comes to the distribution of awarded funding as is shown in Figure 5.4, left-hand side. Under Horizon 2020, Germany accounts for the largest share of funding with CHF 10.954 billion, or 14.5%, followed by the United Kingdom and France, receiving 11.3% and 10.9% respectively of the total funding available. Germany and the United Kingdom also topped the ranking of funding recipients under FP7.[47] Spain, Italy and the Netherlands complete the leading group of countries in terms of committed funding. Switzerland is found in eighth position with 4.0% of committed funding (CHF 3.043 billion) and ranks first among the associated countries.

[47] Detailed data on Switzerland's participation in FP7 can be found in the previous edition, SERI (2018): Swiss participation in European Research Framework Programmes – Facts and Figures 2018.

In Horizon Europe (Fig. 5.4, right-hand side), Germany has been awarded the highest amount of funding so far, with CHF 3.973 billion in committed funding, equalling 16.5% of the total funding. France and Spain follow with 11.2% and 10.3% of the total committed funding. In contrast to Horizon 2020, Horizon Europe data does not include funding that participants from non-associated countries contribute to the project, unless they are deemed essential for the project and thus receive a direct contribution from the European Commission. This means that the funding awarded to the United Kingdom drops to almost zero. Similar to participants in Switzerland, researchers from the United Kingdom receive their funding directly from their government for the years 2021, 2022 and 2023, which is not reflected in the data. Switzerland's data is derived from the total funding requested from SERI by participants based in Switzerland, which amounts to CHF 564 million (as of October 2023). The amount for direct funding for Switzerland in Figure 5.4 only includes funding for collaborative projects[48] and only includes projects that are already contained in both the European database and the Swiss database.

Figure 5.4 Committed funding in Horizon 2020 and Horizon Europe, by country in CHF million

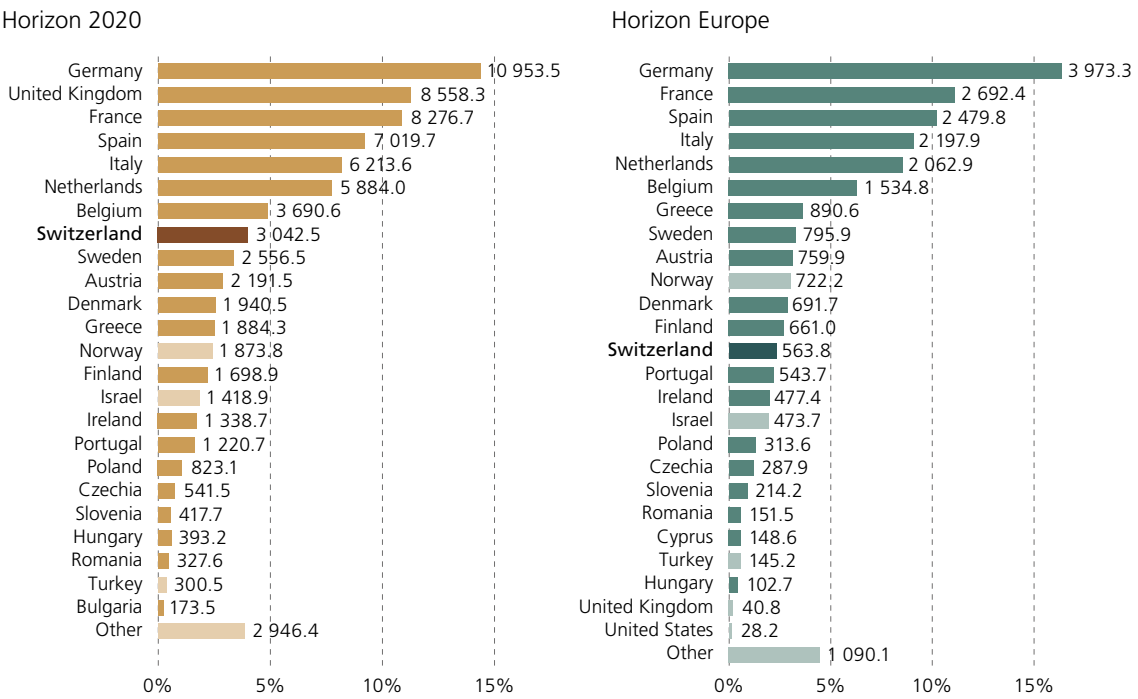


Fig. 5.4: We show the committed funding rate for a given country, meaning the committed funding going to a particular country divided by the total committed funding, while the bars are labelled with committed funding by country. For Horizon 2020 countries with at least 1000 participations and for Horizon Europe countries with at least 400 participations are shown.

Sources: EC and SERI.

The amount of awarded funding per country under Horizon 2020 can also be analysed with respect to domestic research expenditure. Figure 5.5 shows the average in awarded funding per country as a percentage of its annual gross domestic expenditure on research and development (GERD). A high percentage here indicates that EU R&I funding is of relatively high importance in relation to domestic funding. As a result, countries with strong domestic R&I funding will tend to be ranked 'lower' in Figure 5.5. Among the participating countries, Greece's funding from Horizon 2020 equates to the highest share of GERD (13.5%). It is followed by Spain, Slovenia, Portugal and Bulgaria. Countries with strong domestic research expenditure, like Germany, the United Kingdom or Switzerland rank towards the bottom. For Switzerland the funding from Horizon 2020 equates to 2.2% of its GERD.

[48] A further CHF 198 million have been attributed to funding mono-beneficiary projects under Horizon Europe that were still evaluated by the EC in 2021 (namely the ERC Starting and Consolidator Grants 2021 and the EIC Accelerator 2021), see Chapter 8 for further details.

Out of the countries shown for Horizon Europe, Cyprus ranks highest with committed funding equating to 27.5% of its GERD (not shown in the figure). It is followed by Greece and Slovenia. For Switzerland the share of R&I funding that is provided by direct funding (by SERI) of Horizon Europe projects now equates to 1.4% of its GERD. This reflects the exclusions from parts of the programme in which researchers from Switzerland usually perform strongly. Alternative funding is provided through national measures to ensure that researchers and innovators based in Switzerland have access to similar amounts of funding as would be the case with an association.

Figure 5.5 Committed funding in Horizon 2020 and Horizon Europe, by country as a percentage of the annual gross domestic expenditure on research and development GERD

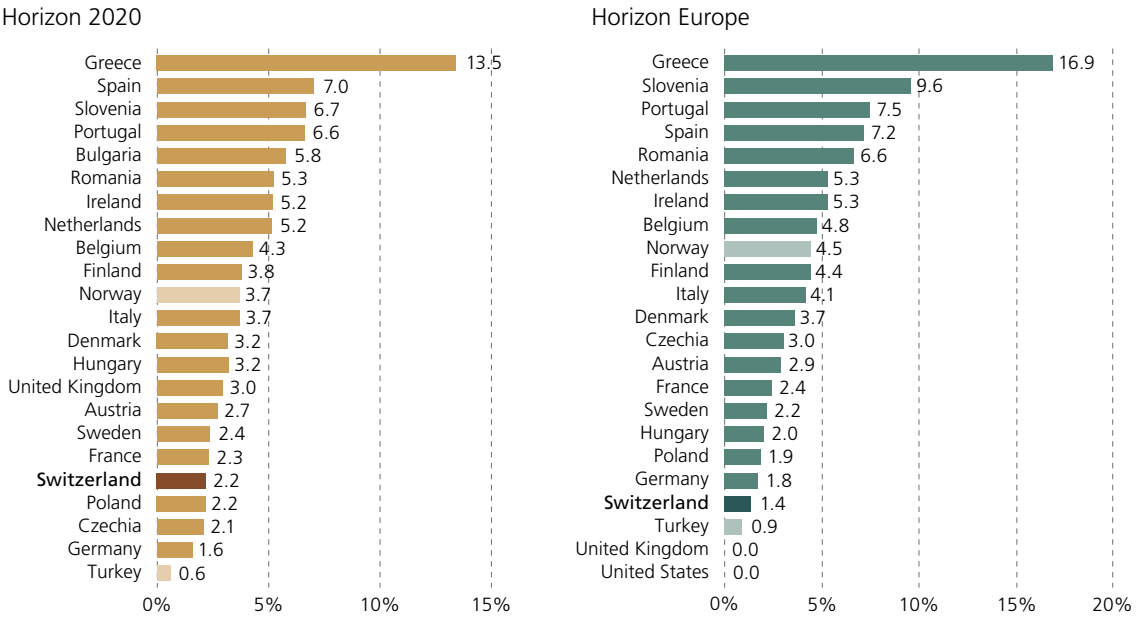


Fig. 5.5: Percentage of the committed funding via Horizon 2020 (left) or Horizon Europe (right) per country with respect to the average annual gross domestic expenditure on research and development (GERD) during the programme periods. For Horizon 2020 countries with at least 1000 participations and for Horizon Europe countries with at least 400 participations are shown.

Sources: EUROSTAT, EC and SERI.

Comparing the success rates across countries shows how successful researchers and innovators from those countries are in competing in the project-approval process. Success rates compare the number of submitted eligible and evaluated proposals to the number of approved proposals and are a measure for the quality of submitted proposals. As shown in Figure 5.6 Switzerland occupies first place in the ranking for Horizon 2020 with a success rate of 17.0%, followed closely by Belgium. Roughly every sixth project proposal from a Swiss institution is accepted by the European Commission. Despite the high number of participations from both Spain and Italy, these countries have a relatively low success rate. This indicates that a large number of proposals rather than the exceptional quality of applications contributes to their leading position in terms of number of participations.

Overall, the success rates were lower for Horizon 2020 (14.4%) than FP7, where the overall success rate across all project proposals and countries stood at 21.2%.[49] This decrease can be explained by calls for proposals in Horizon 2020 having been formulated more openly and therefore attracting more proposals. The European Commission implemented this change to address criticism about FP7 that call conditions were too narrow. However, the broader scope of the calls has had the side effect of attracting a large number of project proposals, leading to heavy oversubscription of calls and reduced success rates.

[49] Detailed data on Switzerland's participation in FP7 can be found in the previous edition, SERI (2018): Swiss participation in European Research Framework Programmes – Facts and Figures 2018. The Swiss success rate was 24.1% for FP7.

Figure 5.6 Overall success rates in Horizon 2020, by country

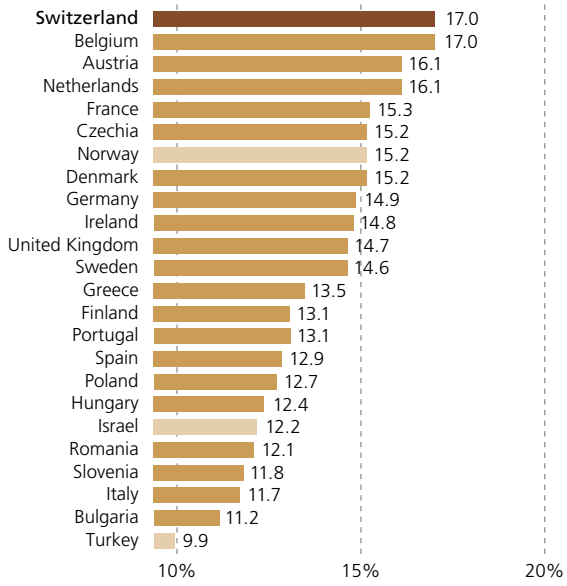


Fig. 5.6: We show the success rates of proposals for each country with at least 1000 participations in Horizon 2020. The success rate is defined by the number of proposals chosen for funding divided by all eligible and evaluated project proposals from a given country.

Sources: EC and SERI.

Figure 5.7 shows the success rates for coordination roles (left-hand side) and mono-beneficiary projects (right-hand side). Belgium and France lead the ranking for project coordination roles for collaborative projects with success rates of 18.5% and 18.0% respectively. Switzerland finds itself in 5th position with a success rate of 16.2%. When considering only mono-beneficiary grants, researchers in Switzerland are the most successful, with 16.7% of all project proposals being approved. Switzerland is followed by the Netherlands, the United Kingdom and Austria, each with success rates of around 14%.

Figure 5.7 Success rates for coordination roles and mono-beneficiary projects in Horizon 2020, by country

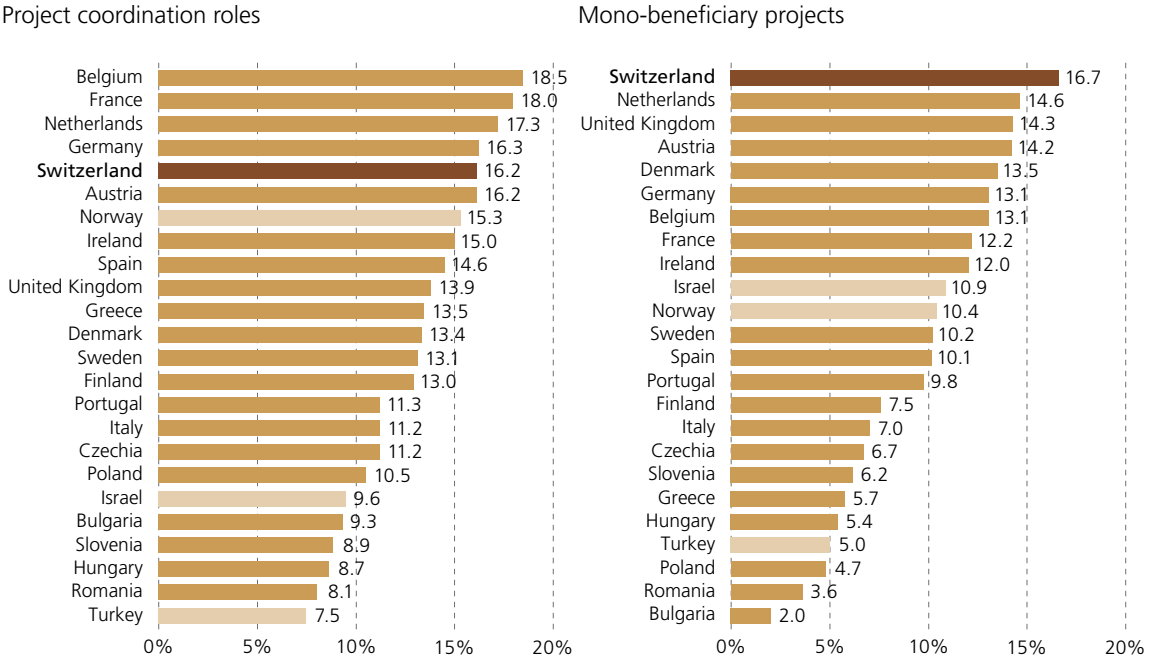


Fig. 5.7: Left panel: Success rates for coordination of collaborative projects, meaning projects where the number of participants exceeds one. Right panel: Success rates for mono-beneficiary grants. In both cases the success rates are defined by the number of proposals chosen for funding divided by all eligible and evaluated project proposals. Only countries with at least 1000 participations are shown.

Source: EC and SERI.

As Switzerland is currently not associated to Horizon Europe, it does not have access to non-public data on submitted proposals. We therefore do not present the corresponding analysis on success rates.

5.2 International collaborations

One of the main strengths of the EU Framework Programme for Research and Innovation is to enable and foster international collaboration in research and innovation. Figure 5.8 shows the number of joint projects (upper bars) between Switzerland and other countries participating in Horizon 2020 (left-hand side) and Horizon Europe (right-hand side) meaning the number of projects in which at least one partner from Switzerland and one partner from the respective country are involved. It also shows the number of potential collaborative links between Switzerland and other participating countries (lower bars). This sums for all projects the number of pairwise combinations between partners from Switzerland and another country in the respective projects. If for example Germany and Switzerland had one project with two German researchers and one Swiss researcher, then there would be two potential collaborative links between the two countries. This indicator differs from the number of joint projects in that it increases depending not only on the number of joint projects but also on the number of partners in any given project.

Figure 5.8 Joint projects and potential collaborative links with Switzerland in Horizon 2020 and Horizon Europe

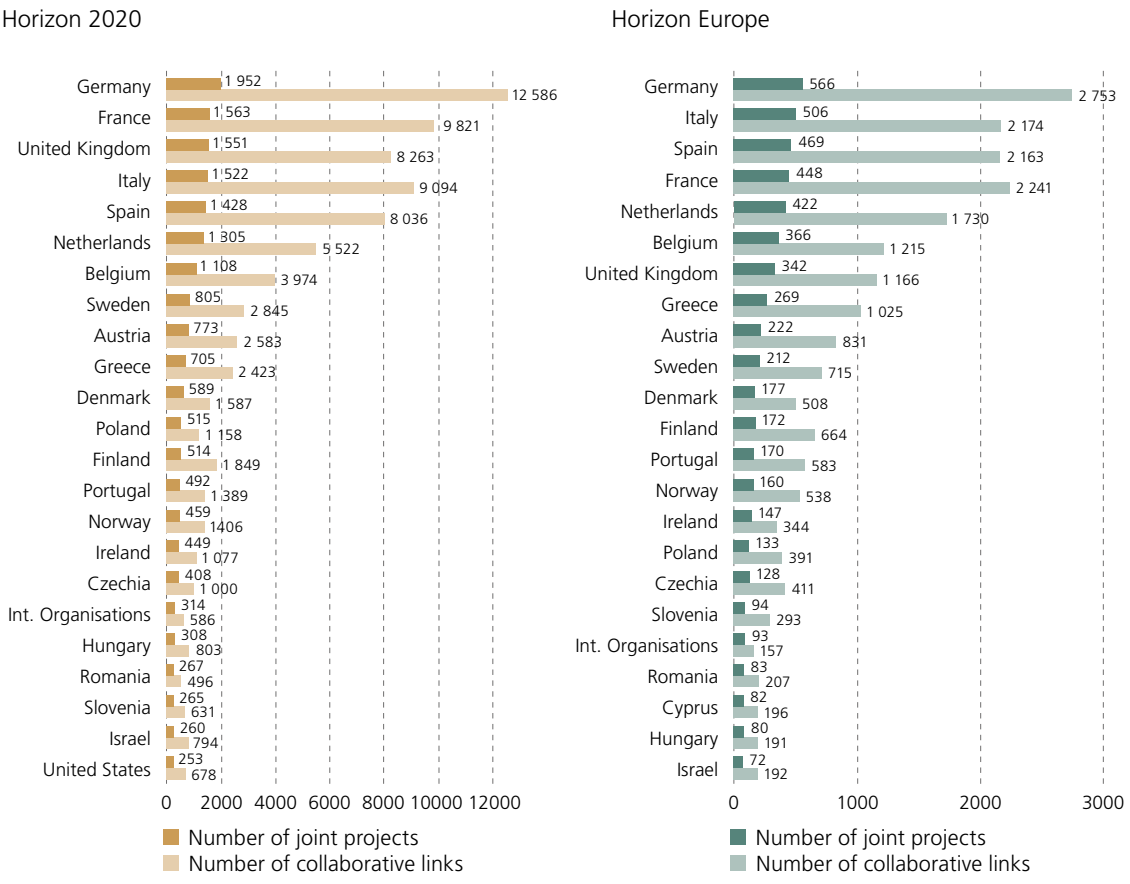


Fig. 5.8: We show the number of joint projects as well as the number of potential collaborative links for both Horizon 2020 (left panel) and Horizon Europe (right panel). The number of joint projects reflects the number of projects that Switzerland has in common with a given country while the number of potential collaboration links refers to the number of pairwise combinations between partners from Switzerland and another country for common projects. For Horizon 2020 countries with at least 1000 participations and for Horizon Europe countries with at least 400 participations are shown.

Sources: EC and SERI.

As is clear from Figure 5.8 (left-hand side), in Horizon 2020 researchers and innovators from Switzerland most frequently worked with partners from countries that also lead in terms of total number of participations (see Section 5.1). Participants based in Switzerland and Germany were jointly involved in 1952 projects and have 12 586 potential collaborative links. This is followed by France, the United Kingdom and Italy, all with more than 1500 joint projects. Among those, Switzerland had the most potential collaborative links with France (9821) followed by Italy (9094) and the United Kingdom (8263). Noteworthy is that Israel, despite its strong participation, ranks low in terms of number of collaborations with Switzerland. This may be because a relatively large share of Israel's project participations is coming from mono-beneficiary grants (36.5%).

The picture remains similar for Horizon Europe (see Figure 5.8, right-hand side) where partners from Germany and Switzerland work together on 566 projects and share 2753 potential collaborative links. This is followed by collaborations with Italy, Spain, and France. The United Kingdom is now in seventh position which is most likely related to its overall drop in project participations.

