Multi-Year Programme 2021–2024

We invest in researchers and their ideas

FNSNF
Swiss National Science Foundation

We invest in researchers and their ideas

Mandated by the Swiss government, the Swiss National Science Foundation (SNSF) supports scientific research in all academic disciplines. We select and fund the best research projects and support the most promising young researchers based on national competitive procedures. The knowledge generated in these projects provides a sound basis for economic and societal progress.

The photographs have been taken from the SNSF Scientific Image Competition and from a series of pictures produced for the SNSF Annual Report.

Planning document for the Federal Authorities
Bern, April 2019

Contents

Executive Summary

Based on its federal mandate, the Swiss National Science Foundation (SNSF) invests in scientific research as a driver of economic and societal innovation. Grants are awarded in a selection procedure that is competitive, quality-driven and independent.

— **Competitive:** The SNSF awards the financial resources in a competitive process to the best researchers and research projects in Switzerland. Competition between ideas is an important factor in high-quality research and scientific discoveries.

— **Quality-driven:** The SNSF evaluation bodies decide whether applications submitted by researchers deserve funding based solely on quality. Leading scientists evaluate the applications according to international standards.

— **Independent:** The SNSF is convinced that scientists are best able to identify promising research topics. Open funding formats with few requirements have been devised to boost freedom of research. Thanks to its independence and expertise, the SNSF is also able to make substantial contributions to the development of the science system.

Strategic priorities

Although Swiss research is in an excellent position internationally, it is also confronted with a number of challenges in a highly competitive environment. In order to optimally meet these challenges and underpin and expand Switzerland's leading position, the SNSF has set the following strategic priorities for the 2021–2024 funding period:

— **Foster excellence through diversity:** The SNSF has a mandate to promote high-quality research in Switzerland in all its diversity. In the next funding period, its activities will remain focused on funding basic research. In order to unlock further potential for excellent research, the SNSF will support use-inspired research at universities of applied sciences as well as research carried out by women, in particular.

— **Strengthen international leadership through collaboration:** Research is global, but at the same time it is becoming increasingly specialised. Many research questions can only be addressed if different groups with complementary skills work together. The SNSF wants to make it easier for researchers to jointly contribute to the development of new areas of knowledge and enhance the leading position of Swiss research.

— **Support data infrastructures and services for open science:** Research produces, stores, administers and analyses increasingly large volumes of data. The SNSF aims to ensure that researchers in Switzerland are able to use high-quality data infrastructures and services that are well coordinated and easily accessible. This is crucial to the quality and usability of research results and expedites the transition to open science.

— **Enhance the value of research for society:** The full potential of research findings is not yet being realised. The SNSF will continue to support their translation into innovations in collaboration with Innosuisse. In addition, the SNSF will bring together SNSF-funded researchers with stakeholders who want to apply research findings. This will facilitate, in particular, the implementation of the sustainable development goals defined by the United Nations.

New measures and funding portfolio

A series of new measures supports the implementation of these strategic priorities. The measures complement the existing funding portfolio through which the SNSF has successfully promoted scientific research in Switzerland.

The orientation and structure of the funding portfolio remain unchanged. Open formats with few thematic or other requirements (projects and careers) still account for the lion's share of the funding budget, approximately 80 %.

Funding category in the portfolio	New financially relevant measures to implement the strategic priorities	Additional funds for 2021–2024 period compared to the level at the end of the previous period (2020)
Projects		
Enable researchers in all disciplines to apply for support for self-chosen projects to pursue new ideas and achieve their research targets.	New funding scheme for research collaboration in medium-sized consortia	Reallocation within funds for projects
	Temporary measure for health and engineering research at universities of applied sciences	CHF 24 million
Careers		
Funding schemes have been enhanced in the current funding period in order to offer young researchers clear career prospects.	Excellence grants for female doctoral candidates in the STEM disciplines and life sciences	CHF 17 million
Programmes		
Pursue special predefined goals.	Development of BRIDGE, the joint programme of the SNSF and Innosuisse	CHF 18 million (additional mandate)
Infrastructures		
Support the development of entire disciplines.	Funding and evaluation for data infrastructures and services of national importance	CHF 28 million (additional mandate)
	Start-up and development grants for emerging data infrastructure requirements	CHF 10 million
Scientific communication		
Foster dialogue and knowledge transfer.	Funding of implementation networks to support communication between researchers and potential users of research	CHF 7 million
Total		**CHF 104 million***

* incl. additional mandates from the government in the amount of CHF 46 million in total

European research funding

The SNSF's planning presupposes the full association of Switzerland to the next European research framework programme Horizon Europe. The SNSF is striving to achieve this objective in close collaboration with the SERI. Both SNSF funding and European funding are necessary: without competition-based national funding, Swiss research would be less competitive. In the absence of European funding, Swiss research would lack international integration and the very important opportunity to measure up against European quality standards.