Figure 5.9 Map of joint projects with Switzerland in Horizon 2020 and Horizon Europe

Horizon 2020 Horizon Europe

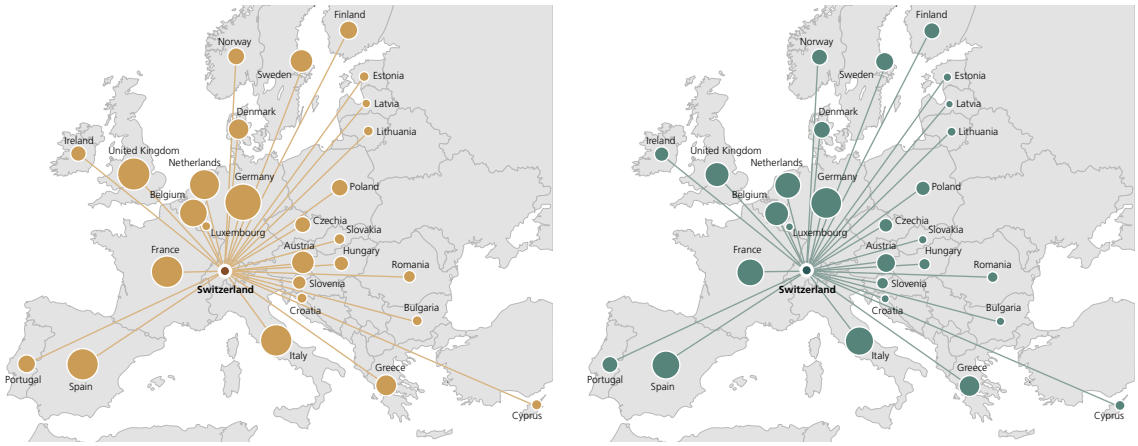


Fig. 5.9: A geographical view of the number of projects involving partners from both Switzerland and selected partner countries.
Sources: EC and SERI.

Key messages from Chapter 5

► During Horizon 2020, Switzerland was the associated country with most project participations (4967). With CHF 3.043 billion in funding awarded, it is overall in eighth position in terms of committed funding and first among the associated countries.

► With a success rate of 17.0% in Horizon 2020, Switzerland occupies first place when comparing success rates across countries.

► In terms of mono-beneficiary grants for Horizon 2020, Switzerland emerges as the clear leader across all participating countries with 16.7% of all project proposals for mono-beneficiary grants being approved.

► During Horizon Europe, Switzerland has so far recorded 1144 project participations in collaborative projects and has awarded CHF 564 million in funding.

► Germany is the country with which Switzerland has the most joint projects for both Horizon 2020 and Horizon Europe.

6 Participation of Swiss institutions in Horizon 2020 and Horizon Europe packages

6.1 Type of institutions

Participation in Horizon 2020 and Horizon Europe is in principle open to any legal entity, as well as individual researchers and innovators. Consequently, researchers from different types of institutions will participate in the programmes, and some parts of the programme are explicitly targeted at certain types of institutions. For example, SME instruments specifically address access to finance for SMEs. In this report we distinguish the following types of institutions:

1. ETH Domain: the two federal institutes of technology ETH Zurich (ETHZ) and EPF Lausanne (EPFL), as well as the four research institutes: the Paul Scherrer Institute (PSI), the Swiss Federal Institute of Aquatic Science and Technology (Eawag), the Swiss Federal Laboratories for Materials Science and Technology (Empa) and the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL).

2. Universities: the ten cantonal universities as well as the Graduate Institute of International and Development Studies (IHEID). The university hospitals also fall into this category.

3. Universities of applied sciences: the nine public universities of applied sciences.

4. SMEs: private enterprises with less than 250 employees.

5. Industry: private enterprises with 250 or more employees.

6. Non-profit organisations (NPOs): public and private non-profit organisations. International organisations with headquarters in Switzerland are not included in the Swiss participation figures.

7. Confederation: all entities that are part of the centralised (e.g. departments) or decentralised Federal Administration (e.g. MeteoSwiss). This does not include the ETH Domain.

8. Cantons and municipalities: entities of the cantonal or local governments.

6.2 Participation and coordination by type of institution

Figure 6.1 shows how the 4967 Swiss project participations in Horizon 2020 are distributed across the various types of institutions. The darkest bar on the left-hand side of the figure indicates both the total number of participations per institution type as well as the relative participation rate. Just over half of the participations (50.7%) can be attributed to public research institutions (ETH Domain: 1290, universities: 1018, and universities of applied sciences: 208), where the ETH Domain also has the overall largest participation rate across the different institutions. A total of 36.6% of the participations originate from the private sector, with SMEs having the second-largest share (1261 participations) and almost matching the ETH Domain.

Figure 6.1 also displays the number and share of coordination roles (medium shade) and mono-beneficiary projects (light shade) for each type of institution. Under Horizon 2020, researchers and innovators in Switzerland have acted as project coordinators in 277 collaborative projects (5.6% of all project participations) and have received 1141 mono-beneficiary grants (23.0% of all project participations). Therefore, the total coordination rate is 28.5% (1418). This is an increase compared to FP7 where 22.8% of all Swiss participations were project coordinators.[50] The numbers for Horizon 2020 are striking when considering that researchers in Switzerland were excluded from participating in two ERC calls in 2014. At that time, it was also uncertain whether Swiss partners would be allowed to coordinate projects under Horizon 2020.

[50] Detailed data on Switzerland's participation in FP7 can be found in the previous edition, SERI (2018): Swiss participation in European Research Framework Programmes – Facts and Figures 2018.

Corresponding to its highest share in project participations, the ETH Domain also had the largest share of coordination roles in collaborative projects as well as mono-beneficiary projects. The latter can largely be attributed to its success in the ERC calls. Considering that most mono-beneficiary grants under Horizon 2020 are either ERC grants or MSCA fellowships geared towards university researchers, SMEs managed to attract a relatively high number of mono-beneficiary grants. These stem mostly from their success in SME instruments that piloted the EIC grants.

Along with the highest participation rate, the ETH Domain secured by far the largest share of funding throughout Horizon 2020 (CHF 1.114 billion, 36.6%), followed by the universities (CHF 774 million, 25.5%) and SMEs (CHF 497 million, 16.3%), as is shown in Figure 6.1 (right panel). On average a project participation in the ETH Domain was worth CHF 863 362 compared to CHF 760 704 for universities and CHF 394 110 for SMEs. This difference can be explained by the varying amount of funding in different programme areas, but also by the large share of ERC grants – which can each be worth up to EUR 2.5 million – awarded to ETH Domain researchers.

Figure 6.1 Participation and committed funding for Swiss institutions, distinguishing coordination of collaborative projects, and mono-beneficiary grants under Horizon 2020

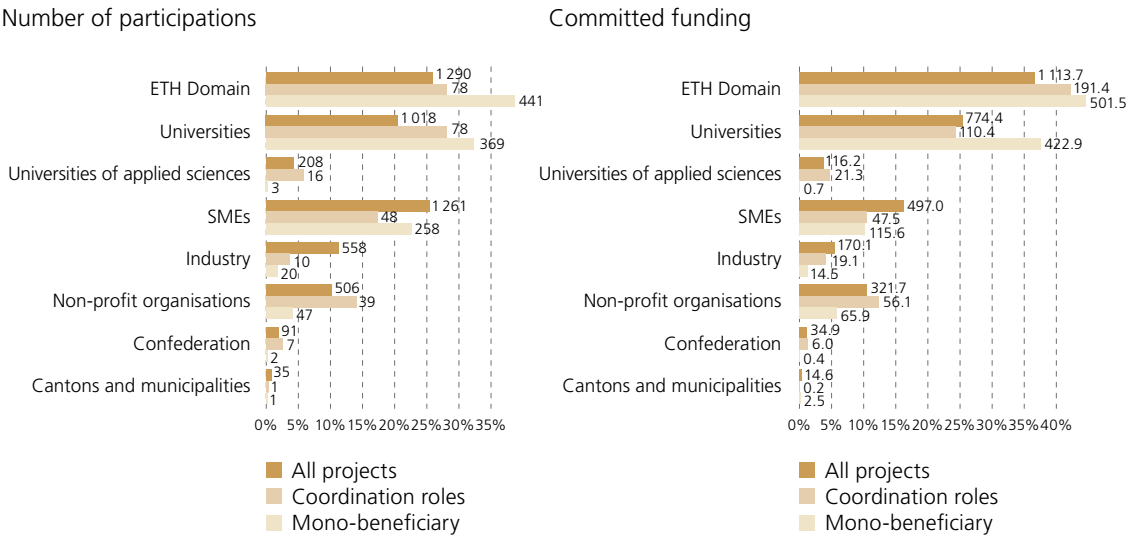


Fig. 6.1: The left-hand panel shows the participation rate by institution type in Horizon 2020, meaning the number of participations of a particular type of institution divided by the total number of participations. We distinguish between the overall number of participations, coordination roles for collaborative projects and mono-beneficiary grants. The bars are labelled with the number of participations by institution in each category. The right-hand panel shows the committed funding rate, meaning the committed funding in CHF million for a particular type of institution divided by the total committed funding in CHF million. The bars are labelled with committed funding in CHF million by institution and grant type.

Sources: EC and SERI.

Figure 6.2 shows the equivalent graph on participations by type of institution for Horizon Europe. Due to the status as a non-associated country Switzerland-based researchers are currently not able to access mono-beneficiary grants nor coordinate projects. Therefore, the figure only contains collaborative projects in accessible programme parts. As discussed previously (see Section 4.2.), due to their strategic importance, some topics exclude the participation of non-associated countries or even of associated countries. So far, under Horizon Europe, SMEs tally the largest participation rate (287, 25.1%), followed by the ETH Domain (256, 22.4%), the non-profit organisations (187, 16.3%) and the universities (182, 15.9%). The ETH Domain slipping to second place in terms of number of participations shows the importance of the ERC and MSCA grants for its researchers. Under Horizon 2020 these grants had contributed almost a third of the total participations of the ETH Domain. As far as the awarded funding is concerned, the ETH Domain outperforms (CHF 132 million) the SMEs (CHF 128 million). As expected with the non-accessibility of the ERC grants, the average funding per project in the ETH Domain is lower compared to Horizon 2020 (CHF 516 521). For SMEs it has however increased substantially to CHF 445 973 per project. There are a number of reasons for this increase, including a shift in Horizon Europe towards collaborative projects with higher average funding and an increased focus on partnerships, making participation more attractive for SMEs.

It should also be noted that comparisons between funding for various institution types are non-trivial: often, but not always, the funding rates are different for different institution types with for-profit entities having lower funding rates than non-profit organisations or the academic sector.

Figure 6.2 Participation and committed funding for Swiss institutions under Horizon Europe

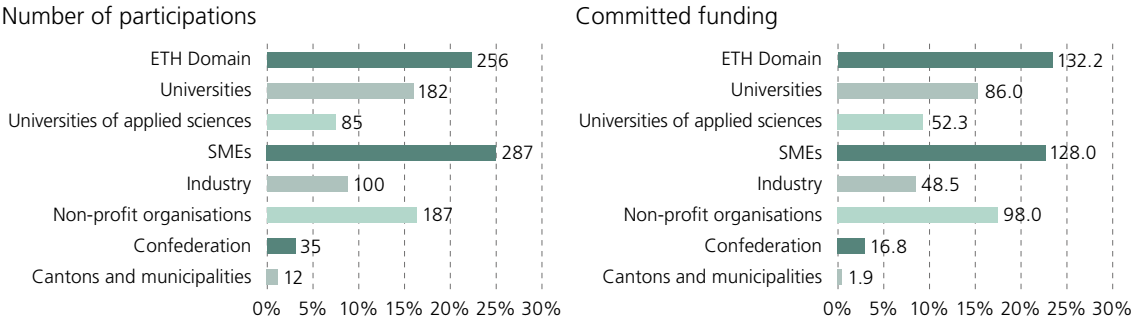


Fig. 6.2: The left-hand panel shows the participation rate by institution in Horizon Europe, meaning the number of participations of a particular institution type divided by the total number of participations, while the bars are labelled with the number of participations by institution. The right-hand panel shows the committed funding rate by institution type, meaning the committed funding in CHF million for a particular institution type divided by the total committed funding in CHF million, while the bars are labelled with committed funding in CHF million.

Sources: EC and SERI

As mentioned above, the academic research sector (including the ETH Domain, universities and universities of applied sciences) accounted for just over half of the participations in Horizon 2020 as well as almost two-thirds (65.9%) of the awarded funding. Figure 6.3 shows how successful the individual research institutions were in Horizon 2020. The two federal institutes of technology, ETHZ and EPFL, had the highest number of participations, followed by the University of Zurich. It should be noted that the number of participations also correlates with the number of researchers at any given institution, so smaller or less research-focused universities will likely participate less in the framework programmes. Further the universities of applied sciences are increasing their participation rate, having accounted for 4.0% of participations in FP7[51], 4.2% in Horizon 2020 and 7.4% in Horizon Europe – although the latest increase might to some extent be attributed to the lack of access to the ERC calls, which traditionally are a strength of the ETH Domain and to a lesser degree of the universities.

[51] Detailed data on Switzerland's participation in FP7 can be found in the previous edition, SERI (2018): Swiss participation in European Research Framework Programmes – Facts and Figures 2018.

Figure 6.3 Participation of the Swiss academic sector under Horizon 2020 and Horizon Europe, by location of institution

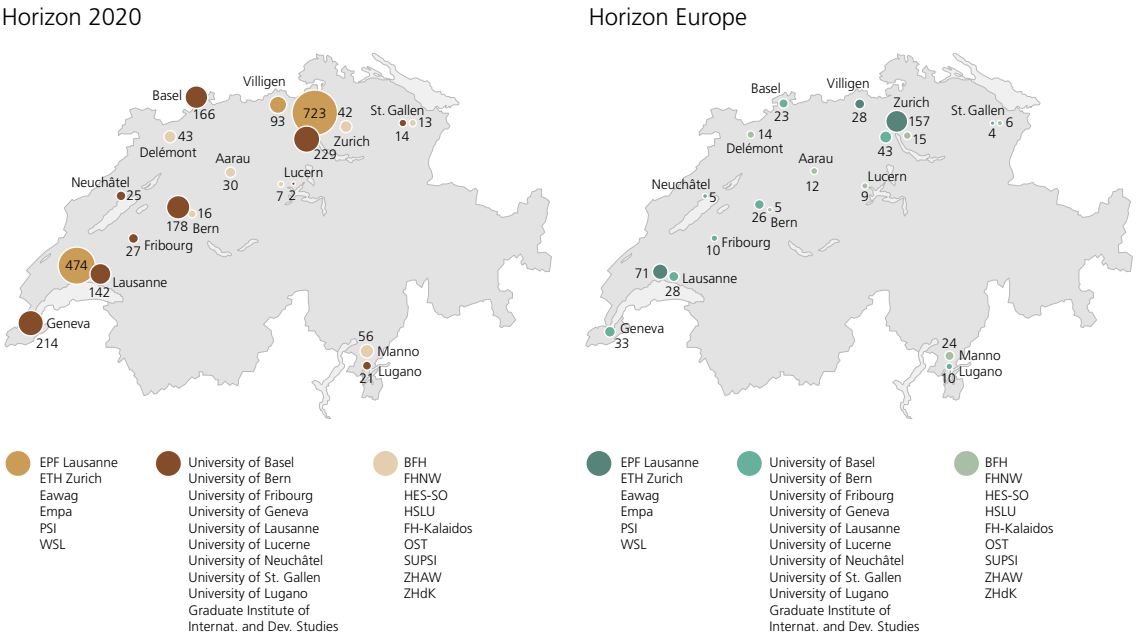


Fig. 6.3: Number of participations in Horizon 2020 (left panel) and Horizon Europe (right panel) by location.
Sources: EC and SERI.

Another important measure for the competitiveness of Swiss institutions is their success rate, defined as the ratio between the number of proposals approved for funding and the number of submitted eligible and evaluated proposals.[52] As previously discussed, the success rates among all participants vary substantially across the different programme parts. This makes it difficult to compare the success rates between different institution types since their project applications often focus on different programme parts. With that caveat in mind, we show the success rates during Horizon 2020 for the various institution types in Figure 6.4. It is evident that despite its large number of participations, the ETH Domain has a lower success rate than for example private industry. This is among other factors influenced by the fact that the ETH Domain is heavily involved in the highly competitive ERC grants.

Figure 6.4 Success rates for Swiss institutions in Horizon 2020

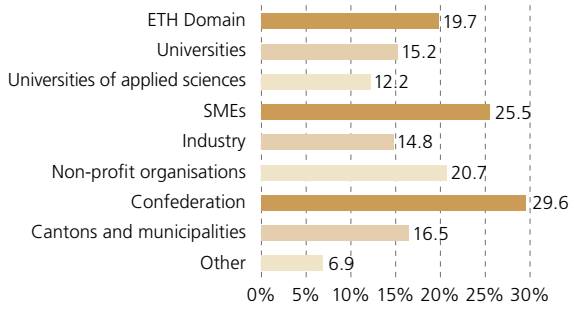


Fig. 6.4: We show the success rates during Horizon 2020 for the various institution types. The success rate is defined by the number of proposals chosen for funding divided by all eligible and evaluated project proposals.
Sources: EC and SERI.

[52] Please note that depending on the application there are two ways to define success rates: when comparing success rates of countries, it is done on a proposal basis. This means that any given proposal is only counted once for a country, independently of the number of e.g. Swiss applicants in that proposals. When comparing success rates for institutions it is done on an applicant basis, i.e. each proposal may be counted multiple times.

Key messages from Chapter 6

► The academic research sector (including the ETH Domain, the universities and the universities of applied sciences) accounts for just over half of the participations in Horizon 2020 as well as almost two-thirds of the awarded funding.

► Universities of applied sciences have nearly doubled their participation rate from 4.2% in Horizon 2020 to 7.4% in Horizon Europe.

► Over a third of the Swiss participations in Horizon 2020 can be attributed to the private sector (SMEs and industry).

► Success rates vary by institution type since different sectors are active in different programme parts. Despite its large number of participations, the ETH Domain has a lower success rate than for example industry.

► For Horizon 2020, the rate of project coordination roles and mono-beneficiary grants increased when compared to FP7.

► For Horizon Europe, the SMEs show the largest participation rate, closely followed by the ETH Domain. Note that this only includes collaborative projects.

7 Swiss Participation in the Horizon 2020 and Horizon Europe packages by programme areas and research priorities

This chapter takes a closer look at Switzerland's participation within the different programme areas and research priorities of the Horizon 2020 and Horizon Europe Packages. We will first look at participation across all programme areas as listed in Table 7.1 before focusing on some areas of particular interest and discussing those in more depth. The programme areas were also discussed in more detail in Chapter 4.

When interpreting the data in this section it should be kept in mind that some projects or project calls are administered by organisations other than the European Commission (EC). In some cases, funding is first paid out to the respective organisations and then transferred by the latter to the researchers and innovators involved. In these cases, the European Commission's database contains no data about the final recipients or the amount of funding awarded to them. The actual number of projects funded in Switzerland (or elsewhere, in the case of international comparisons) is therefore higher than the figures presented here. This discrepancy is particularly large in the space domain, where many projects were co-funded under Horizon 2020 but managed by the European Space Agency (ESA). Further examples are projects supported via the ERA-NET instrument, by the European Institute for Innovation and Technology (EIT) or via initiatives under Article 185 of the Treaty on the Functioning of the European Union (TFEU), which are only partially included by the EC data on the framework programmes. Swiss projects that were conducted under Article 187 TFEU are included in the EC data on the framework programmes and covered separately in Section 7.2. Finally, Horizon projects in the field of nuclear fusion solely involve activities to improve networking and coordination in European nuclear fusion research. The actual research projects in this field are run under the Euratom Research and Training Programme (Euratom RTP), which is governed by a separate European agreement and is subject to other funding regulations (see Section 7.7).

Table 7.1 Programme areas in Horizon 2020 and Horizon Europe

Horizon 2020		Horizon Europe	
Pilar I: Excellent Science		**Pilar I: Excellent Science**	
ERC	European Research Council	ERC	European Research Council
FET	Future and Emerging Technologies	MSCA	Marie Skłodowska-Curie Actions
MSCA	Marie Skłodowska-Curie Actions	INFRA	European Research Infrastructures (incl. e-infrastructures)
INFRA	European Research Infrastructures (incl. e-infrastructures)		
Pilar II: Industrial Leadership		**Pilar II: Global Challenges and European Industrial Competitiveness**	
ICT	Information and Communication Technologies	Cluster 1	Health
NMBP	Nanotechnologies, Advanced Materials, Advanced Manufacturing and Processing, and Biotechnology	Cluster 2	Culture, Creativity & Inclusive Societies
Space	Space	Cluster 3	Civil Security for Society
SME	Small and Mediumsized Enterprises Instrument	Cluster 4	Digital, Industry & Space
		Cluster 5	Climate, Energy & Mobility
		Cluster 6	Food, Bioeconomy, Natural Resources, Agriculture & Environment
Pilar III: Societal Challenges		**Pillar III: Innovative Europe**	
Health	Health	EIC	European Innovation Council
Food	Food, Agriculture and Aquatic Research	EIE	European Innovation Ecosystems
Energy	Energy	EIT	European Institute of Innovation and Technology
Transport	Transport		
Environment	Climate Protection and Environment		
Society	Inclusive Societies		
Security	Secure Societies		
Specific objectives		**Transversal component**	
SEAWP	Spreading Excellence and Widening Participation	WIDENING	Spreading Excellence and Widening Participation
SWAFS	Science with and for Society	ERA	Science with and for Society
Euratom Research and Training Programme		**Euratom Research and Training Programme**	

Sources: EC and SERI.

7.1 Overall Swiss Participation in the Horizon 2020 and Horizon Europe packages by programme area

As detailed in Section 5.1, Switzerland counts 4967 project participations in Horizon 2020 with total awarded funding of CHF 3.043 billion, and so far in Horizon Europe a total of 1144 participations in collaborative projects amounting to CHF 564 million. The Swiss government provides this funding directly to participants when participating in the framework programme as a non-associated country, as for parts of Horizon 2020 and the whole of Horizon Europe so far. The European Commission provides funding to the participants when Switzerland is participating as an associated country. In these cases, the Swiss government pays a yearly mandatory contribution to the EC to cover the participation of its researchers and innovators in the respective framework programme.

The left-hand panel in Figure 7.1 shows how the 4967 Swiss participations in Horizon 2020 are distributed across the different programme areas and research priorities that were introduced in Section 4.1 and are listed in Table 7.1. We show the total number of participations in each programme area for Switzerland (dark bars) and for all participating countries (light bars), as well as the participation rate. This is defined as the share of those participations with respect to all participations in Switzerland or the overall number of participations respectively. Under Horizon 2020 Swiss institutions were predominantly involved in the following research priority areas and programme areas: mobility measures under the MSCA (1070 participations, 21,5% of all Swiss participations); ERC (525, 10.6%); Information and Communication Technologies (ICT; 509, 10.2%) and Health (453, 9.1%). These numbers are also partially a reflection of the overall importance of any given programme part, as becomes clear when comparing the Swiss participation rates to the overall participation rates. Areas with a small overall number of projects will likely correlate to a small absolute number of Swiss participations. Swiss participation rates in areas like the MSCA, the ERC, and Health exceed the overall participation rates, meaning that researchers and innovators in Switzerland are more active in these programme instruments compared to the average country.

In addition to the aforementioned high interest areas, Swiss institutions exhibit a comparatively strong involvement in Future and Emerging Technologies (FET), a funding programme newly introduced in Horizon 2020 and geared towards innovation and high-risk interdisciplinary research. It focused on domains like high performance computing and quantum technologies. With a rate of 6.7% (331 participations) the Swiss participation rate in FET is nearly double the overall participation rate. On the other end of the spectrum the Swiss participation rates in the Inclusive Societies programme, which primarily concerns calls for projects in social sciences and humanities reached 1.0%, which is below the overall participation rate of 2.3%. This area had seen a low participation rate in FP7 as well.[53] It is worth mentioning that participation in the ERC started off low at the beginning of Horizon 2020 – a consequence of Swiss institutions being excluded from the first two ERC calls for proposals in 2014. As soon as the bans were lifted, participation in the ERC rose again. With 525 or 10.6% of all Swiss participations, the rate of Swiss participations is more than double the participation rate across all countries.

Displayed in the right-hand panel of Figure 7.1 are the corresponding awarded funds, both in absolute numbers as well as the respective share of each programme area in Horizon 2020. The research areas and instruments which have received by far the most funding correspond primarily to those with high Swiss participation. The ERC grants account for the largest amount of funding, namely CHF 1.111 billion or 36.5% of all funding awarded to Swiss institutions, followed by the Marie Skłodowska-Curie Actions (CHF 286 million, 9.4%), ICT (CHF 264 million, 8.7%) and health (CHF 237 million, 7.8%).

Direct comparisons between the number of participations and the committed funding per research area can only be drawn to a certain degree because the amount of funding awarded per project varies greatly depending on the individual research areas. The average committed funding per Swiss participation in Horizon 2020 across all research areas amounts to CHF 612 547. In ICT the average funding per participation was CHF 519 621 and therefore comparatively low. In contrast, ERC projects received an average of CHF 2.1 million. MSCA grants are adjusted to country-specific costs of living. MSCA researchers in Switzerland received an average of CHF 267 685 in funding, compared to the European average of CHF 215 785.

[53] Detailed data on Switzerland's participation in FP7 can be found in the previous edition, SERI (2018): Swiss participation in European Research Framework Programmes – Facts and Figures 2018.

Figure 7.1 Participation and committed funding in the Horizon 2020 package by programme area, in relation to all projects

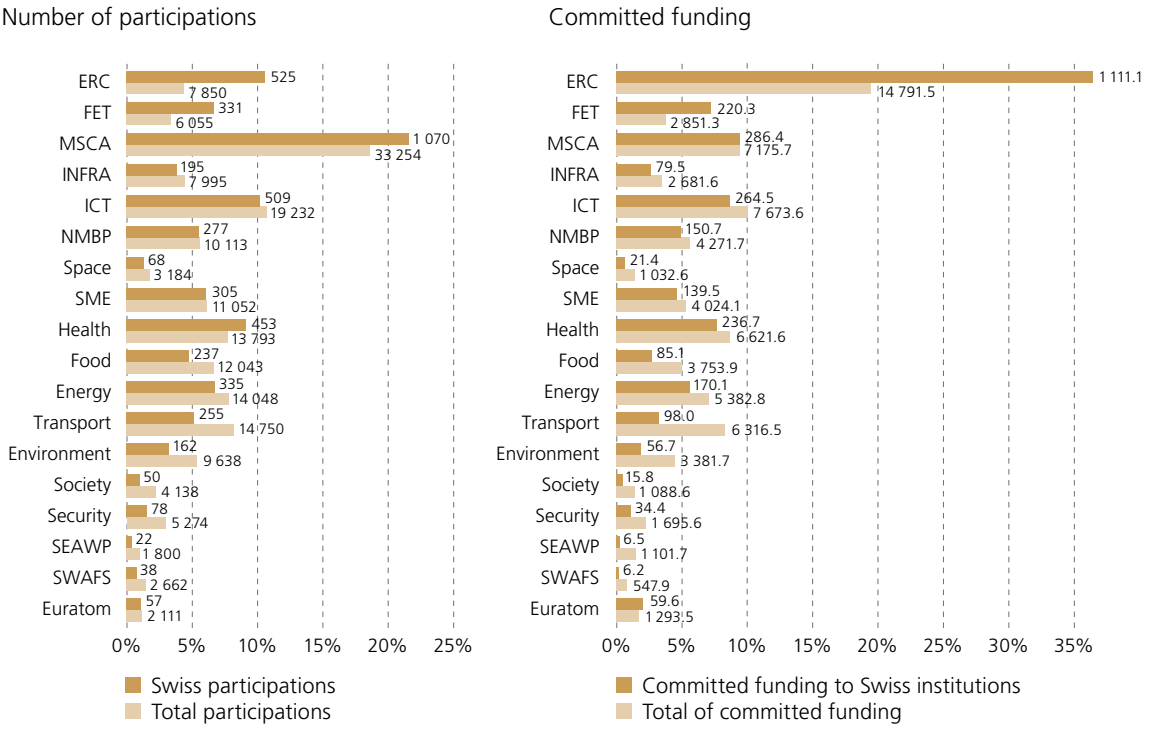


Fig. 7.1: The left-hand panel shows the participation rate, meaning the number of participations in a particular programme area divided by the total number of participations, while the bars are labelled with the number of participations by programme area for Swiss and overall participations. The right-hand panel shows the committed funding rate, meaning the committed funding in CHF million for a particular programme area divided by the total committed funding for all programme areas in CHF million, while the bars are labelled with committed funding in CHF million by programme area for Swiss and overall committed funding.

Sources: EC and SERI.

Figure 7.2 shows the equivalent information for the Horizon Europe programme, but it is less straightforward to interpret. Due to Switzerland's status as a non-associated country, researchers and innovators based in the country are not eligible to participate in certain programme areas. As discussed in Section 4.2, this affects almost all ERC grants, a good fraction of the MSCA and EIC actions as well as predominantly, but not exclusively, certain areas of cluster 4 'Industry, Digital and Space'. Therefore, Swiss participation should only be compared in programme areas where participation is largely possible. With this caveat in mind, researchers and innovators in Switzerland have extended their strong record of participation in health (cluster 1), but are also strong in industry, digital and space (cluster 4) as well as topics in areas such as climate, energy, agriculture and environment (clusters 5 and 6).

The right-hand panel in Figure 7.2 is also challenging to interpret due to the fact that Horizon Europe project data do not include the budgets of institutions from non-associated countries. Since the overall data on committed funds sum up the budgets of all participants, the total funds in each area are not representative of the total allocated budget. They only include funding for participants in countries associated to Horizon Europe. The average share of funding for any given programme area might be affected by this. If for instance funding is 'awarded' to non-associated countries that historically have a large number of participations in a given area (example: Switzerland in the health domain), then this will negatively affect the stated average budget share. This also partially explains why the picture emerging from the budget shares differs in some instances from the participation rates.

Figure 7.2 Participation and committed funding in the Horizon Europe package by programme area, in relation to all projects

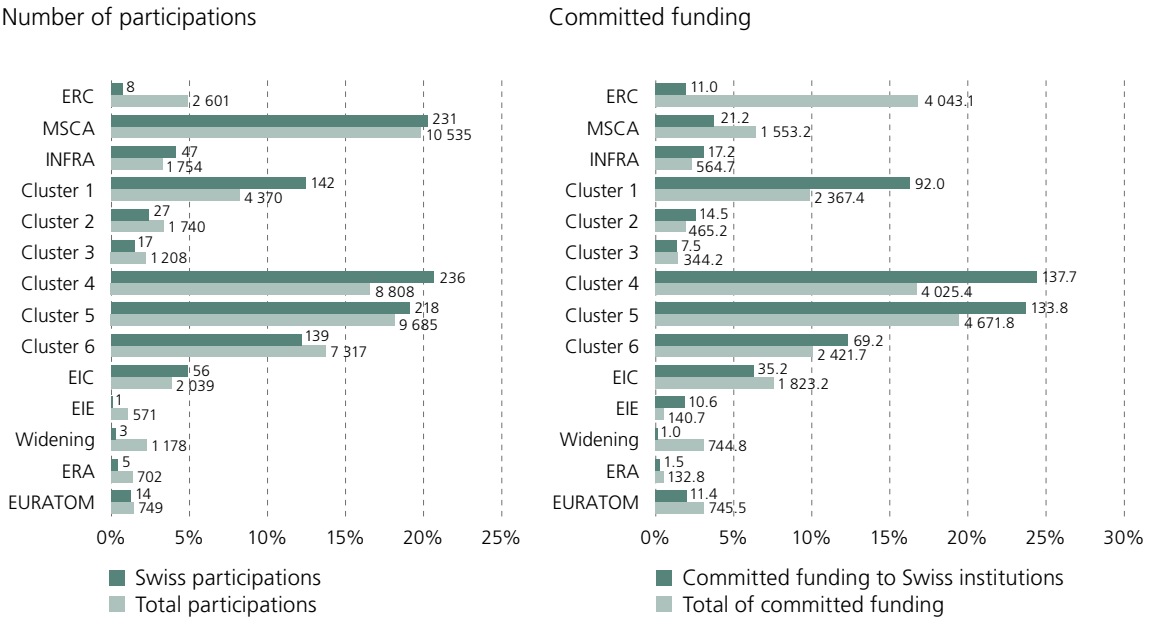


Fig. 7.2: The left-hand panel shows the participation rate, meaning the number of participations in a particular programme area divided by the total number of participations for all programme areas, while the bars are labelled with the number of participations by programme area for Swiss and overall participations. The right-side panel shows the committed funding rate, meaning the committed funding in CHF million for a particular programme area divided by the total committed funding for all programme areas in CHF million, while the bars are labelled with committed funding in CHF million by programme area for Swiss and overall committed funding.

Sources: EC and SERI.

As discussed before, EU research funding is awarded on a competitive basis. This means that each project proposal is assessed by a committee of experts and only the best proposals are awarded funding. The success rate is calculated from the share of proposals approved for funding compared to the total number of eligible and evaluated proposals. A country's average success rate therefore depends on the quality of the proposals submitted by its institutions and the quality of the other applicants.

The overall success rates can vary substantially throughout the different programme areas and research priorities. They depend primarily on the relationship between the budget for a given programme area, the total number of submissions and the average amount of funding per selected project. Some areas have a considerable overall budget yet only target a limited circle of possible funding recipients. This restricts the number of submissions, resulting in high success rates. In contrast, other areas may have a large number of potential recipients or meet a high interest from researchers and innovators whilst distributing a comparatively smaller budget, resulting in high competition and thus lower success rates.

Figure 7.3 Success of Swiss proposals by programme area and research priority in the Horizon 2020 package

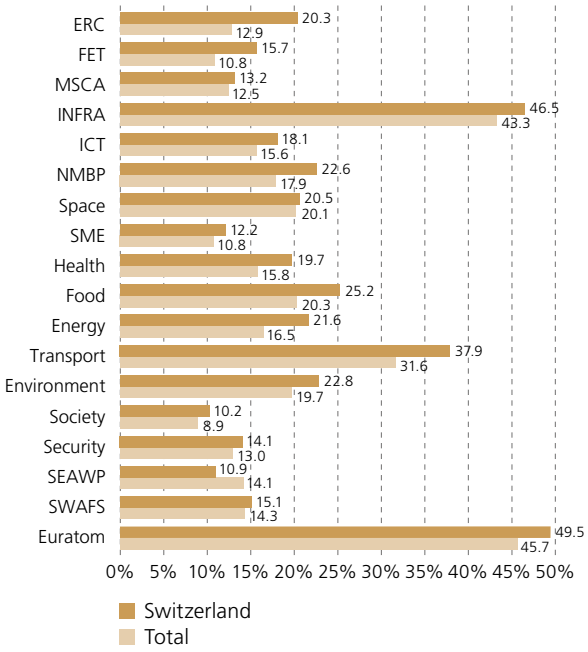


Fig. 7.3: We show the success rates per programme area for proposals from Switzerland and proposals from all participating countries. The success rate is defined by the number of proposals chosen for funding divided by all eligible and evaluated project proposals in each programme area.

Sources: EC and SERI.

Figure 7.3 shows the success rates of researchers and innovators in Switzerland as well as the average success rate across the different programme parts in Horizon 2020. This serves as a good gauge for the quality of the proposals submitted by participants in Switzerland. As previously explained the success rates for the different parts of the programme are inherently different. However, in almost all programme parts the success rates of participants in Switzerland range above the average success rate for that programme part. This is particularly true in areas like the ERC and FET, where participants in Switzerland outperform their peers by a large margin.

Apart from the global comparison above it is also interesting to understand how the various programme areas in Horizon 2020 attracted participants based in Switzerland. To this end we look at two indicators: the activity index and the success index. The activity index compares the share of Swiss project proposals in a specific area with the share of proposals from all countries in this area. The more intense Switzerland's participation, the higher the value of the index. If, for example, 10% of all Swiss project proposals were in the health area, and this area globally accounted for only 5% of all project proposals, it would result in an index value of 2 and reflect Switzerland's over-proportional activity in this field. A value of 1 indicates average participation of researchers and innovators in Switzerland in comparison to the participants from other countries, and an index value below 1 indicates that the activity of participants in Switzerland in the respective programme area is under-proportional. The success index in a given area is defined as the ratio of the success rate of Swiss proposals compared to the success rates of all countries. The success index value behaves in the same way as that of the activity index: the higher the success rate of Swiss project proposals in comparison with the overall success rate, the higher the index value is. Again, a success index of 1 indicates a similar success rate.

Figure 7.4 shows these two indices for the various programme areas and research priorities in the Horizon 2020 package. As discussed before, the Swiss success rate lies above the overall average – indicated here by the horizontal line at a success index equalling 1 – in all but one area. Programme areas in the upper right quadrant in Figure 7.4 show above-average participation rates coupled with above-average success rates. While Switzerland's excellent performance in the ERC and FET programmes is evident, Health, SME instruments, and the MSCA also fall into this quadrant.

No programme areas appear in the bottom right quadrant of the diagram, signalling that no programme area with above-average participation experiences below-average success. The area in the upper left quadrant indicates a sound success rate but comparatively low activity. It suggests untapped funding potential for Swiss institutions in the fields of environment, food, agriculture and aquatic research, energy, transport, secure societies, space exploration, social sciences and humanities (Inclusive Societies and Science with and for Society). In the bottom left quadrant lies Spreading Excellence & Widening Participation (SEAWP). Here both participation and success of Swiss partners is low throughout Horizon 2020. This analysis is only shown for Horizon 2020 since no data is available on success rates for Horizon Europe.

Figure 7.4 Activity and success index of Swiss project proposals in the Horizon 2020 package, by programme area and research priority

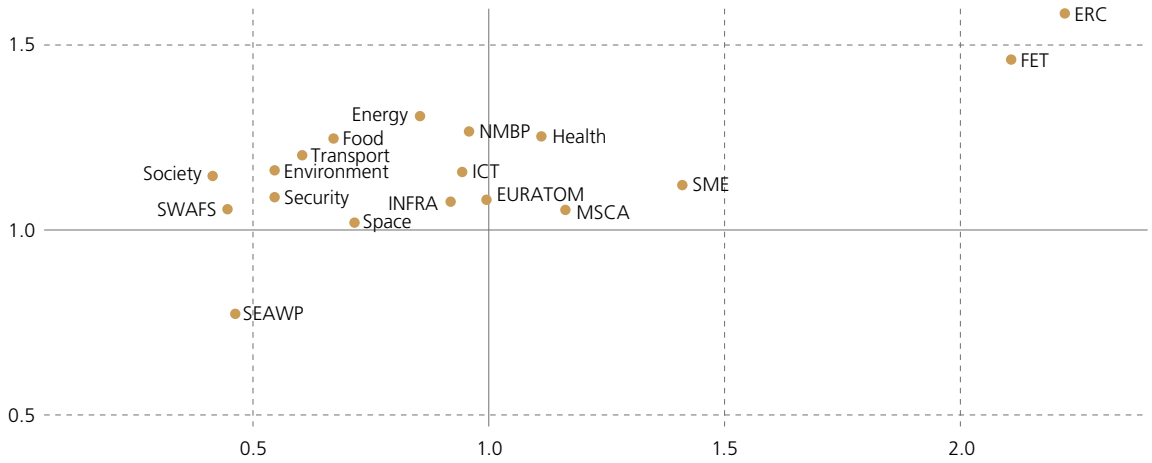


Fig. 7.4: The x-axis shows the activity index, which is obtained by dividing the share of Swiss project proposals in a given area by the share of proposals from all countries in this area. The y-axis shows the success index, which is defined by dividing the success rate of applications from Switzerland by the success rate of those from all countries in a given area. The lines at an activity index and success index of one indicate average participation and success.

Sources: EC and SERI.

7.2 Partnerships

This section takes a closer look at the participation of Swiss institutions in initiatives in which the European Commission works with public and private partners to address some of Europe's most urgent challenges. Specifically we will focus on Swiss participation in initiatives under Article 187 TFEU for Horizon 2020 and the Institutionalised European Partnerships for Horizon Europe. To understand the different types of partnerships, we first give a brief overview of the partnership landscape and describe how this has changed from Horizon 2020 to Horizon Europe.

7.2.1 Structure of the European Partnerships

With the aim of coordinating with national programmes and facilitating cooperation between the EC and national and private partners, Horizon 2020 distinguished between three main types of partnerships:

Horizon 2020

Public-to-Public Partnerships (P2Ps) are formed by the EC, EU member states, associated countries and in some cases third countries. In P2P transnational joint research and innovation programmes and activities are financially supported by the framework programme. They include, in particular, initiatives under Article 185 TFEU and ERA-NET Cofunds. Countries participating in such initiatives provide some of the funding themselves, and the rest is co-funded by the EU via the framework programme budget.

Public-Private Partnerships (PPPs) are formed by the EC and industry, ranging from a simple memorandum of understanding to Joint Technology Initiatives (JTIs) under Article 187 TFEU. The JTIs are implemented by Joint Undertakings (JUs) and aim to strengthen the development of strategically important technology areas in Europe. These PPPs are co-funded by the FP budget and the participating industry.

EIT Knowledge and Innovation Communities (EIT KICs) aim to strengthen European innovation in promising sectors and industries. Each KIC is organised as a partnership between the EC and a broad consortium of higher education institutions and industry actors with a common thematic focus. The KIC projects are funded by the EIT and by non-EIT sources, such as KIC partners' own resources (co-funding).

In preparing Horizon Europe, all partnership initiatives under Horizon 2020 were reviewed for relevance as part of the strategic planning process. The aim was to consolidate the partnership initiatives and to align Horizon Europe with other EU programmes to create synergies. As a result, the complex partnership landscape was restructured with the partnerships' governance structure as a key distinguishing factor. This led to Co-Programmed, Co-Funded and Institutionalised European Partnerships. The number of partnerships has likewise been reduced from almost 120 under Horizon 2020 to 49 in the first strategic plan of Horizon Europe covering the 2021–2024 period.

Horizon Europe

Co-Funded European Partnerships (former P2P, excluding initiatives under Art. 185) are based on a grant agreement between a consortium and the European Commission. They are centred on research funding bodies and other public bodies. Most co-funded partnerships are used to fund transnational research programmes co-funded by the EC and the consortium.

Co-Programmed European Partnerships (former PPP, excluding initiatives under Art. 187) are set up between the EC and mainly private (and less frequently public) partners. They usually form an association based on a memorandum of understanding. They are primarily funded and implemented through calls for proposals under the Horizon Europe work programmes.