Financial requirements

The financing required for the 2021–2024 period has increased for three reasons:

Prior financial commitments and continuation of new grants at a level similar to 2020: The SNSF generally funds projects over several years to allow researchers to plan and think ahead. This has an impact on the financial requirement, as funding decisions made in one period entail payments in the next period. If the newly approved project funds go up, the SNSF's financial requirement for the following years will increase, into the next ERI period. This applies even if new approvals do not continue to increase. In the 2021–2024 period, the SNSF plans to continue approving new applications in existing schemes at the same level as in the period up to 2020. To achieve this, it requires an additional CHF 231 million for the above-mentioned reasons. Most of these resources will be allocated to career funding, which was expanded by the SNSF in the 2017–2020 period.

Necessary adjustments to existing funding schemes: CHF 61 million are needed to adjust the salaries of project employees to the development of nominal wages and to increase the mobility fellowships, which will be taxable from now on.

New strategic priorities: The SNSF requires CHF 104 million for the above-mentioned measures.

In relation to the funding budget, the indirect research costs at higher education institutions (overhead) and for service provision (Administrative Offices and evaluation processes) are in the region of the costs for 2017–2020.

The additional financial requirement for the 2021–2024 period thus comes to CHF 396 million. This corresponds to an annual increase of approximately CHF 100 million, or 3.5 %. The SNSF is not requesting compensation for the generally increasing research costs and it will transfer money within project funding to finance some of the new measures. It will require less funding for the NCCRs and NRPs than in the current period.

Continuation of grants at level of 2020
Necessary adjustments to existing funding schemes
New strategic priorities

	2020	2021	2022	2023	2024	2021 – 2024	Additional funds for 2021– 2024 period compared to the level at the end of the previous period (2020) in CHF million
Projects	540	548	549	580	604	2,280	120
Careers	185	200	228	232	240	900	160
Programmes	14	15	17	19	19	70	12
Infrastructures	36	40	40	40	41	159	15
Science communication	11	12	13	15	16	56	11
Total I	**787**	**814**	**846**	**885**	**919**	**3,465**	**318**
NCCRs and NRPs	86	89	77	75	75	316	**-26**
Additional mandates from the Federal Government	43	54	54	54	55	218	**46**
Total II	**915**	**957**	**978**	**1,015**	**1,049**	**3,999**	**338**
Service provision	69	72	74	76	79	301	**25**
Overhead for indirect research costs at higher education institutions	107	100	117	119	124	460	**33**
Total III	**1,091**	**1,129**	**1,168**	**1,210**	**1,252**	**4'759**	**396**

The amounts may include rounding differences

The SNSF will definitively prioritise the planned measures on the basis of the ERI Dispatch 2021–2024.

1. Introduction

Switzerland depends for its future prosperity on a thriving research sector and on scientific discoveries. As a high-wage, high-price economy, it can only develop its living standards and international competitiveness through the high quality of its products, services and workforce. Today's environmental and social challenges, moreover, are a formidable threat to future generations, in Switzerland and around the world. These challenges require the constant renewal of the knowledge base, the rapid transformation of scientific results into practical applications, and the capacity to adapt to changing circumstances – digitalisation today, unknown developments tomorrow. To this end, a strong, stable and internationally open research environment is an essential prerequisite.

Almost 90,000 people at Swiss research and higher education institutions are committed to keeping Switzerland ahead in the long term.[1] Research groups from Switzerland are at the forefront of research in fields as diverse as anthropology, artificial intelligence or oncology, to mention but three examples. Nevertheless, international competition is intense. Many countries, in particular China, are investing heavily in research and building up scientific capacity and research infrastructure (see Figure 1).[2] At the same time, the cost of research is increasing constantly. Switzerland will not be able to remain competitive on money alone: to maintain its leading position, it will need to invest the available funds as effectively as possible.

Figure 1. Gross domestic expenditure on research and development (GERD) in percentage of gross domestic product (GDP) and average growth of GERD per year in international comparison. Size of bubble shows GERD at constant prices and purchase power parity. Source: OECD, MSTI database. Data: 2008–2016.

1.1
The SNSF's mission and funding policy

Based on its federal mandate, the SNSF invests in all types of high-quality scientific research aimed at acquiring new knowledge as a driver of innovation. This includes both basic and use-inspired research, with a special focus on basic research. Complementing the activities of the SNSF, the Swiss innovation agency Innosuisse funds research-based innovation projects and requires co-financing by non-academic partners.

The core principles of the SNSF's funding policy are:

Competition
The SNSF is Switzerland's main platform for the competition between researchers. Its key task is to identify and support the best projects and the best people through independent and quality-driven selection procedures. Competition between different ideas is a key driver of high-quality research and scientific discovery.

Overall, in Switzerland, the share of competitive project funding, allocated based on expected performance, is relatively low compared to other countries (see Figure 2).[3, 4]

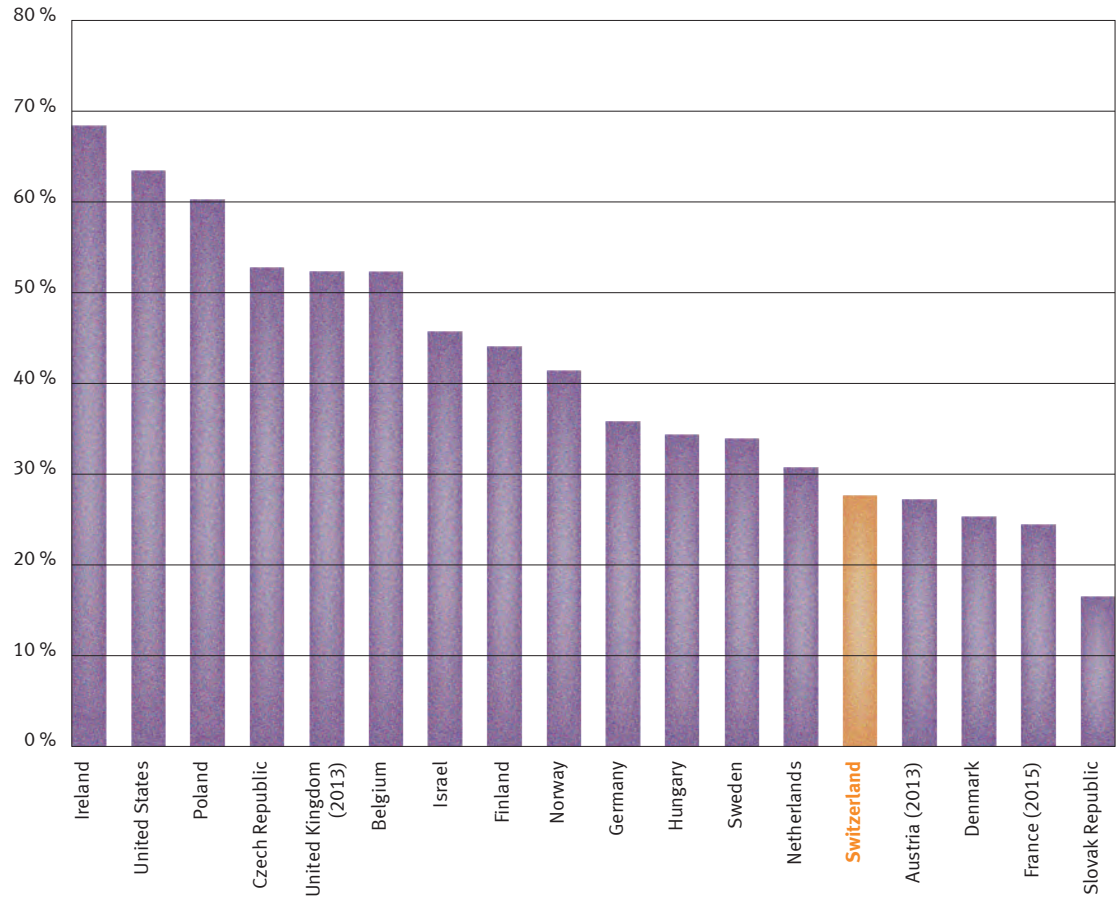


Figure 2. Project funding as % of total government budget allocations for R&D. Project funding is defined as money attributed to a group or an individual to perform a research activity limited in scope, budget and time. In Switzerland this includes transfer funds to the SNSF, Innosuisse, EU Framework Programmes (yearly contribution), European Space Agency (yearly contribution) and federal and cantonal exchange funds for projects. Source: PREF. Data: 2014.