Institutionalised European Partnerships (initiatives under Art. 185 and Art. 187 TFEU and EIT KICs) are set up between the EC, EU member states and/or industry. Initiatives under Article 185 and Article 187 TFEU aim to cover topics over a longer timeframe and are established through the ordinary legislative procedure of the EU. Institutionalised European Partnerships have their own legal personality with governance structures in which the EU member states and associated countries are represented in steering/governing boards at ministerial level. The projects are realised through calls for proposals under dedicated work programmes. Most Institutionalised European Partnerships are jointly funded by the EC and the relevant public or private partners.[54]

7.2.2 Horizon 2020 initiatives under Article 187 TFEU and Institutionalised European Partnerships under Horizon Europe

Under Horizon Europe, the initiatives under Article 185 and Article 187 TFEU together with the EIT-KICs became the Institutionalised European Partnerships. They are established within the six clusters of pillar II, with the exception of EuroHPC which is located in the Digital Europe Programme. Table 7.2 shows which Horizon 2020 initiatives under Article 185 and Article 187 TFEU are continued under Horizon Europe. Some needed adaption to the new requirements of Horizon Europe and now run partly under different names. The table further includes the Swiss participation possibilities in the different initiatives under Horizon 2020 and Horizon Europe. The EIT-KIC partnerships are not covered in this report as the relevant data is not yet included in the available datasets.

[54] Exceptions are the EuroHPC JU and KDT JU, where the EU contribution to the budgets derives from both Horizon Europe and the DEP. For these two JUs, in addition to the funding from the JU, national co-financing is also provided to fund collaborative projects.

Table 7.2 Article 185 and Article 187 partnerships in Horizon 2020 and institutionalised partnerships in Horizon Europe

Horizon 2020

Initiatives under Article 185

- Active and Assisted Living Programme (AAL)*
- European & Developing Countries Clinical Trials Partnership (EDCTP)*
- European Metrology Programme for Innovation and Research (EMPIR)*
- Support for research performing SMEs (Euro-stars)*
- Joint Baltic Sea Research Programme (Bonus)
- Research and Innovation in the Mediterranean Area (PRIMA)

Initiatives under Article 187 (JUs)

- Clean Sky JU (CS2)
- Innovative Medicines Initiative JU (IMI2)
- Fuel Cells and Hydrogen JU (FCH2)
- Electronic Components and Systems for European Leadership JU (ECSEL)
- Bio-based Industries JU (BBI)
- Shift2Rail JU
- Single European Sky ATM Research JU (SESAR)

Swiss participation:

Article 185: Switzerland was involved in the four initiatives marked with an asterisk (*). During partial association (2014-2016) Switzerland was still able to take part as a full and equal member in these initiatives and direct project funding was provided by the Swiss government.

Article 187: Research and innovation actors in Switzerland took part in calls for research and innovation projects in all of the Article 187 initiatives. During the partial association, direct funding was ensured by the Swiss government.

Horizon Europe

Institutionalised European Partnerships: Former Horizon 2020 initiatives under Article 185

- Global Health EDCTP3 JU (GH EDCTP3)
- European Metrology Partnership

Institutionalised European Partnerships: Former Horizon 2020 initiatives under Article 187

- Clean Aviation JU
- Innovative Health Initiative JU (IHI)
- Clean Hydrogen Partnership (CLEANH2)
- Key Digital Technologies JU (KDT)
- Circular Bio-based Europe JU (CBE)
- Europe's Rail JU (ER)
- Integrated Air Traffic Management (IATM)

Institutionalised European Partnerships: New initiatives

- Smart Networks & Services JU (SNS)
- High Performance Computing JU (EuroHPC)

Swiss participation:

As a non-associated third country, Switzerland cannot be a member in the Institutionalised European Partnerships and is therefore not represented in their governance structures. However, direct funding from the Swiss government is provided for participation in collaborative projects in the framework of the partnerships. For KDT JU, additional national co-funding is provided by Innosuisse. No participation is possible in the EuroHPC JU.

Sources: EC and SERI.

The left-hand panel of Figure 7.5 shows the participation rate and participation numbers both for Switzerland and in total across all participating countries in partnerships under Article 187 during Horizon 2020. Participation data on the EuroHPC flagship is also included. It was not yet a partnership under Horizon 2020 but became an institutionalised partnership under Horizon Europe. The Innovative Medicines Initiative is the partnership with the highest number of Swiss participations (195, 40.3% of all Swiss participations in partnerships), followed by the SESAR partnership dedicated to air traffic management research with a participation rate of 14.7%, and the hydrogen technologies partnership (FCH2) with 12.4%. The Swiss participation differs from the overall participations: globally the electronic components and semiconductor partnership ECSEL records the most participations (3530, 21,0%), followed by the health partnership (IMI2) (3120, 18.5%). The partnerships dedicated to aeronautics (CS2) and air traffic management (SESAR) each account for around 14% of all participations.

As shown in the right-hand panel of Figure 7.5 the relative rate of committed funding reflects the distribution seen in the participation numbers of Swiss institutions. With a total of CHF 86 million, the health-focused partnership IMI2 accounts for nearly half the committed funding to Swiss institutions (49.1%). Across the overall participations, however, the highest share of committed funding is held by the aeronautics partnership with CHF 2.052 billion (26.5%). On average a CS2 project participant received committed funding of CHF 865 886, compared to the second-largest average participant contribution of CHF 527 573 going to IMI2 participants.

Figure 7.5 Participation and committed funding for participants based in Switzerland and overall, in Horizon 2020 partnerships

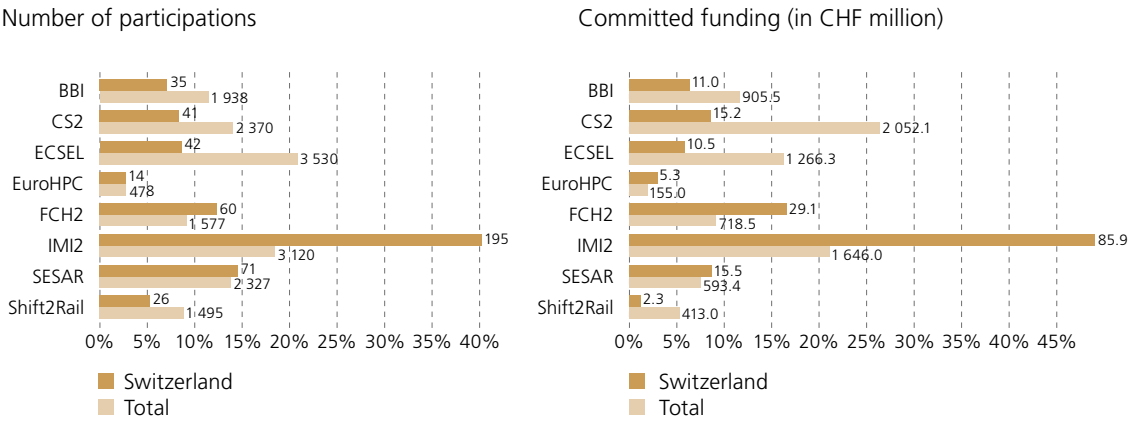


Fig. 7.5: The left-hand figure shows the participation rate, meaning the number of participations in a particular partnership divided by the total number of participations in all partnerships, while the bars are labelled with the number of participations by partnership for Switzerland and overall. The right-hand figure shows the committed funding rate, corresponding to the committed funding going to a particular partnership divided by the total committed funding to all partnerships, while the bars are labelled with the contributions by partnership.

Sources: EC and SERI.

Figure 7.6 shows the distribution of Swiss participations across the partnerships in Horizon 2020 for different types of institutions. Industry and SMEs are the most active in partnerships with 207 (42.8%) and 128 (26.4%) participations respectively. The academic sector accounts for 101 (20.9%) participations in partnerships. The figure also shows which types of partnerships elicit highest participation from industry (IMI2 with 112, SESAR with 51, and Shift2Rail with 21 participations), SMEs (FCH2 with 33 and ECSEL with 27 participations), universities (IMI2 with 31 participations) and the ETH Domain (FHC2 with 16 participations).

Figure 7.6 Participation of Swiss institutions in Horizon 2020 partnerships

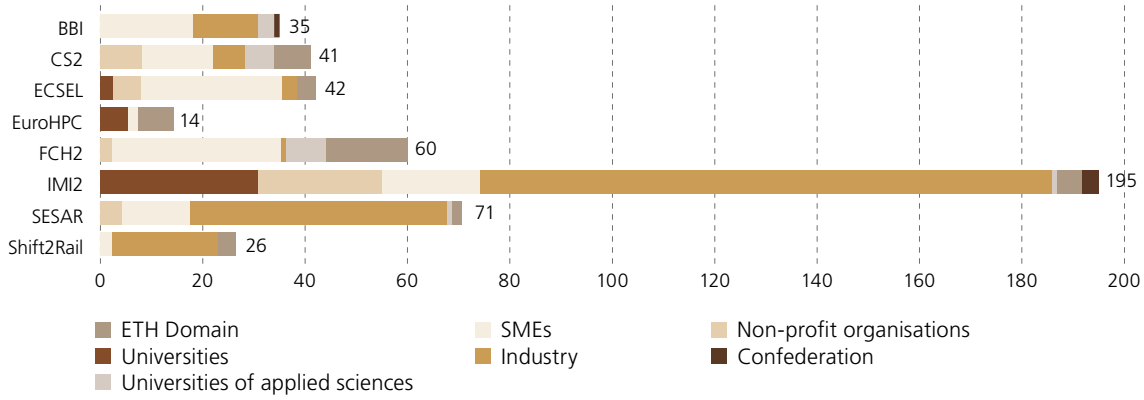


Fig. 7.6: We show the number of participations in the various partnerships for different institution types in Switzerland for Horizon 2020
Sources: EC and SERI.

The left-hand panel of Figure 7.7 displays the participation rates and participation numbers both for Switzerland and in total across all participating countries in institutionalised partnerships of Horizon Europe. The Key Digital Technologies partnership (KDT) has the most Swiss participations to date (55, 49.1%). In second place we find the SNS and CLEANH2 partnerships dedicated to smart networks and services and hydrogen technologies respectively, with 13 participations each (11.6%). Note that since institutionalised partnerships have their own work programme, the data presented here may be incomplete or not up-to-date. Again, the participation figures across all participating countries differ from the numbers for participants based in Switzerland: there is a more equal distribution of participations across the partnerships when all participations are considered. KDT leads with 1133 (28.0%) of all participations, and is followed by CLEANH2 and SNS with 581 (14.4%) and 529 (13.1%) participations. As shown in the right-hand panel of Figure 7.7 the relative rate of committed funding reflects the distribution seen in the participation numbers of Swiss institutions. It should be noted that the funding rates for the various institutionalised partnerships differ. In the case of KDT for example, only about 25–35% of the project costs are funded through the framework programme or, during Switzerland's non-association, directly by SERI. An equal share is usually funded by a national funding agency (in this case Innosuisse) and the remaining project costs are carried by the participants.

Figure 7.7 Participation and committed funding for participants based in Switzerland and overall in institutionalised partnerships under Horizon Europe

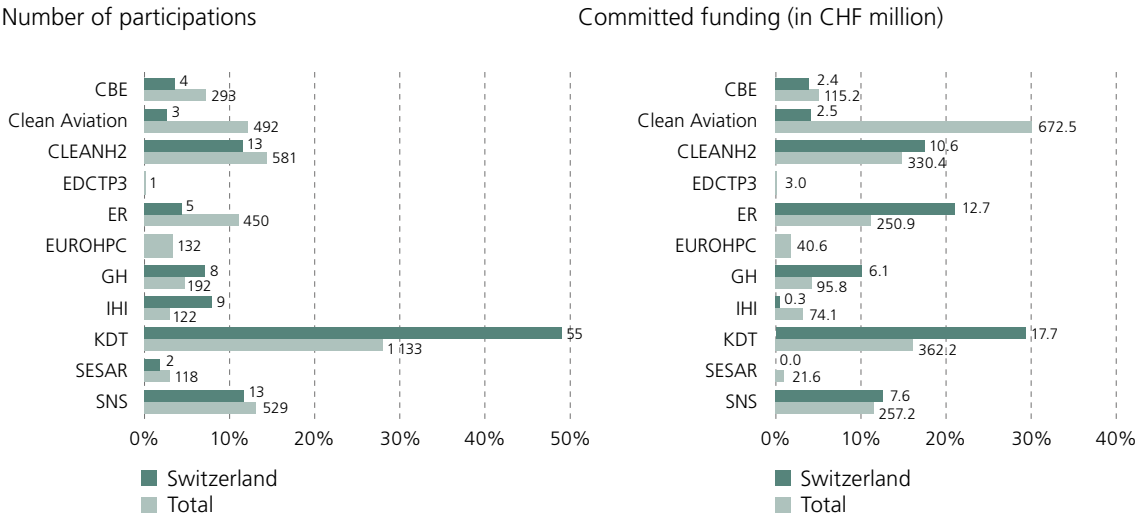


Fig. 7.7: The left-hand panel shows the participation rate, meaning the number of participations in a particular partnership divided by the total number of participations in all partnerships, while the bars are labelled with the number of participations by partnership for Switzerland and overall. The right-hand panel shows the committed funding rate, meaning the committed funding going to a particular partnership divided by the total committed funding for all partnerships, while the bars are labelled with the contributions by partnership.

Sources: EC and SERI.

Figure 7.8 shows the distribution of Swiss participations across the partnerships for different types of institutions in Horizon Europe. To date, SMEs are the most active in partnerships, with 53 (47.3%) participations. The academic sector accounts for 23 (20.5%) participations in partnerships so far. The figure also shows which individual partnership elicits the highest participation from SMEs (KDT with 33 and SNS with 10 participations) and universities of applied sciences (CLEANH2 with six participations).

Figure 7.8 Participations of Swiss institutions in institutionalised partnerships under Horizon Europe

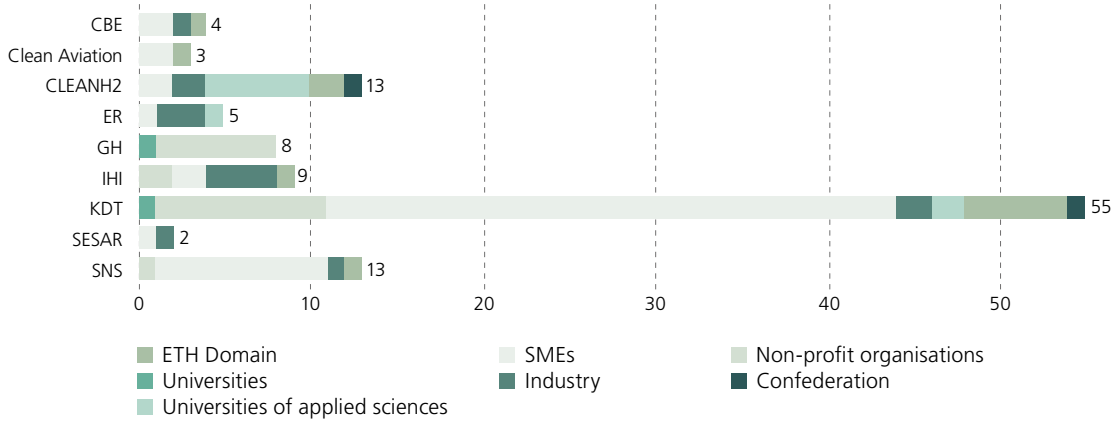


Fig 7.8: We show the number of participations in a particular partnership for different institution types in Switzerland.

Sources: EC and SERI.

7.3 EU Missions

EU Missions are a new instrument in Horizon Europe aiming to give a new role to research and innovation by combining different forms of governance and collaboration including involvement of citizens. Their goal is to provide concrete solutions to support the EU's transition to becoming greener, healthier, more inclusive and more resilient. For the first time the EC has set concrete targets and a deadline of 2030 to reach those. The missions are part of the six clusters in pillar II, but are implemented through calls for proposals in dedicated work programmes.

The five EU Missions are:

- Conquering Cancer (CANCER)
- A Climate Resilient Europe (CLIMA)
- Restore our Ocean and Waters (OCEAN)
- 100 Climate-Neutral Cities by 2030 (CIT)
- Caring for Soil is Caring for Life (SOIL)

Figure 7.9 shows the number of participations and committed funding for both participants based in Switzerland as well as across all participating countries. Researchers and innovators in Switzerland are mostly participating in the SOIL mission (17 participations, CHF 6.8 million in committed funding), however the overall participation rate of Switzerland is quite low (1.4% of all participations in missions). This may partly be explained by the first phase of this new instrument: the calls in 2021 were predominantly coordination and support actions (CSAs) dedicated to developing the governance structure of the missions, finding new ways to engage citizens and implementing the missions. Researchers in Switzerland were initially not eligible to participate in CSAs.

Due to the novelty of the five missions and the fact that Swiss institutions were initially not admitted to the coordination and support actions in 2021, it is difficult to make meaningful statements on the success and participation rates of Swiss partners at this stage. More reliable statistics will be available as the programme progresses.

Figure 7.9 Participation and committed funding for participants in Switzerland and overall in Horizon Europe EU Missions

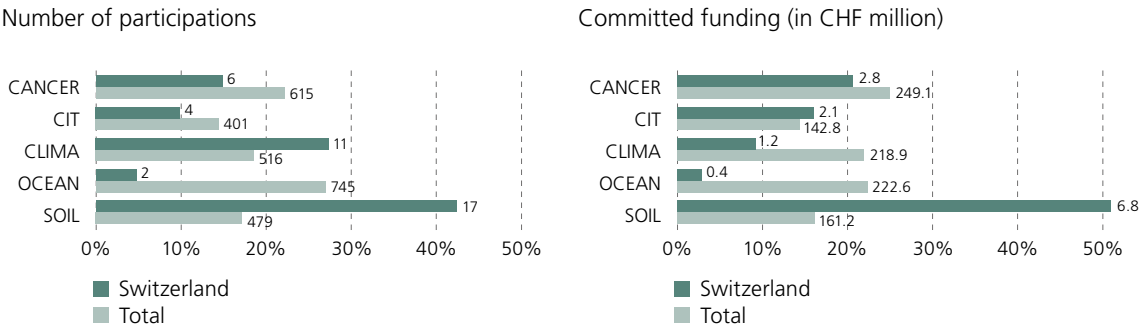


Fig. 7.9: The left-hand panel shows the participation rate, meaning the number of participations in a particular mission divided by the total number of participations, while the bars are labelled with the number of participations by mission for Switzerland and overall. The right-hand panel shows the committed funding rate, meaning the committed funding going to a particular mission divided by the total committed funding, while the bars are labelled with the contributions by mission for Switzerland and overall.

Sources: EC and SERI.

Figure 7.10 shows the Swiss participation in each mission divided by institution type. Typically, EU missions fund relatively few, but large projects with consortia of up to 40 partners and funding of up to EUR 20 million. Interestingly, almost two thirds of the participants based in Switzerland are NPOs and SMEs. This can be explained by the fact that a central task of the missions is the implementation of research and innovation in society. Among the SMEs and NPOs there are numerous foundations, associations and federations with the purpose of representing the interests of society.

Figure 7.10 Participation of Swiss institutions in Horizon Europe EU missions

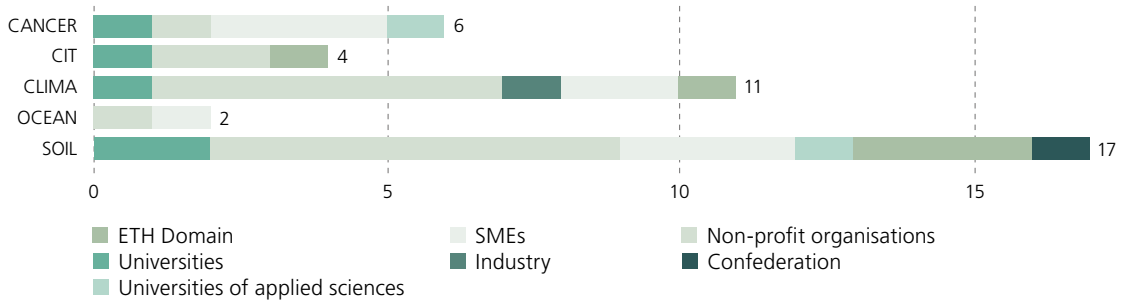


Fig. 7.10: We show the number of participations in a particular mission for different institution types in Switzerland.
Sources: EC and SERI.

In July 2023, the European Commission published an evaluation report on the first two years of the five missions. It concludes that the mission-based approach provides appropriate incentives for the engagement of broad stakeholders and that EU missions could play a central role in the relevant societal challenges. The European Commission has therefore decided to continue the implementation of the current five missions and to increase political and financial support. In addition, the European Commission proposes a sixth mission – the New European Bauhaus – to complement the current missions. Discussions among EU member states and the European Commission are still ongoing and it is not clear whether the mission will take place. An advisory board is currently being set up to prepare a proposed implementation plan.

7.4 Promoting excellence

While most of the Horizon 2020 and Horizon Europe programme areas focus on more applied research in a collaborative setting, the Marie Skłodowska-Curie Actions (MSCA) and the European Research Council (ERC) aim to promote excellence and fundamental science in both collaborative and mono-beneficiary projects. These two programme parts are open to all domains (bottom-up) and target a variety of career stages. The MSCA focus more on mobility and knowledge transfer and ERC grants mainly provide funding for frontier research, but both seek to attract top researchers to Europe.

7.4.1 Marie Skłodowska-Curie Actions

The MSCA are aimed at developing doctoral and postdoctoral training programmes and collaborative research projects worldwide. They support the mobility of researchers between countries, sectors and disciplines in order to acquire new knowledge, skills and competences. The four MSCA[55] with Swiss participation are described in the table below, distinguishing between collaborative and mono-beneficiary actions. These were named differently under Horizon 2020, but their aim was very similar, so Table 7.3 describes only the Horizon Europe actions.