Quality
With a focus on research aimed at producing new knowledge, the selection of projects at the SNSF is based on scientific quality. Where relevant, the SNSF also considers the potential broader impact of research on society.

From the outset, the SNSF's funding policy has been based on the core conviction that promising research avenues are best identified by the research community itself. The SNSF will continue to focus on funding mechanisms that allow researchers to pursue and develop their ideas and priorities. It will also continue to invest a small share of its budget to support specific research topics and policy objectives, but most funding formats will remain open, with few thematic or other requirements.

Page 12 illustrates that this funding portfolio is well suited to fostering research on crucial issues such as digitalisation.

Independence
Independent research funding and evaluation processes support freedom of research, which is rooted in the Swiss Constitution. As an organisation for the representation of researchers by researchers, the SNSF can also contribute to transforming research from within. It seeks to develop evidence-based research funding policies (see text box) to support the leading position of Swiss research.

The three principles of competition, quality and independence have guided the SNSF in the current period and remain the cornerstones of its funding policy for the future. Knowledge production is a long-term endeavour and the SNSF aims to provide stable and predictable funding opportunities that lay the foundation for a strong Swiss science sector. For this reason, it strives for continuity in its policy objectives and funding portfolio.

With the measures set out in its current Multi-Year Programme 2017–2020, the SNSF aims to support excellence and internationality in research and evaluation, to facilitate early independence for young researchers and to contribute to knowledge transfer and innovation. Most of the planned measures have been implemented successfully (see page 10), but will take their full effect progressively and continue to influence the financial requirements for the 2021–2024 period, particularly in order to maintain the important additional investments in young researchers (see chapters 3.2 and 4.2).

While the objectives of the current period remain relevant, the emphasis of the priorities and measures proposed for the 2021–2024 period evolves in the light of today's challenges (see chapter 1.2).

The SNSF primarily funds basic research as well as use-inspired research. In highly competitive evaluation procedures, scientists select the most promising projects of their peers based on quality alone.

Evidence-based research funding policy
The SNSF is driven by the conviction that research funding policies should be informed by research on research. Building on the latest research findings on peer review, the SNSF designed the evaluation procedure to award the Swiss Science Prize Marcel Benoist. It has also initiated an international discussion on the assessment of researcher CVs, which will inform the development of evaluation processes (see chapter 2.1). As a basis for its open access policy, the SNSF has investigated the phenomenon of predatory publishing, which will help researchers identifying trustworthy journals when publishing their results.
The SNSF is developing the analysis of its own activities, especially with respect to the impact of funding activities (see chapter 4.1). Internal analysis will be complemented by external, independent evaluations. By making its own data and analyses publicly available, and through cooperation with researchers in relevant fields, the SNSF seeks to contribute to the knowledge base for research funding policy.

How the SNSF is implementing its priorities for the 2017–2020 period

The SNSF has implemented most of the measures set out in its current Multi-Year Programme.

To support excellence and internationality in research and evaluation, the SNSF has…

— started to internationalise its evaluation bodies. As of early 2019, 32 % of the members of evaluation bodies are from institutions outside Switzerland.

— launched the Swiss Programme for International Research by Scientific Investigation Teams (SPIRIT), in 2019, to promote team-oriented cross-border research with selected countries that are receiving development assistance.

— targeted the funding scheme Sinergia more specifically to interdisciplinary research in order to encourage disruptive research.

— adopted a new research data policy in 2017, to ensure that research data generated by funded projects are made publicly accessible whenever possible.

— set stronger incentives to implement open access for all SNSF-funded publications as of 2020. Currently 48 % of SNSF-funded publications are open access and 67 % are freely available in some form. This means that the SNSF is far above the international average, but at the same time still far away from the target of 100 %.

In order to facilitate early independence for young researchers, the SNSF has…

— streamlined its whole career funding portfolio to improve the career prospects of promising young researchers. It now offers a clear range of funding schemes that are aligned with the different career stages and with its project funding scheme. The share of funds dedicated to career funding was increased.

— extended its measures for promoting gender equality with the introduction of PRIMA, the new scheme for excellent women researchers, in 2017.

In order to contribute to knowledge transfer and innovation, the SNSF…

— has introduced BRIDGE, a new scheme to simplify the transition from research to innovation, in 2017, together with Innosuisse.

— enables the exchange of ideas between academia and businesses, NGOs or the public sector through mobility funding for young researchers.

Regarding initiatives with respect to specific priorities, the SNSF promotes research on digitalisation (see page 12 for more details):

— in the 5th call for National Centres of Competence in Research (NCCRs), launched in 2017, where proposals that reflect the goals of the Digitalisation Action Plan are a high priority.

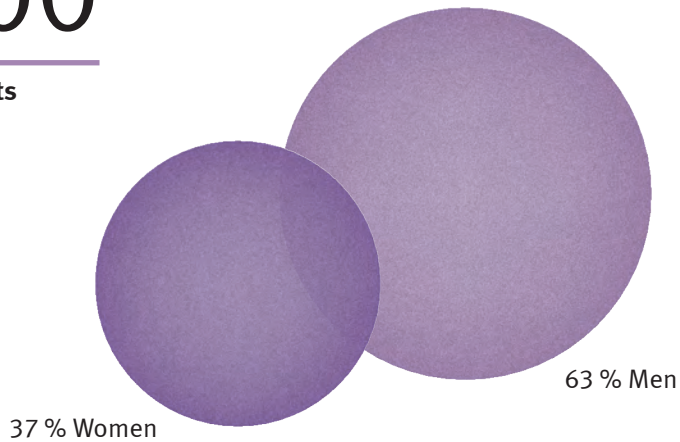
— through the National Research Programme (NRP) 77 “Digital Transformation”.

— with the one-off call “Digital Lives”, in 2017, addressing questions surrounding the digital transformation.

Researchers in ongoing SNSF projects at year-end 2018

16,300
Researchers in projects

6,500
Ongoing projects

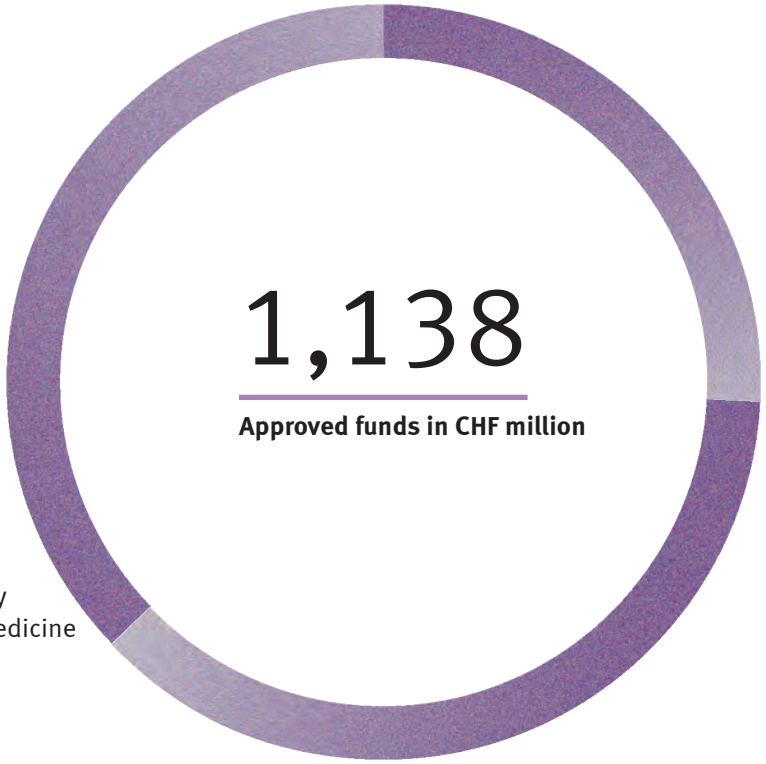


Funding approved in 2018

6,073
Processed applications

2,958
Approved applications

1,138
Approved funds in CHF million



Digitalisation: The SNSF's contribution

Digitalisation is regularly in the focus of researchers' submissions to thematically open schemes, but has also been the focus of specific programmes and initiatives such as the NCCRs and Digital Lives.