[5] The fifth action MSCA & Citizens is not considered in this overview, as there have been no Swiss participations under Horizon 2020 and Horizon Europe so far.

Table 7.3 MSCA with Swiss participation in Horizon 2020 and Horizon Europe

Horizon 2020	Horizon Europe
Collaborative actions	
Innovative Training Networks (ITN)	Doctoral Networks (DN)
The aim of doctoral networks is to implement doctoral programmes through partnerships of organisations from different sectors across Europe and beyond. DNs are open to international consortia of universities, research institutions, companies, SMEs and other non-academic organisations.	
Research and Innovation Staff Exchanges (RISE)	Staff Exchanges (SE)
The staff exchanges action funds short-term international and intersectoral exchanges of staff involved in research and innovation activities of the participating organisations. The aim is to develop sustainable collaborative projects between the academic and non-academic sectors (in particular SMEs), based in Europe and beyond.	
Both of these collaborative actions are open to participation from non-associated countries, so Swiss participation with direct funding by the Swiss government was possible during the partial association in Horizon 2020 and remains possible during the non-association in Horizon Europe.	
Mono-beneficiary actions	
COFUND	MSCA-COFUND (COFUND)
The COFUND action provides funding for regional, national and international programmes for training and career development through co-funding mechanisms of doctoral or postdoctoral programmes. These should promote international, interdisciplinary and intersectoral mobility.	
Individual Fellowships (IF)	Postdoctoral Fellowships (PF)
The aim of the postdoctoral fellowships is to support the careers of researchers and to promote excellence in research. The action targets postdoctoral researchers and allows them to gain experience in other countries, other disciplines and non-academic sectors.	
At the start of Horizon 2020 until 15 September 2014, participants in Switzerland were excluded from mono-beneficiary grants until an agreement on the partial association was reached. No transitional measures were implemented since Switzerland was associated to pillar I (including the MSCA) shortly afterwards.	Researchers in Switzerland cannot participate in mono-beneficiary instruments due to the country's current status as a non-associated third country. For this reason, the Swiss government has mandated the SNSF to implement transitional measures (see Subsection 8.1.2).

Sources: EC and SERI.

[56] With the exception of COFUND where a Swiss participation can exceptionally be funded by the Swiss government from the 2022 calls onwards.

As described in Section 7.1, Swiss institutions were highly involved and very successful in the MSCA throughout Horizon 2020. Figure 7.11 shows the success rates of Swiss institutions in the various MSCA compared to the average success rate (left-hand panel) and split by institution type (right-hand panel). Swiss institutions achieve higher success rates than average in the Innovative Training Networks (ITN) and Individual Fellowships (IF). When comparing the success rate between the different institution types, the ETH Domain (14.5%) is most successful in its applications, followed by industry (13.9%). Cantons, universities, NPOs, and SMEs hover around 12%, while the Swiss government and universities for applied sciences remain below 10% in their success rates.

Figure 7.11 Success rates for Swiss institutions and by MSCA type in Horizon 2020

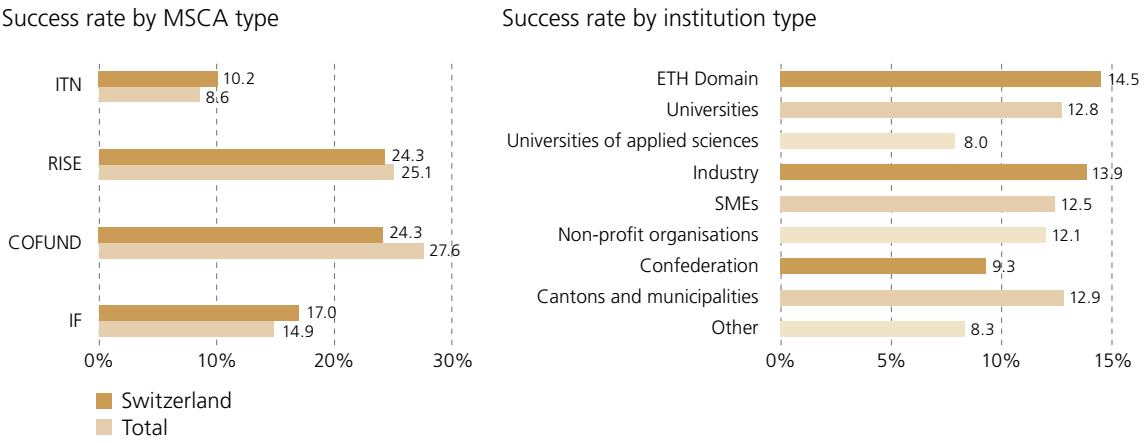


Fig. 7.11: The success rate is defined by the number of proposals chosen for funding divided by all eligible and evaluated project proposals. The left-hand panel shows the success rate for all Swiss participants and overall by MSCA type. The right-hand panel shows the success rates of Swiss institutions in MSCA by institution type.

Sources: EC and SERI.

The MSCA intend to foster international collaboration and knowledge transfer. This is also evident when looking at the nationality of MSCA fellows hosted in Switzerland (Fig. 7.12, left-hand panel) and the host countries of fellows with Swiss nationality (Fig. 7.12, right-hand panel). The largest proportion of fellows in Switzerland for whom we have information about their nationality came from our neighbouring countries: Italy with 192 out of 1623 fellows, or 11.8% of all MSCA fellows in Switzerland, followed by Germany (158 fellows or 9.7%) and France (103 fellows or 6.3%). It is notable that a large number of fellows were nationals of third countries such as China, India, the US, Iran, Russia and Canada. This highlights the fact that the MSCA have an international reputation and are a valuable tool in fostering the mobility of young academics. A total of 25 fellows hosted in Switzerland had Swiss nationality. These were researchers who had either returned to Switzerland from abroad with their MSCA grant or who received funding through the RISE instrument, which does not require fellows to change their country of residence.

For MSCA fellows of Swiss nationality, the UK was the most popular destination. In total 40 researchers, or almost one fifth of all Swiss MSCA fellows, conducted their research at a UK institution during Horizon 2020. In second place was Switzerland itself, with the abovementioned 25 fellows, followed by Germany and France with 21 researchers from Switzerland each. With Switzerland having a low population but a relatively active research community, the number of incoming international researchers is far higher than Swiss nationals using an MSCA grant to conduct research abroad. It is also noteworthy that non-European countries are not among the top destinations for Swiss nationals, while countries like China, India and the US figure high in the ranking of fellows coming to Switzerland. This may again be explained by the active research community in Switzerland and possibly by non-European countries being perceived as less attractive for research purposes. Another reason may be that the MSCA are not the only instrument allowing Swiss researchers to carry out research abroad: the Swiss National Science Foundation also offers fellowships to enable mobility of young scientists at a variety of career stages.

Figure 7.12 Nationalities of MSCA fellows at Swiss institutions and location of Swiss MSCA fellows by country in Horizon 2020

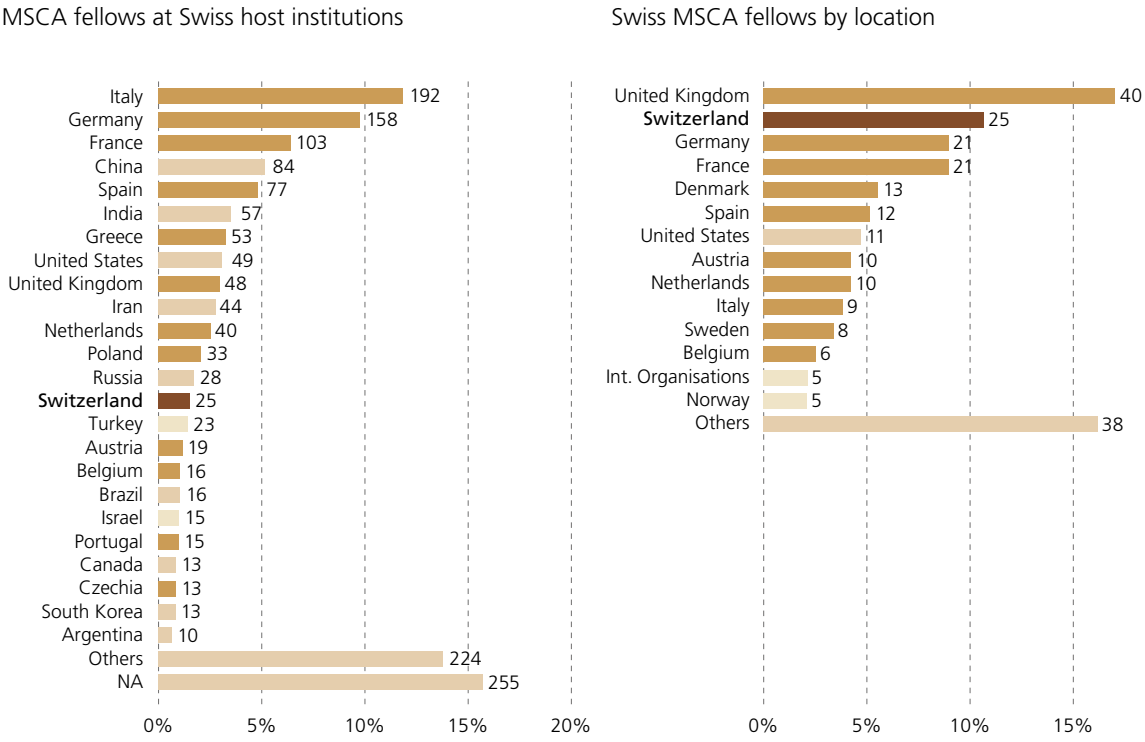


Fig. 7.12: The left-hand panel shows the overall number of MSCA fellows at Swiss institutions by their nationality for countries with at least ten fellows, and the right-hand panel shows the location of Swiss MSCA fellows in countries with at least five Swiss fellows.

Sources: EC and SERI.

Figure 7.13 shows the number of grants in Switzerland by type of action (left-hand side) and by institution type (right-hand side) in Horizon 2020. Swiss organisations are most involved in IF actions with 488 participations or a share of 45.6%, followed by ITN with 474 participations (44.3%). Less than ten percent of Swiss MSCA participations go to RISE and COFUND with 72 and 33 participations respectively. This differs from the overall participation across all countries, where ITN accounts for 39.5% of participations, followed by IF with 33.8%, RISE with 19.9% and COFUND with 2.9%. This means that compared to the overall MSCA participation in Horizon 2020, the ITN and IF actions attract more mobility to Switzerland than the RISE actions. Taking into account the success rates shown in Figure 7.11, applications from Swiss institutions are focused on ITN and IF, with comparatively less interest for RISE as shown by the low participation numbers despite a relatively high success rate. Most MSCA grants in Switzerland go to the academic sector (71.9% including universities, universities of applied sciences and the ETH Domain), with the ETH Domain having the highest share at 36.5%. The private sector records 21.3% of all participations.

Figure 7.13 Participation numbers of MSCA in Switzerland by type of MSCA or institution in Horizon 2020

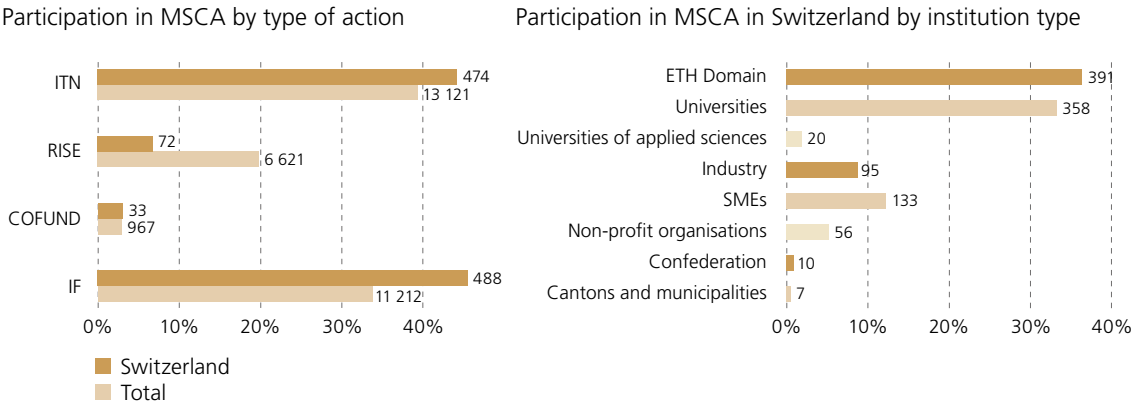


Fig. 7.13: The left-hand panel shows the number of MSCA participations by type of MSCA grant for both Switzerland and all participating countries. The x-axis indicates the participation rate by type of grant, corresponding to the number of participations in a particular MSCA type divided by the total number of MSCA participations for Switzerland and overall, while the bars are labelled with the number of participations by MSCA type. The right-hand panel shows the number of MSCA participations in Switzerland by institution type. The x-axis shows the participation rate by institution type, meaning the number of MSCA participations for an institution type divided by the total number of MSCA participations for Switzerland, while the bars are labelled with the number of MSCA participations by institution type.

Sources: EC and SERI.

The participation data for MSCA fellows also includes information on their gender. This is, however, incomplete and the records are missing for 29.9% of all fellows and 25.8% of fellows in Switzerland. With that in mind, 58.1% of all fellows are men and 41.9% in Horizon 2020 women. For Switzerland the shares are similar with 59.3% male fellows and 40.7% female.

In Horizon Europe, participation in the collaborative projects Doctoral Networks (DN) and Staff Exchanges (SE) is possible with direct funding from the Swiss government. It should be noted that a comparison with Horizon 2020 is difficult, since these participation numbers are still incomplete (see Section 9.1). With 64 DN and 10 SE participations at Swiss institutions, Switzerland is still actively involved in the MSCA. The academic sector carries out most of those projects, with 67 participations or a share of 90.5% being hosted at either cantonal universities, universities of applied sciences or the ETH Domain, followed by the private sector with 6.8% of all participations. This is a similar distribution to that seen under Horizon 2020.

7.4.2 ERC Grants

The overall aim of the ERC grants is to promote excellent science at later career stages, mostly after the postdoctoral phase. Unlike collaborative projects, which make up most of the Horizon 2020 and Horizon Europe projects, the ERC Grants are non-thematic, meaning that there are no prescribed research topics to be covered. Proposals are evaluated strictly on the basis of scientific merit. The five types of ERC grants are detailed in Table 7.4. The respective calls are conducted annually.

Table 7.4 ERC grant types

Type of Grant	Short description / Eligibility
ERC Starting Grant (StG)	Aimed at early career researchers that are ready to conduct high-quality independent research. Individuals with 2 to 7 years of experience since completion of a PhD are eligible.
ERC Consolidator Grant (CoG)	Aimed at outstanding researchers ready to establish or strengthen their own research group. Condition is 7 to 12 years of research experience after completion of a PhD degree.
ERC Advanced Grant (AdG)	Aimed at established researchers who have been making significant research contributions for at least 10 years.
ERC Synergy Grant (SyG)	Aimed at small groups of principal investigators (2 to 4 individuals) working together on an ambitious project.
ERC Proof of Concept Grant (PoC)	Only accessible for researchers holding an ERC grant that led directly to an idea for which they seek to establish proof of concept.

Sources: EC and SERI.

Common to all ERC grants with the exception of the ERC Synergy Grant is that researchers are only eligible to participate if their host institutions are from countries that are either associated to the corresponding framework programme or are EU member states. Consequently, researchers based in Switzerland have been ineligible to participate in these calls throughout the duration of Horizon Europe so far.[57] The same was true at the start of Horizon 2020, when researchers in Switzerland were unable to participate in the first ERC calls in 2014. It should, however, be noted that the eligibility criteria are based on the location of the host institution and not nationality, so in principle the ERC grants are open to any researcher with a host institution in an eligible country.

Figure 7.14 shows the success rates in Horizon 2020 for Switzerland in the different ERC instruments in comparison to the respective average success rate across all countries (left-hand panel) as well as the success rates achieved by the various types of institutions in Switzerland (right-hand panel). Researchers in Switzerland excel in all types of ERC grants, with some success rates almost double the average success rates. When focusing on institutions in Switzerland only, researchers from NPOs and the ETH Domain show the highest success rates, with 31.9% and 25.2% respectively. It should be noted, however, that the success rate for the NPOs has been calculated from only 31 successful applications and might therefore be less stable than the success rates from institutions with a higher number of participations (particularly the universities and the ETH Domain with 219 and 255 successful participations, respectively).

[57] The ERC Starting and Consolidator Grants in 2021 were an exception. Researchers based in Switzerland were eligible to participate, but did not receive funding. Successful applicants received direct funding by the Swiss government covering their grant.

Figure 7.14 Success rate for ERC grantees in Switzerland and overall by ERC type and institution in Horizon 2020

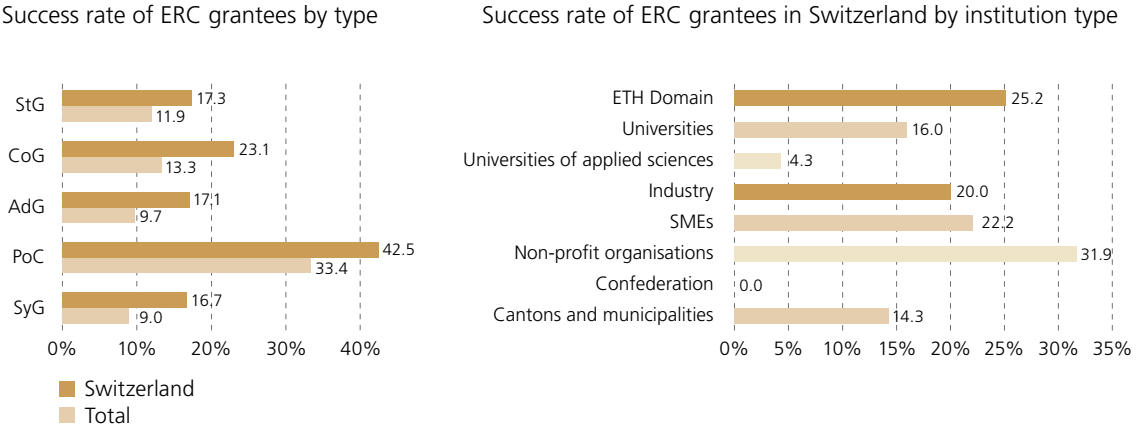


Fig. 7.14: The success rate is defined by the number of proposals chosen for funding divided by all eligible and evaluated project proposals. The left-hand panel shows the success rate for participants in Switzerland and overall participants by type of ERC grant. The right-hand panel shows the success rate of participants in Switzerland by institution type.

Sources: EC and SERI.

The number of participations in Horizon 2020 ERC calls is illustrated in Figure 7.15. The left-hand panel shows both the participations and participation rates by researchers based in Switzerland as well as the overall number of participations across all countries whilst the right-hand panel focuses on Swiss participations by splitting them by type of institution. Most ERC grants awarded to researchers based in Switzerland are ERC Starting Grants (168 in total or 32.1% of all awarded grants). This also applies to the overall distribution of grants where the ERC Starting Grants hold the highest share (2771 grants, 35.4%). In comparison to other participating countries, however, the ERC Advanced Grant holds a higher relative importance for researchers in Switzerland. It accounts for 26.3% of all ERC grants awarded to researchers in Switzerland, whilst it makes up 20.2% of all ERC grants. Since ERC grants are awarded for excellent fundamental research projects, it is not surprising that the ETH Domain and the universities account for most participations in Switzerland with 255 and 219 grants respectively. Researchers in the ETH Domain alone have been awarded almost half (48.7%) of all Swiss ERC grants.

Figure 7.15 Participation numbers for ERC grantees in Switzerland by ERC type and institution in Horizon 2020

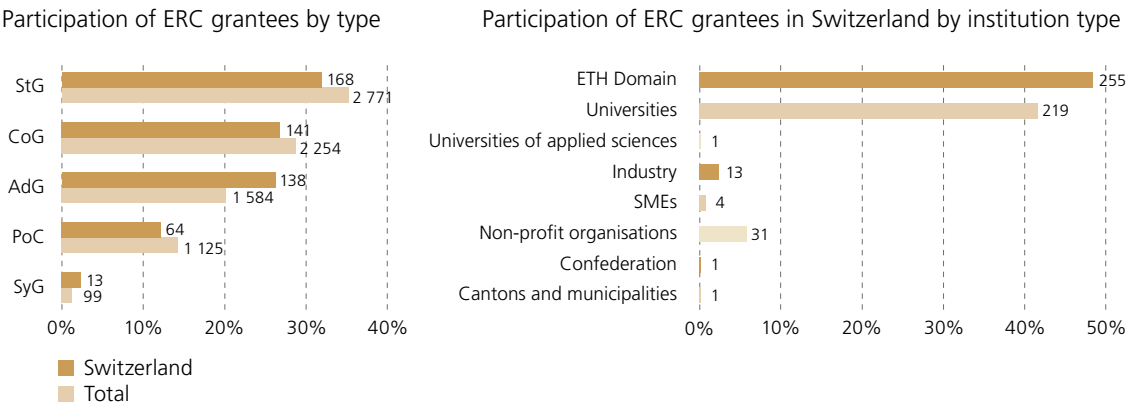


Fig. 7.15: The left-hand panel shows the number of participants based in Switzerland and globally by type of ERC grant. The right-hand panel shows the number of participants in Switzerland by institution type.

Sources: EC and SERI.

Research has become increasingly internationalised over the last decades. This also applies to personnel conducting research at Swiss universities. In 2022 the share of foreign nationals in professor positions at Swiss universities was at 51.0%.[58] Consequently, ERC grantees hosted by Swiss institutions during Horizon 2020 are also international, as illustrated in Figure 7.16 (left-hand panel). In total, 155 ERC grantees at Swiss institutions had Swiss nationality, followed by 100 grantees with German nationality and 49 Italian grantees. The right-hand panel of Figure 7.16 shows the host countries of ERC grant holders with Swiss nationality. Switzerland itself ranks first as a host nation to its own nationals followed by Germany (18 participants) and the United Kingdom (11 participants).

Figure 7.16 Nationalities of ERC grantees at Swiss institutions and location of Swiss ERC grantees by country in Horizon 2020

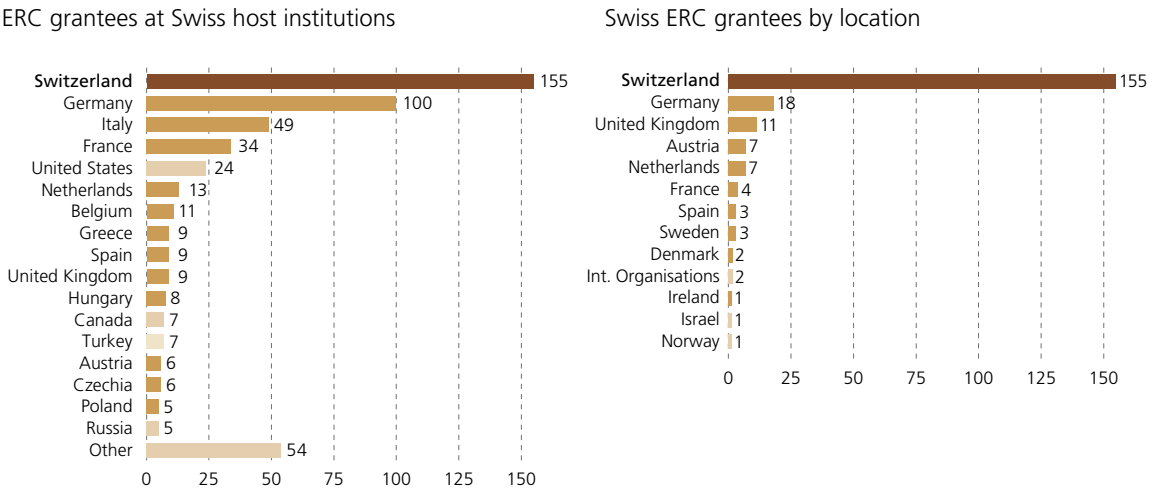


Fig. 7. 16: The left-hand panel shows the overall number of ERC grantees at Swiss institutions by their nationality and the right-hand panel shows the location of Swiss ERC grantees.

Sources: EC and SERI.

Figure 7.17 shows the gender distribution for each grant type on the left-hand side and the distribution for researchers in Switzerland on the right-hand side. No data is shown for the Synergy Grants where two or more researchers work together. On average 71.8% of researchers awarded an ERC grant are male, which is similar to the ratio in Switzerland where 75.9% of all recipients are male. These numbers are however shifting towards higher proportions of female ERC recipients. In the last edition of this report in 2018, the percentage of male recipients was still at 81.5%. When considering that the percentage of female professors at Swiss universities lies at 25.2% (in 2020, up from 20.5% in 2014, at the start of Horizon 2020[59]) the gender breakdown of ERC grantees mirrors the gender distribution of professorial staff in Switzerland. However, the rate of female researchers is increasing which is also reflected in the participation numbers for the ERC Starting Grants that focuses on relatively early career researchers. There the share of female grant holders lies at 35.3% overall and 31.5% in Switzerland.

[58] www.bfs.admin.ch > Look for statistics > Education and science > Educational staff > Tertiary education - Higher education institutions > Universities (status: 01.10.2023).

[59] www.bfs.admin.ch > Look for statistics > Education and science > Educational staff > Tertiary education - Higher education institutions > Universities (status: 01.10.2023).

Figure 7.17 ERC grantees by type of grant and by gender in Horizon 2020

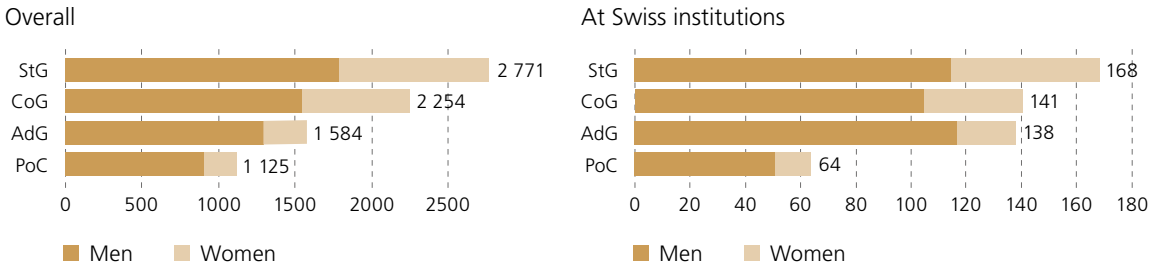


Fig. 7.17: The left-hand panel shows the overall number male and female participants by ERC instrument, while the right-hand panel shows the same for participants from Swiss institutions.

Sources: EC and SERI.

7.5 Euratom Research and Training Programme

The Euratom Research and Training Programme (Euratom RTP) is a funding programme complementary to the EU Framework Programme for Research and Innovation, covering nuclear research, innovation and training. Its calls for proposals follow the same rules for participation as Horizon 2020 or Horizon Europe. The programme consists of direct and indirect actions. Direct actions are research activities carried out by the Joint Research Centre (JRC), the European Commission's internal science and knowledge service. No statistical data on these activities are available in the EC database. The indirect actions are collaborative projects that focus on both nuclear fission and nuclear fusion activities and are carried out by international consortia of research institutions. The remainder of this section focuses on these indirect actions.

7.5.1 Fission research

The nuclear fission part of the indirect actions focuses on improving nuclear safety, security and radiation protection, the management of radioactive waste and decommissioning, the safe and secure use of nuclear energy and non-power applications, and the maintenance and development of nuclear expertise and competence.

As shown in Figure 7.18, Switzerland recorded a total of 53 participations during the Horizon 2020 period, with committed funding of CHF 18.7 million. Activities in the fission programme during this period were strongly focused on the safety of nuclear systems and on radioactive waste, which together account for over 72.2% of all participations and over 72.9% of committed funding at EU level. The focus on these areas was even stronger in Switzerland, with 83.0% of the participations and 87.4% of the committed funding.

Figure 7.18 Swiss and overall participation in Euratom fission actions in Horizon 2020

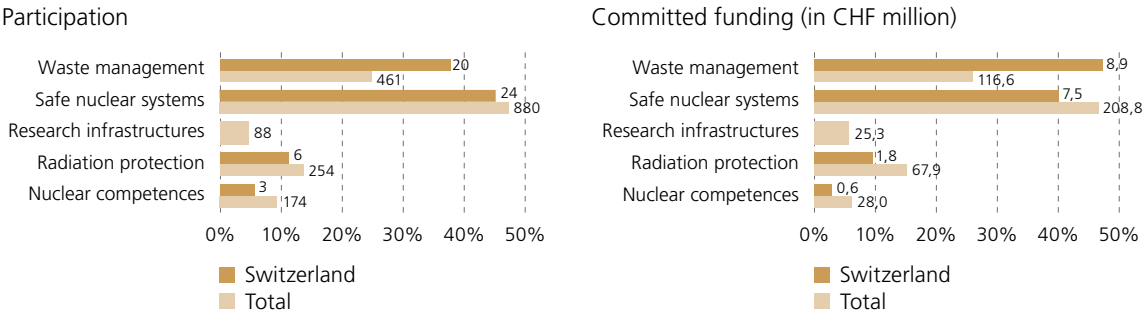


Fig. 7.18: The left-hand figure shows the participation rate, meaning the number of participations in a particular topic divided by the total number of participations, while the bars are labelled with the number of participations by topic for Switzerland and overall. The right-hand figure shows the committed funding rate, meaning the funding committed to a particular topic divided by the total committed funding, while the bars are labelled with the contributions by topic for Switzerland and overall.

Sources: EC and SERI.

Thematically, research on the safety of nuclear systems focused on the prevention of accidents and radioactive releases outside nuclear installations of current and future systems. Research on radioactive waste addressed the characterisation and minimisation of the amount of radioactive waste generated, as well as the containment and longterm isolation from the environment. This research is mainly organised through the European Joint Programme on Radioactive Waste Management (EURAD) and its successor, the Co-Funded European Partnership EURAD-2, which will launch in 2024 and run until 2027. The radiation protection part focused on a range of research topics beyond energy-related technologies, such as the development of safety standards for the use of nuclear technologies. As shown in Figure 7.18, 11.3% of Swiss participations were in this area. Finally, Euratom placed particular emphasis on training the next generation of researchers and engineers in nuclear technologies. A share of 5.7% of Swiss participations were in this field. The vast majority of the Swiss participations in Euratom fission activities in Horizon 2020 have been carried out by the ETH Domain (37, 69.8%), in particular by the Paul Scherrer Institute (PSI). Consequently, the ETH Domain also received the majority of the committed funding (CHF 11.6 million).

Within the Euratom RTP, calls for proposals follow a biennial rhythm. Since the launch of Horizon Europe, there has only been one call for proposals in 2021 and the second call is still open at the time of this report. A detailed statistical analysis for Horizon Europe and a comparison with Horizon 2020 is therefore difficult. We still show the participation figures so far for Horizon Europe in Figure 7.19. To date, Switzerland has had 12 participations with a financial commitment of CHF 5.7 million, directly funded by SERI. Of these, 11 focus on nuclear safety and one on radiation protection. All participations so far are from the ETH Domain, in particular the PSI. In the 2021 call, there was only one Coordination and Support Actions topic dedicated to nuclear waste management, as the bulk of the activities in this field will only start with the launch of EURAD-2. Starting with the 2021–2022 work programme, the research infrastructures category, with actions to facilitate access to nuclear research infrastructures, has been integrated into the nuclear competences category and is no longer listed separately.

Figure 7.19 Swiss and overall participation in Euratom fission actions in Horizon Europe

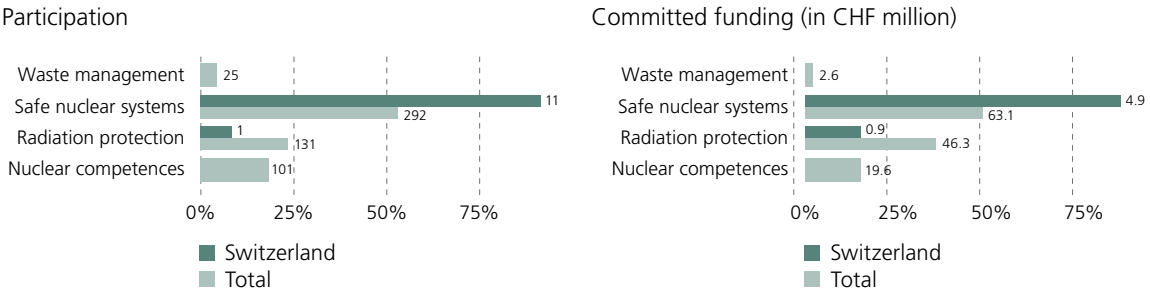


Fig. 7.19: The left-hand figure shows the participation rate in the fission actions of Euratom, meaning the number of participations in a particular topic divided by the total number of participations, while the bars are labelled with the number of participations by topic for Switzerland and overall. The right-hand figure shows the committed funding rate, meaning the committed funding going to a particular topic divided by the total committed funding, while the bars are labelled with the contributions by topic for Switzerland and overall.

Sources: EC and SERI.

7.5.2 Fusion research

During 2014 to 2020 the Euratom RTP was allocated a total budget of EUR 978 million to fund indirect actions aiming at the implementation of the research activities set out in the European Roadmap to the Realisation of Fusion Energy.[60]

About 35% of the EU support were allocated to the operation of the Joint European Torus (JET). Built in Culham (UK) in 1979, JET remains the world's largest tokamak in operation today. In 1997 it established the current record for plasma efficiency in tokamak systems. In 2021, it set another world record for the most energy produced in a single fusion reaction and it continues to offer research opportunities supporting global fusion research. The other 65% of the Euratom RTP support for fusion research was aimed at funding 55% of the eligible costs arising from the execution of the European Joint Programme in Fusion Research. To coordinate efforts in this cost-intensive research domain, the execution of this research programme has been delegated to the 31 members and associated partners of the EUROfusion consortium, bringing together all major fusion labs across Europe. EUROfusion's broad range of research activities aim to make fusion energy available. This includes support for the realisation of ITER (see Subsection 2.1.3) and its operation, the preparatory work for the construction of a grid-connected demonstration reactor, the evaluation of an alternative design to classical tokamaks and the required research and development of fusion science and dedicated technologies.

During 2014-2020 Swiss research institutions have been awarded an estimated total of EUR 34 million as part of an increasing role in the execution of the EUROfusion workplan.[61] The European Joint Programme is implemented as a COFUND action and SERI supported the participation of Swiss entities with national accompanying measures amounting to CHF 7.4 million. Beyond major scientific contributions in research areas including plasma physics, numerical simulation, diagnostics, heating systems and superconductivity, the Swiss Plasma Center (SPC) holds a strategic role in the implementation of the European fusion roadmap. Operating the Tokamak à Configuration Variable (TCV) as one of the three midsized infrastructures selected for the implementation of the EUROfusion work programme, the SPC was chosen to host one of the five advanced computing hubs of EUROfusion.

The Euratom RTP 2021–2025 allocates EUR 584 million to indirect actions in fusion research and development. Due to Switzerland's non-association to this programme, the participation of Swiss research institutions in EUROfusion activities runs through EPFL, which is an associated partner of the German Max Planck Institute for Plasma Physics. In 2021 and 2022 SERI committed total funding of CHF 21.3 million to support the participation of Swiss entities in EUROfusion activities.

[60] EU funding allocated to ITER realisation is not included here.

[61] Source: Swiss Plasma Center.

7.6 ITER

Building upon its long-standing collaboration with Euratom in the field of nuclear fusion research, Switzerland joined Fusion for Energy (F4E) as a full member in 2007. F4E is a European Joint Undertaking established by the EU to deliver the European – and Swiss – contribution to the construction of ITER. Whereas EUROfusion performs general fusion research in the frame of a programme, F4E is an EU agency specialized in the procurement of buildings, components as well as general and research services to be delivered as European inkind contribution to ITER Organization. The Euratom RTP 2021–2025 would normally regulate the Swiss financial contribution to F4E activities, but Switzerland's membership in F4E has been suspended since the end of 2020 due to its non-association to the programme.

During 2007–2020, Switzerland contributed CHF 275 million to F4E's operational and administrative budget (see Figure 7.20). Swiss research institutions and private companies benefitted from grants and business opportunities of an estimated total amount of CHF 215 million over the same time period. Considering that ITER is not constructed on Swiss soil, this figure is indicative of the strong competitiveness of Swiss research institutions and companies in this field.

Figure 7.20 Swiss contribution and financial commitments to Swiss institutions for the construction of ITER, 2007– 2020

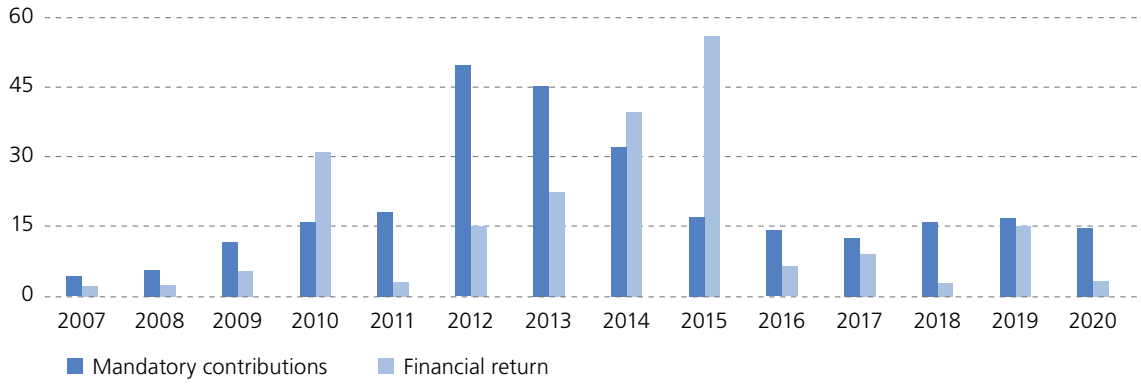


Fig. 7. 20: We show the Swiss contributions to ITER as well as the estimated financial return (in million CHF) in each year since the start of ITER. Sources: SERI, Swiss ILO Office.

Key messages from Chapter 7

Programme areas

► In Horizon 2020, the programme areas MSCA, ERC, ICT and Health accounted for the most participations by Swiss institutions.

► The largest share of committed funding to Swiss institutions went to ERC grants, followed by MSCA, ICT and Health in Horizon 2020.

► In almost all programme parts of Horizon 2020, success rates of participants based in Switzerland were above average. This is particularly true for the ERC and FET, where Swiss participants outperformed their peers by a large margin while also being particularly active in those domains.

► For Horizon Europe, researchers and innovators in Switzerland show high participation in the health domain, but also in the industry, digital and space cluster as well as projects related to climate, energy, food systems and environment.

Partnerships

► Partnerships are initiatives in which the European Commission works with public and private partners to co-fund and co-program specific research and innovation domains.

► Swiss Industry and SMEs showed the highest participation share in Horizon 2020 partnerships. The health-focused partnership IMI2 accounted for nearly half of the committed funding to Swiss institutions in Horizon 2020.

► In Horizon Europe, Swiss SMEs continue to be very active in institutionalised partnerships. The most Swiss participations to date are recorded for the Key Digital Technologies partnership (KDT).

EU Missions

► Five EU Missions have been launched in Horizon Europe to reach specific goals through R&I and public involvement by 2030.

► So far, most participations by Swiss partners have been reported for the Soil mission.

► Almost two thirds of Swiss participants are NPOs and SMEs.

Promoting Excellence

► Marie Skłodowska-Curie Actions (MSCA) and the European Research Council (ERC) aim to promote excellence and fundamental science in both collaborative and mono-beneficiary projects.

► In Horizon 2020 most participations from Switzerland in the MSCA were registered in the Innovative Training Networks, followed by the Individual Fellowships and COFUND.

► The largest number of fellows in Switzerland in the MSCA during Horizon 2020 came from our neighbouring countries Italy, Germany and France followed by China and Spain.

► In Horizon 2020, researchers in Switzerland excelled in all types of ERC grants, with some success rates almost double the average success rates.

► Almost half of the ERC grantees during Horizon 2020 in Switzerland were in the ETH Domain, followed by the universities.

Euratom Research and Training Programme

► Fission: In Horizon 2020, Swiss institutions were strongly focused on projects on the safety of nuclear systems and on radioactive waste. The vast majority of the Swiss participations in Euratom fission activities in Horizon 2020 were carried out by the ETH Domain.

► Fusion: Through its facilities, skills and expertise, Switzerland has established itself as a leading partner in the European Joint Programme in fusion research. The Swiss Plasma Center holds a strategic role in the implementation of the European Fusion Roadmap.

► ITER: During 2014–2020, Swiss research institutions and companies made a strong contribution to the realisation of ITER, the largest fusion device ever built, through Switzerland's membership of Fusion for Energy.

8 Transitional measures for non-accessible parts of the Horizon Europe package

At the time of publication of this report, Switzerland is a non-associated third country to the Horizon Europe package. Consequently, it has not had access to some programme parts (see Section 4.2). To provide researchers and innovators in Switzerland with similar opportunities and funding as would have been the case with an association, the Swiss government has decided to implement transitional measures.

The transitional measures distinguish between accessible and non-accessible programme parts (see Section 4.3):

- Accessible programme parts: areas where applicants in Switzerland can participate but have to provide their own funding. These are usually collaborative projects in topics that are not affected by strategic exclusions. The Swiss government provides direct funding for these programme parts covering the costs of the Swiss partner. The relevant statistics have been covered in the previous chapters on Swiss participation figures.
- Non-accessible programme parts: these include all mono-beneficiary projects, meaning most ERC grants, some MSCA and EIC instruments, as well as collaborative projects in areas where strategic exclusions apply. For these calls, the Swiss government provides bespoke national calls or additional funding for pre-existing instruments implemented via SERI, the SNSF, Innosuisse and ESA. Participation in these measures is covered in this chapter.

The transitional measures are defined annually and have so far been introduced for the years 2021, 2022 and 2023. The funding available for these measures amounts to a total of CHF 1.851 billion, with CHF 1.072 billion allocated to direct funding and CHF 779 million to measures for non-accessible programme parts.

SERI calculates the allocation of funds for transitional measures according to the expected Swiss participation in the corresponding programme area. This ensures that the amount of funding allocated to each of the transitional measures corresponds to the level of funding that researchers and innovators based in Switzerland could have expected to secure from the EC had Switzerland been associated. The allocation of funds among the transitional measures therefore does not necessarily mirror the allocation of the overall Horizon Europe budget. For example, Switzerland has been very successful in securing mono-beneficiary grants from the European Research Council (ERC) and Accelerator funding from the European Innovation Council (EIC), whilst participation in collaborative projects has been comparatively lower. As a result, in associated status Switzerland would receive proportionally more funding from these first-mentioned instruments compared to their share in the Horizon Europe budget. SERI distributes the funding for the transitional measures based on this expected return to Switzerland.

8.1 Transitional measures for pillar I: ERC and MSCA instruments

Most ERC grants as well as the MSCA Postdoctoral Fellowships are mono-beneficiary and therefore not accessible to researchers in Switzerland. This section provides a preliminary analysis of the transitional measures that have been implemented to cover these calls.

8.1.1 Transitional measures for the ERC calls

When Switzerland was removed from the list of countries that were 'to be associated', its researchers became ineligible to participate in calls for the ERC Starting, Consolidator and Advanced Grants. All these calls are conducted annually. The SNSF has been mandated to offer an alternative for each affected call in the years 2021, 2022 and 2023. The eligibility criteria and conditions of the SNSF calls were tailored such that they would closely mimic the respective ERC calls.

The only exceptions for the SNSF mandated calls are the first two ERC calls in 2021. During this initial phase of Horizon Europe, Switzerland still had 'to be associated' status, which allowed researchers and innovators to submit proposals as if they were located in an associated country. Therefore, researchers in Switzerland were able to submit proposals for the ERC Starting and Consolidator Grants 2021 which were evaluated by the EC. The successful projects were subsequently funded directly by SERI.

In addition to the transitional measures targeting researchers located in Switzerland, SERI also offers transfer grants for researchers that successfully obtained an ERC grant and wish to transfer that grant to a Swiss institution and conduct their project there. This would otherwise lead to the researcher losing the respective grant.

The transitional measures for the ERC grants and the corresponding funding are summarised in Table 8.1 below. The SNSF Starting Grant calls have so far benefitted from additional funding provided by the budget of SNSF. In both cases these calls were joint calls covering both the transitional measure for the ERC Starting Grant as well as replacing some of the pre-existing SNSF instruments that have a similar target audience to the ERC Starting Grants.

Table 8.1 Transitional measures for ERC grants

Transitional measures for the ERC Starting Grant	**Funding**
SERI-funded ERC Starting Grant 2021	CHF 51 million
SNSF Starting Grant 2022	CHF 60 million plus CHF 55.2 million from SNSF
SNSF Starting Grant 2023	CHF 45 million plus CHF 79 million from SNSF
Transitional measures for the ERC Consolidator Grant	**Funding**
SERI-funded ERC Consolidator Grant 2021	CHF 66 million
SNSF Consolidator Grant 2022	CHF 66 million
SNSF Consolidator Grant 2023	CHF 41 million
Transitional measures for the ERC Advanced Grant	**Funding**
SNSF Advanced Grant 2021	CHF 60 million
SNSF Advanced Grant 2022	CHF 51 million
SNSF Advanced Grant 2023	CHF 38 million
Transfer Grants	**Funding**
SERI-funded ERC Transfer Grant	CHF 23 million

Table 8.1: These figures reflect the maximum amount provided by the Swiss government and include overheads as well as administrative costs of the call.

Sources: SERI and SNSF.

When analysing participation in the transitional measures for the ERC grants, it should be noted that at present there is only data available for the 2021 and 2022 calls. The 2023 calls are still ongoing. This leads to low number statistics and impacts the meaningfulness of the figures reported here. A further limitation comes from the lack of proposal data for the SERI-funded ERC grants, making the analysis of success rates impossible there.

Figure 8.1 Participation in ERC transitional measures by institution type and instrument

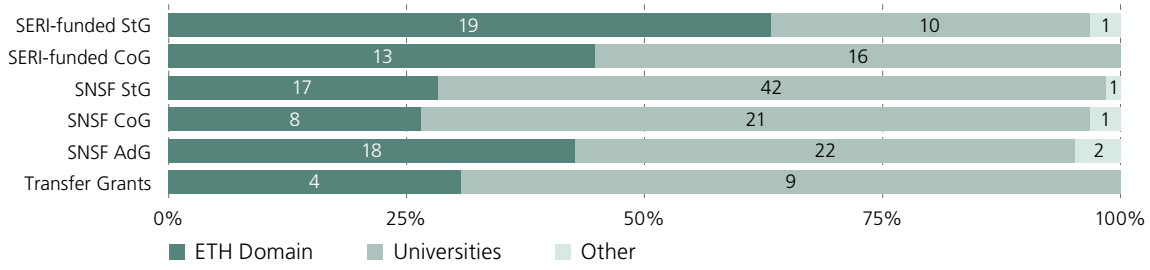


Fig. 8.1: We show the share of grants for the various transitional measures for the ERC Grants for the participating institutions. The bars are also labelled with the respective number of grants for each institution type. These numbers do not include withdrawn projects (as of this report). The SNSF CoG includes one project that is paid for by a donation and not SERI funding.

Sources: SERI and SNSF.

Figure 8.1 gives an overview on how the various transitional measures for the ERC are distributed according to institution type. With the ERC grants addressing fundamental research it is no surprise that a majority of grants are awarded either to the ETH Domain or the cantonal universities. There is a marked difference between grants being evaluated by the ERC (SERI-funded StG and CoG) and the SNSF. In the case of the SERI-funded grants, a total of 32 grants (54.2%) were awarded to the ETH Domain, whilst the cantonal universities secured 26 grants (44.1%). This picture changes with the SNSF-evaluated calls, where the cantonal universities were awarded 85 grants (64.4%) across all categories compared to the 43 grants (32.6%) that were awarded to the ETH Domain. It should, however, be noted that these numbers rely on individual calls and that the usual fluctuations between the individual years might be of a similar order as the fluctuations observed here, or at least contribute to these differences.

On the level of individual institutions, ETHZ secured the most SERI-funded ERC grants with a total of 15, followed by EPFL with 13 and the Universities of Basel and Bern with 7 each. For the SNSF grants, the University of Geneva had the most participations (21) followed by EPFL (20) and then ETHZ and the University of Zurich with 19 each. In addition to these, SERI has funded 13 transfer grants, out of which there were 7 ERC Starting Grants, 5 ERC Consolidator Grants and 1 Proof of Concept Grant. Most transfer grants went to cantonal universities (9).

As mentioned above, an analysis of success rates per institution type is only possible for the SNSF mandated calls (see Figure 8.2). The overall success rates of the SNSF-mandated calls are lower than the average Swiss success rate of 20.3% for ERC calls during Horizon 2020. This is due to the enhanced interest in these calls, with the number of proposals submitted being higher than would be typical for the number of Swiss proposals in an ERC call. The SNSF Advanced Grant is the only call that has already been concluded twice (as of November 2023). There the number of submitted proposals dropped substantially from the first to the second iteration, from 232 proposals to 93 proposals, bringing the success rate for the SNSF Advanced Grant 2022 back to 19.4%, which is closer to expectations from Horizon 2020. Whether the same will be true for the second iterations of the SNSF Starting and Consolidator Grants is unclear.

With that in mind, the ETH Domain has higher success rates than the cantonal universities in the SNSF Starting and Advanced Grant calls, whilst being less successful in the SNSF Consolidator Grant calls. The difference, however, is not as large as during Horizon 2020 when the ETH Domain had overall success rates in the ERC calls that were about 1.6 times that of the universities.

Figure 8.2 Success rates for SNSF mandated transitional measures by institution type and instrument

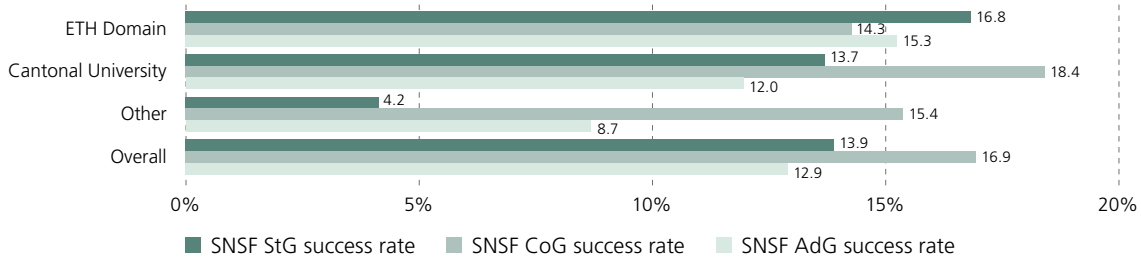


Fig. 8.2: We show the success rates, i.e. number of successful proposals divided by number of eligible proposals for the different institution types and grant types. Each bar is also labelled with the corresponding value for the success rate.

Sources: SERI and SNSF.

Finally, Figure 8.3 shows the committed funding per institution type and transitional measure. These numbers represent direct project costs and do not include the administrative costs of the SNSF calls nor the overheads and are therefore lower than the total amount attributed to each call (see Table 8.1). Overall, the cantonal universities have received the most funding with a total of CHF 249 million, including both the directly funded ERC grants as well as funding from the SNSF-mandated calls. The ETH Domain received a total of CHF 165 million.

Figure 8.3 Committed funding for ERC transitional measures by institution type and instrument

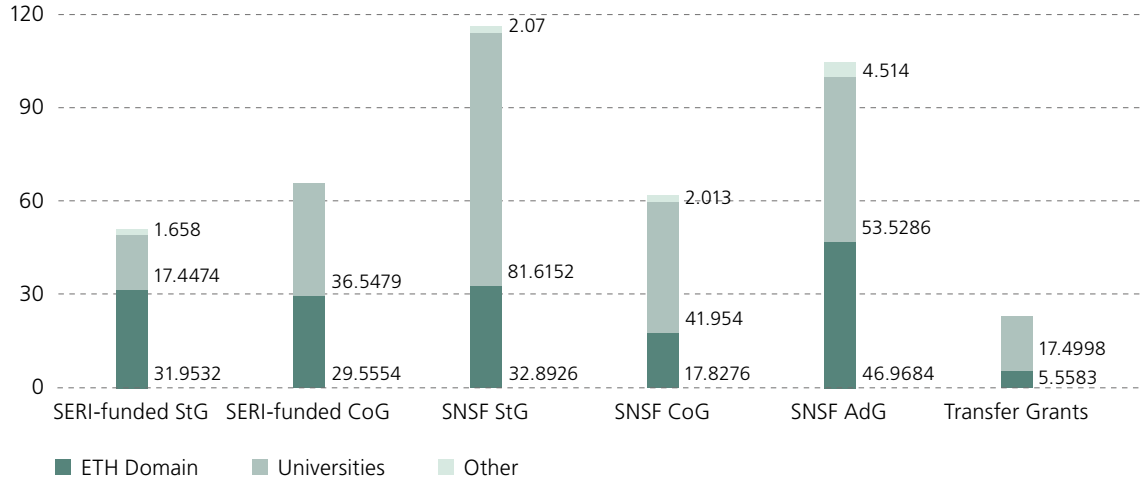


Fig. 8.3: For each transitional measure for the ERC Grants (including overheads) we show the committed funding in total and for the various institution types. The bars are also labelled with the committed funding (including overheads) for each institution type and grant type. It should be noted that these do not include the administrative costs of the calls. The funding for the SNSF StG also includes the additional funding from SNSF's own resources. The SNSF CoG includes one project that is paid for by a donation and not SERI funding.

Sources: SERI and SNSF.

8.1.2 Transitional measures for MSCA Postdoctoral Fellowships

The MSCA Postdoctoral Fellowships are a mono-beneficiary instrument and therefore not accessible to researchers with a Swiss host institution due to Switzerland's current status as a non-associated third country. The transitional measures for the MSCA instruments consist of the new Swiss Postdoctoral Fellowships (SPF) instrument implemented in 2021, 2022 and 2023, and of additional funding for the SNSF Ambizione instrument in 2021.

The Ambizione grants are a national instrument offered by SNSF to fund young researchers within four years of their PhD who wish to conduct an independent research project at a Swiss institution. An additional CHF 8 million from SERI and another CHF 1.9 million from the SNSF were allocated to this instrument in 2021. This top-up funding was used specifically to promote incoming mobility, resulting in 11 additional projects.

The Swiss Postdoctoral Fellowships calls 2021, 2022 and 2023

The Swiss Postdoctoral Fellowships are a new and bespoke instrument open to applicants from any country of origin allowing them to gather postdoctoral research experience at a Swiss host institution. It promotes mobility into Switzerland and offers the opportunity for knowledge exchange and building of research networks. The SNSF has been mandated by the Swiss government to implement the respective calls, with call budgets amounting to CHF 22 million in 2021, CHF 15 million in 2022 and CHF 14 million in 2023. These figures include overheads and costs for the administration of the call. In 2022 the SNSF also dedicated an additional CHF 10 million from its own budget to the SPF call.

The SPF 2023 call closed in December 2023. This report therefore only discusses the participation figures for the SPF calls in 2021 and 2022. Figure 8.4 gives an overview of the participation in those two calls by showing both the share of participations by institution type as well as the total number of participations. With the calls being geared towards postdoctoral researchers, the majority of the 159 successful projects came from cantonal universities (92, 57.9%) and the ETH Domain (61, 38.4%). The institutions with the highest number of participations were ETHZ (32), followed by the University of Zurich (29) and EPFL (19).

Figure 8.4 Participation in transitional measures for MSCA mono-beneficiary grants by institution type

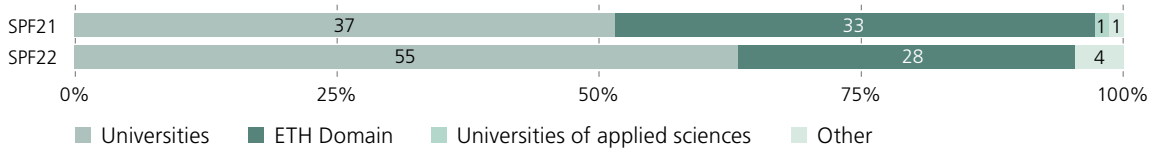


Fig. 8.4: We show the share of grants for the various institution types for the two Swiss Postdoctoral Fellowship calls. The bars are labelled with the number of allocated grants for each institution type. These numbers do not include withdrawn projects (as of this report).
Sources: SERI and SNSF.

The first SPF call in 2021 was heavily oversubscribed, as shown in Figure 8.5, similar to the first SNSF-mandated calls for ERC alternatives. The success rates for both the ETH Domain as well as the cantonal universities hovered at around 10%. For the SPF call 2022 the success rates have recovered to 18.2% for the cantonal universities and 16.3% for the ETH Domain, both due to a reduced number of submitted proposals and additional funding provided by SNSF, allowing for more projects to be funded.

Figure 8.5 Success rates in transitional measures for MSCA mono-beneficiary grants by institution type

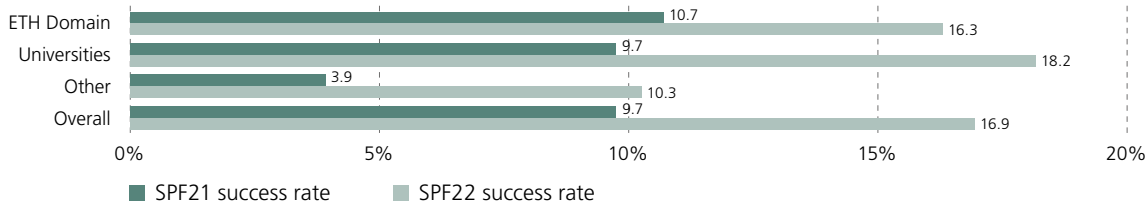


Fig. 8.5: We show the success rates for the two concluded Swiss Postdoctoral Fellowship calls for the various institution types. The success rate is defined as number of successful proposals divided by the number of submitted and eligible proposals. The bars are labelled with the exact values for the success rates.

Sources: SERI and SNSF.

In Figure 8.6 we also illustrate the amount of committed funding. Researchers at cantonal universities received a total of CHF 22.5 million and researchers in the ETH Domain a total of CHF 14.8 million. Most projects have been funded in the area of science, technology, engineering and mathematics (66 projects, CHF 16.0 million), followed by projects in life sciences (59, CHF 14.4 million). Another 34 projects (CHF 8.3 million) were funded in the area of social sciences and humanities.

Figure 8.6 Committed funding for transitional measures for MSCA mono-beneficiary grants by institution type and instrument (in CHF million)

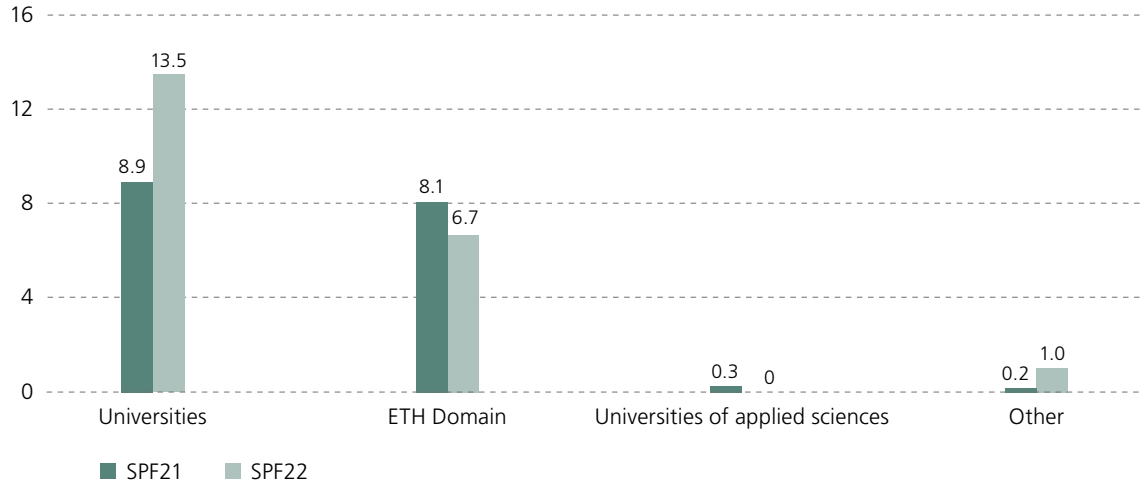


Fig. 8.6: We show the awarded funding for the various institution types for the two concluded Swiss Postdoctoral Fellowship calls. It should be noted that these do not include the administrative costs of the calls nor the overheads. The funding for the SPF 2022 also includes the additional funding from SNSF's own resources.

Sources: SERI and SNSF.

The SPF calls have been devised as incoming instruments, meaning that they were specifically geared towards encouraging mobility into Switzerland. This is also reflected in the nationalities of the 159 grantees: they come from 40 countries, with the largest groups coming from Germany and Italy with 20 recipients each, followed by France with 17 fellows.

8.2 Transitional measures for pillar III: funding for EIC instruments

The EIC has been established under the Horizon Europe programme after a pilot phase during Horizon 2020 running from 2018 to 2020. It aims at promoting innovation at various readiness levels and offers three instruments as shown in Table 8.2.

Table 8.2 EIC instruments

Type of Grant	Short description / Eligibility
EIC Pathfinder	Supports the development of new technologies allowing for conducting high-risk projects and reaching proof-of-concept. Most EIC Pathfinder projects are collaborative projects accessible to researchers and innovators based in Switzerland, but there are also opportunities for mono-beneficiary projects, which are not accessible.
EIC Transition	Aims at the maturation of new technologies and is geared towards developing their commercialisation. EIC Transition projects are often collaborative projects accessible to researchers and innovators based in Switzerland, but there are also opportunities for mono-beneficiary projects, which are not accessible.
EIC Accelerator	Addresses start-ups and SMEs by offering mono-beneficiary projects that allow to scale-up innovation. The EIC Accelerator is not accessible to researchers and innovators based in Switzerland.

Sources: EC and SERI.

The Swiss government decided on transitional measures for the years 2021, 2022 and 2023 offering additional and new funding for researchers and innovators in Switzerland affected by the non-accessibility of some EIC instruments. These measures are listed in Table 8.3.

Table 8.3 Transitional measures for EIC grants

Year	Funding	Number of projects
Transitional measures for EIC Accelerator		
Direct funding for the EIC Accelerator		
2021	Committed funding from SERI: CHF 58.3 million	24
Additional funding for the Innosuisse Impulse Programme		
2021	Top-up funding CHF 15 million from SERI and CHF 0.2 million from Innosuisse	31
Swiss Accelerator calls 2022 and 2023		
Call 2022	CHF 88 million from SERI and CHF 28 million from Innosuisse	53
Call 2023	CHF 75 million from SERI	Not known yet
Transitional measures for EIC Pathfinder and Transition		
Additional funding for the SNF and Innosuisse Bridge instrument		
2021	Top-up funding CHF 5 million from SERI	Not known
2022	Top-up funding CHF 5 million from SERI	Not known
Additional funding for the Innosuisse Flagship Initiative		
2021	Top-up funding CHF 15 million from SERI	4
2022	Top-up funding CHF 25 million from SERI	Not known yet

Table 8.3: The funding for the Swiss Accelerator calls includes overheads and administrative costs for the call.
Sources: SERI and Innosuisse.

Measures for the EIC Accelerator

As shown in Table 8.3, the measures for the EIC Accelerators are divided into direct funding for the EIC Accelerator call 2021, top-up funding for the impulse programme in 2021 and two tailor-made Swiss Accelerator calls for 2022 and 2023.

During the initial phase of Horizon Europe, researchers and innovators in Switzerland still held 'to be associated' status. This meant that Swiss start-ups and SMEs were able to submit proposals to the EIC Accelerator call in 2021, which were evaluated by the EC. The 24 successful projects subsequently received a total of CHF 58.3 million in direct funding from SERI.

In 2021, additional funding was provided to the Swiss Innovation Power impulse programme, which aimed at strengthening innovation in SMEs in view of the COVID-19 pandemic. The allocated funding was CHF 15.2 million, which consisted of CHF 15 million provided by SERI via the transitional measures and CHF 0.2 million from Innosuisse's own budget. This additional funding allowed another 31 projects to be realised.

After 2021, the Swiss government mandated Innosuisse to implement the Swiss Accelerator, a new instrument to provide an alternative to the EIC Accelerator calls. The aim of the Swiss Accelerator is to provide funding for individual Swiss start-ups and SMEs that are working to realise an innovation project with scale-up potential. Similar to the EIC Accelerator calls, the Swiss Accelerator operates a multistage model: short applications are evaluated, full applications are invited and evaluated, and finally a presentation is held. The Swiss government allocated CHF 88 million in funding to the 2022 Swiss Accelerator call. This was topped-up by Innosuisse's own funding, leading to a total call sum of CHF 116 million. In 2023 a total of CHF 75 million was allocated to the Swiss Accelerator.

The Swiss Accelerator 2023 is still ongoing at the time of writing this report. In the following only the 2022 call is being discussed.

A total of 752 short applications were received for the Swiss Accelerator call 2022, out of which 128 projects were invited for a long application. Ultimately 53 projects were funded with CHF 112 million. This number is slightly smaller than the call sum due to administrative costs for the call. The distribution of funded projects divided by innovation area is shown in Figure 8.7, along with the total amount of funding in each area. Most projects are aiming at innovation in the area of life sciences (20 projects, funded with CHF 45.9 million) followed by 11 projects each in ICT and energy and environment (funding of CHF 24.4 million and CHF 19.3 million respectively). In accordance with the call conditions, all projects are conducted by start-ups or SMEs.

Figure 8.7 Swiss Accelerator projects by innovation area

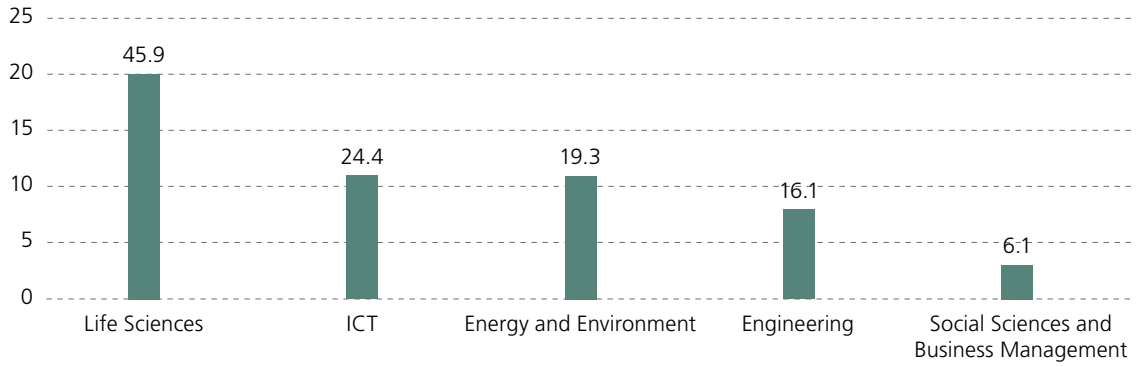


Fig. 8.7: We show the number of projects in various innovation areas as well as the funding allocated to those projects (in CHF million on the top of each bar).

Sources: Innosuisse and SERI.

Measures for the EIC Pathfinder and EIC Transition

As detailed above, the EIC Pathfinder and EIC Transition instruments are partially accessible to researchers and innovators in Switzerland. Transitional measures were implemented to provide additional opportunities for researchers and innovators based in Switzerland to realise their ideas in the non-accessible areas of the EIC Transition and Pathfinder calls. The transitional measures provide top-ups for relevant national instruments, i.e. for Bridge and for the Flagship Initiative (see Table 8.3).

The Bridge instrument is a joint instrument of the SNSF and Innosuisse aimed at researchers who want to either develop an application based on their research results or want to explore the innovation potential of their results. In 2021 and 2022 additional funding of CHF 5 million each was provided to realise such projects.

The Flagship Initiative implemented by Innosuisse aims at stimulating innovation in predefined topics that address societal or economic challenges. The funding from the transitional measures in 2021 allowed for four additional projects. A total of CHF 15.2 million was allocated, consisting of CHF 15 million from SERI and CHF 0.2 million from Innosuisse's own budget. This transitional measure was repeated in 2022 when an additional CHF 25 million in funding was provided. At the time of writing this report, the relevant reporting by Innosuisse has not been completed yet.

8.3 Transitional measures for strategic areas

With the advent of Horizon Europe, the European Commission has placed restrictions for non-EU member states on access to certain calls in topic areas that it deems to be of strategic importance. The extent of these exclusions varies from call to call. For some calls, all EU member states and EEA countries are admitted, whilst for others all OECD countries have access. Space and quantum research are by far the most inaccessible areas. Here a large fraction of calls is only open to EU member states or associated countries that fulfil additional criteria (for instance Israel is admitted to calls in quantum research but not to certain space topics). In addition to these areas in Horizon Europe, the Digital Europe Programme (DEP) is almost completely inaccessible to researchers in Switzerland. Consequently, the transitional measures in strategic areas focus on these three areas: quantum research, space research and DEP topics. These are also areas where researchers and innovators in Switzerland are either leading or have unique expertise, making the transitional measures even more crucial.

8.3.1 Measures in the Digital Europe Programme areas

Transitional measures in topics that are covered by the DEP have so far focused on two separate initiatives, detailed below. In addition, funding was provided for a collaborative project that includes MeteoSwiss.

SwissTwins Initiative

SwissTwins is a new initiative introduced by the Federal Council in 2021 and 2022 to position researchers and research infrastructures in Switzerland in the strategic area of high-performance computing (HPC) within the European landscape. SwissTwins complements the Swiss initiative for HPC and Networking (HPCN), as well as EC initiatives such as Destination Earth (DestE) and those led by the European HPC Joint Undertaking (EuroHPC JU). The overarching goal of the SwissTwins initiative is to keep the Swiss research infrastructures of the ETH Domain, which rely on HPC, well-integrated into the European landscape and competitive at a global level. The initiative focuses on development of middleware that leverages the HPCN-funded Alps infrastructure at the Swiss National Supercomputing Center (CSCS) to support simulations, data analysis, as well as scientific workflows in domains that are of high priority to the ETH Domain. SwissTwins is emphasising software engineering to make its products deployable on contemporary supercomputing infrastructures at CSCS, in Japan, the USA, as well as those of the EuroHPC JU. The initiative coordinates closely with DestE and focuses its development on the weather and climate vertical. The SwissTwins technology and infrastructure is largely generic and will be available to all scientific domains. SERI is cofinancing the initiative with CHF 20 million.

SwissChips Initiative

SwissChips is a new initiative decided by the Federal Council in 2023 to maintain and secure a strong position for researchers and research infrastructures in Switzerland in the strategically important areas of semiconductor technologies, microelectronics, and more specifically integrated circuit (IC) design. The initiative was triggered by the exclusion of Swiss actors from certain EC activities and is aligned with the Horizon Europe and Digital Europe programmes. Several work packages are being proposed by ETHZ, EPFL and the Centre suisse d'électronique et de microtechnique (CSEM). SERI will provide CHF 26 million to cofinance the initiative, which will run for three years starting in 2024.

The GLORI Digital Twin

GLORI DT is a configurable global-to-regional short-range, high-resolution digital twin that leverages the weather and climate prediction capability for selected regions, such as GLORI-A for the Alpine region and GLORI-Med for the Mediterranean region. The twin utilises current operational systems but is also fit to run on next generation supercomputers at kilometre-scale resolution and allows on-demand predictions of selected atmospheric composition elements, such as mineral dust for energy applications and pollen for health applications. It also includes interfaces for hydrological applications. SERI provides CHF 3 million in funding for MeteoSwiss to participate in the independent international project consortium.

8.3.2 Measures in the area of space

In the programme years 2021, 2022 and 2023, Switzerland was unable to access almost half (48.7%) of the budget in calls on space topics under Horizon Europe. In order to replace these opportunities, the Swiss government has decided to increase the budget for specific programmes implemented by the European Space Agency (ESA). Switzerland is a founding member of ESA and conducts most of its activities in the space domain as part of various ESA programmes. Increasing the funding for these programmes allows the direct targeting of Swiss actors in areas of exclusion with a guaranteed return on investment on the committed funds. Additional funding has been provided through the transitional measures for the ESA programmes shown in Table 8.4. These programmes have been selected to cover topics that would otherwise have been accessible in Horizon Europe, as well as to further strengthen research and innovation in areas of unique Swiss expertise.

Table 8.4 Transitional measures in the space domain

Transitional measures 2021	**Additional funding: CHF 25 million**

- PRODEX (Programme de Développement d'Expériences scientifiques): promotes scientific research and allows for the development of instruments for space science. These projects are led by Swiss universities or research institutes, and implemented together with Swiss industry. Projects with a large international component and high scientific potential are selected in the context of transitional measures.
- ARTES (Advanced Research in Telecommunication Systems): promotes projects in the area of innovative telecommunication systems. These are generally led by Swiss industry.
- FLPP (Future Launcher Preparatory Programme): funds projects to develop new technologies and capabilities in the area of launchers, balancing reliability and reduction of operational costs. These projects are usually industry led.
- GSTP (General Support Technology Programme): this is a programme aiming at developing nascent technologies into usable products.

Transitional measures 2022	**Additional funding: CHF 12 million**

- NAVISP (Navigation Innovation and Support Programme):
  promotes projects in innovation in positioning, navigation and timing. These projects are industry-led.
- FLPP (Future Launcher Preparatory Programme): described above.
- GSTP (General Support Technology Programme): described above.

Transitional measures 2023	**Additional funding: CHF 11 million**

To be defined.

Sources: SERI and ESA

Funding is provided for two years following the introduction of the respective measure. For example, the additional funding from the transitional measures 2021 is available in two tranches in 2022 and 2023. Consequently, only part of the funding listed in the above table has already been allocated.

As of September 2023, a total of EUR 22.9 million has been committed to a total of 18 projects. ESA is the contractual partner for the involved Swiss entities. Since ESA allocates funding in euros, the committed funding is cited in that currency. The distribution of committed project funding across the various ESA programmes is illustrated in Figure 8.8.

Figure 8.8 Transitional measures in the Space domain by ESA programme

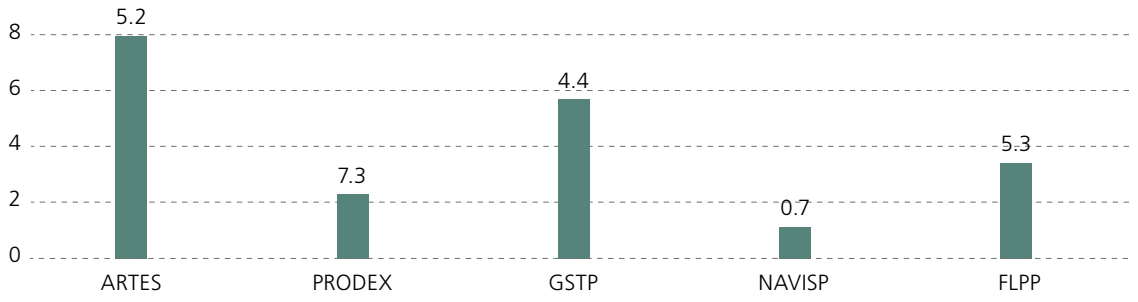


Fig. 8.8: We show the number of additionally funded projects in the framework of the transitional measures per ESA programme. The committed funding is shown at the top of each bar in EUR million.
Source: SERI.

8.3.3 Measures in the area of quantum research

Researchers in Switzerland were extraordinarily successful in the Horizon 2020 Quantum Technology flagship, receiving funding amounting to CHF 23.2 million, almost 11% of the total funding distributed under those calls. In Horizon Europe, quantum research is deemed an area of strategic interest, leading to most researchers from non-EU member states, including associated countries, being excluded from the relevant calls. In the years 2021–2023, quantum researchers in Switzerland had access to only 19.2% of the funding in those calls.

To maintain the Swiss leading expertise in the quantum field and to ensure compatibility with developments on a European level, the Swiss government has provided funding for transitional measures totalling CHF 34 million. Specifically, CHF 24 million were allocated for the years 2021 and 2022 and another 10 million in 2023. The SNSF was mandated to conduct the Quantum Transitional Call 2022, aimed explicitly at researchers who otherwise would have participated in the EC's quantum actions. This call was met with great interest by the quantum community and is funding 16 projects with a total of CHF 24 million.

While this report was being produced, a further call has been prepared in collaboration with the Swiss Quantum Initiative and the SNSF. SERI will contribute CHF 10 million for projects related to ongoing European quantum research, particularly in the Quantum Flagship.

8.4 Transitional measures for ITER

Fusion for Energy and the ITER Organization stopped treating Switzerland as a participating country in the realisation of ITER in 2021. As a consequence, Swiss entities can only participate in ITER activities in areas where specific capabilities are not available in F4E or the ITER Organization member countries. This means that although collaboration agreements signed before 2021 are continuing, Swiss entities cannot enter into new collaboration agreements. This is resulting in a slow fade in Swiss participation in the delivery of ITER. However, some Swiss research institutions still benefit from bilateral collaboration agreements at an institutional level with F4E and the ITER Organization to conduct research projects of joint interest. SERI currently supports the relevant research institutions with transitional measures totalling CHF 10.6 million. However, such a scheme is not feasible for Swiss private companies.

Key messages from Chapter 8

► Transitional measures are defined annually and have so far been implemented for the years 2021, 2022 and 2023.

► Transitional measures distinguish between accessible parts of the programme, for which SERI provides direct funding, and inaccessible parts of the programme, for which other instruments are either augmented or set up.

► For the transitional measures 2021–2023 a total of CHF 1.851 billion in funding is available, with CHF 1072 million allocated to direct funding and CHF 779 million to measures for non-accessible programme parts.

► Innosuisse and the SNSF have been mandated to implement transitional measures for non-accessible parts in the ERC, MSCA, EIC and quantum programme areas. The tailor-made calls are met with great interest by the R&I community.

► Specific initiatives have been set up for the transitional measures in the non-accessible strategic areas related to the DEP.

► The transitional measures in the space domain are implemented through the European Space Agency ESA.

► With regards to ITER, SERI's transitional measures enable the funding of some academic entities' participation in joint research projects, but the participation of Swiss companies in the delivery of ITER is de facto interrupted.

9 Annex: Data

9.1 Data sources

The data for the analysis presented in this report has various origins, each with their own drawbacks which are discussed in this section. The points raised here should be kept in mind when interpreting the data presented throughout this report. Data underlying the figures shown in the report are available upon request.

eCORDA

This refers to the confidential database which the EC runs for projects under its framework programmes for research and innovation. It contains both information on the implemented projects, as well as on submitted proposals whether successful or not. This allows to analyse not only the approved projects in terms of programme area and project type, but also success rates of proposals from various actors. It is, however, incomplete in certain areas:

- The eCORDA database is continually evolving but does not contain data on all projects linked to the framework programmes. For instance, the information on Article 185 and Article 187 projects is incomplete.

- Partners from non-associated countries do not usually have their budget included in the budget figures of eCORDA. With the advent of Horizon Europe and the non-association of both the United Kingdom and Switzerland for the time period 2021–2023, the budget figures for two countries with a sizeable number of projects are no longer part of the data. This can lead to distortions in conclusions made regarding the allocated funds.

- eCORDA data contains personally identifiable information (PII). For mono-beneficiary projects, this information can be used to extract data on nationality and gender of project participants. However, data quality varies. While ERC PII for Horizon 2020 was virtually complete, MSCA PII had many missing values for gender and nationality.

Access to the eCORDA database is granted to EU member states or countries formally associated to any given framework programme. Information from eCORDA was used to analyse Swiss participation in Horizon 2020 complemented by Profund data on direct funding for the years 2014–2016 (see below). eCORDA data on Horizon Europe is not accessible for Switzerland at this point.

Cordis

This is the publicly available data for participation in the various framework programmes. Whilst Cordis contains information on the implemented projects, it does not contain information on submitted proposals. Cordis data does most likely not yet contain all information on project calls from 2022, since several months may pass between a call deadline, project start and the update of the database. In this report Cordis data is used alongside the Profund data (see below) for Horizon Europe projects.

Profund

With the Swiss partial association from 2014 to 2016 and the current non-association, SERI has created its own project database to handle funding requests for projects. This database contains all relevant information on the Swiss project partner, including their budgets; however, by design it does not contain information on any non-Swiss project partners. For participation data on Horizon 2020, the data from Profund is merged with the data available from eCORDA to provide a complete picture on allocated funds. For Horizon Europe the Profund database is the only source of information on funding of Swiss participants and is used alongside the Cordis data which provides information on the other project partners. For Horizon Europe generally only projects that are contained both in Profund and in Cordis are retained.

Data from SNSF, Innosuisse and ESA

Data on transitional measures was provided to SERI by the organisations mandated with their implementation. For each call the corresponding data is delivered upon conclusion of that call and includes information on the applicants as well as the successful proposals. In the case of top-up funding for pre-existing instruments or programmes, the projects that are funded in the framework of the transitional measures are identified where possible.

In this report all of the above data sources are used alongside each other. The extraction dates (i.e. date of last included data point) are as follows:

- eCORDA: 04.05.2023
- CORDIS: 03.10.2023
- Profund: 03.10.2023
- Transitional measures: varying, all calls that were concluded at the time of writing this report were included.

The data used in this report undergo several cleaning steps. These include mainly:

1) International organisations: they are assigned their own category and their participations do not count towards their host country. An example is the CERN which is hosted in Switzerland.

2) Currency: all committed funding is calculated and stated in Swiss Francs.

3) ERC and MSCA mono-beneficiary grants are treated for duplicates: in cases of grantees with several host institutions, only the host institution that receives the highest amount of funding is retained.

4) All Swiss institutions are categorized by institution type.

5) Only data that was largely complete and that in particular included figures for the awarded funding was retained. Notably all data regarding the EIT and Art. 185 activities was excluded from the analysis.

As previously discussed the data on Horizon Europe should be treated with caution:

- Due to the current non-association, Swiss partners are ineligible for approximately one-third of the calls, including in areas where researchers based in Switzerland have usually excelled, such as the ERC grants. This means that when comparing number of participations or committed funding the Swiss figures will not be directly comparable to other countries with full access to all calls.

- The data itself is currently incomplete as it is a combination of publicly available data and data from funding requests to SERI, neither of which yet contain all calls from 2021–2022. Due to the time it takes from the evaluation of a call and the conclusion of the corresponding grant agreement, almost no data on calls from 2023 are included in this report.

9.2 Main indicators

A main set of indicators is used throughout the report, as described below.

Project participation

Project participation is defined as the number of actors participating in Horizon 2020 or Horizon Europe projects. Each participant in a project is counted individually. The number of participations therefore differs from the number of projects.

Coordination roles

In collaborative projects one of the project partners acts as an initiator and overall lead of the proposal and the project itself. Coordinating projects was possible throughout Horizon 2020 but with the current non-association to Horizon Europe researchers and innovators in Switzerland have been excluded from this role.

Mono-beneficiary grants

In mono-beneficiary projects, individual researchers or innovators are awarded a grant for a specific project and are automatically categorised as coordinators in the eCORDA data base. Most mono-beneficiary grants are found in ERC or EIC programme areas, but occasionally in other programme areas too. In this report, all projects with one project participant were categorized as mono-beneficiary grants.

Committed funding

Committed funding is the amount of funding that a participant requests at the start of a project and which is recorded in the grant agreement. The effective project costs might differ from the initially budgeted costs.

Success rate

The success rate is defined as the ratio between the number of proposals selected for funding and the number of submitted eligible and evaluated proposals. The number of proposals selected for funding is usually not equal to the number of projects that is implemented, since if more money becomes available, projects from a reserve list might be implemented as well. When comparing success rates per country, this was done on a proposal basis: each proposal counted only once per country, independently of how many applicants of the same country it contained. When comparing success rates across institutions in Switzerland, the success rates were calculated on an applicant basis, with each proposal potentially counting multiple times for applicants from different institutions.

Joint projects and potential collaborative links

The number of joint projects between Switzerland and other countries participating in Horizon 2020 and Horizon Europe is defined as the number of projects in which at least one partner from Switzerland and one partner from the respective country are involved. The number of potential collaborative links sums for all projects the number of pairwise combinations between partners from Switzerland and another country in the respective projects. If for example Germany and Switzerland had one project with two German researchers and one Swiss researcher, then there would be two potential collaborative links. The number of potential collaborative links differs from the number of joint projects in that it increases depending not only on the number of joint projects but also on the number of partners in the individual projects.