Below are three examples of the wide range of funded projects that contribute to digital progress (through new technologies, models, algorithms, etc.) and play a role in shaping digital transformations (by analysing the repercussions of digitalisation for society and the economy).

Project Funding Grant "RNNAIssance"
Artificial recurrent neural networks (RNN) are already accessible to billions of users, for example through speech recognition on smartphones. However, biological brains are still far superior in many respects. Among other things, they learn a world model that predicts how the environment will change depending on the actions performed, and use this world model for abstract thinking and planning. They continuously expand skills learned earlier and become more general problem solvers. Guided by the algorithmic information theory, this project builds a revolutionary RNN-based artificial intelligence (RNNAI) capable of doing the same.

Digital Lives Project "Online aggression from a sociological perspective: An integrative view on determinants and possible countermeasures"
Aggressive comments on social media are widespread. In view of the negative social consequences of such online behaviour, this project wants to understand and explain its causes, and derive countermeasures. So far, only isolated explanatory factors have been identified. This project will link survey data from online commentators with their commenting behaviour to identify relevant causes. Interviews with people who have already been legally prosecuted for aggressive commenting (a target group not yet scientifically investigated) will also provide insights into their motives and the effectiveness of legal penalties.
The novel data and sociological approach used in this project have innovation potential and will help to put discussions about online aggression on a scientific footing.

NCCR "QSIT – Quantum Science and Technology"
Digitalisation builds on several new technologies as a key to innovation. Quantum technology is one of these novel approaches/technologies. The NCCR "QSIT – Quantum Science and Technology" has been active in this field since 2011. It takes a multi-disciplinary approach, combining concepts from physics, chemistry, engineering and computer sciences. The goal is to develop technologies to control and exploit quantum physical effects, and to apply these in quantum computers, quantum communication and quantum sensors. Quantum bits of a quantum computer calculate with different states of atoms, electrons or light particles, for which there is no counterpart in the world of classical bits. Thus, a quantum computer should become a device with exponentially larger numbers of computations enabling it to solve certain problems that even the fastest classical supercomputers are unable to cope with.
The European Commission recently launched the € 1 billion Quantum Flagship initiative for which the NCCR QSIT served as a model. If the participation of Swiss research groups in the Quantum Flagship is high, that is also because they pioneered research in quantum technology thanks to the NCCR QSIT.
QSIT is only one of several NCCRs addressing issues related to digitalisation. NCCR Robotics, for example, is at the forefront of worldwide developments in flying drones and four-legged robots.


VIETATO FUMARE

1.2
Challenges for Swiss research

Alongside intense international competition, as well as continuing uncertainty in the European context (see text box), Swiss research faces challenges from within. While developing its Multi-Year Programme, the SNSF focused on the following issues, which it considers key to securing the leading position of Swiss research.

High publication pressure hampers research culture
Researchers should be encouraged to explore new paths. A willingness to take risks should be valued and failure seen as an opportunity on the road to discovery. Today, however, scientists are under great pressure to publish as many results as quickly as possible, sometimes at the expense of their relevance. The San Francisco Declaration on Research Assessment DORA, which the SNSF signed in 2014, aims to correct wrong incentives and to ensure the fair and transparent evaluation of researchers. DORA, however, implies a fundamental change in scientific culture, and its implementation is a challenge for all institutions in the Swiss research landscape.

The SNSF can be a driver for change by redefining quality standards for researchers competing for funds across Switzerland. It strives for a more diverse research culture and a broader understanding of excellence, which rewards all important contributions by researchers to science and beyond (see chapter 2.1). If Switzerland succeeds in leading the way in this respect, its research will be more competitive and more impactful.

To realise its potential, Swiss research needs to master certain challenges – from the low share of women through to the need for data infrastructures. This is essential for maintaining Switzerland's leading position in the global arena.

Continuing uncertainty in the European context
Swiss research needs integration, collaboration, mobility and competition at both the national and international level. National competition organised by the SNSF supports the international competitiveness of Swiss research. International competition – in particular through full association to future European research and innovation programmes – enables Swiss researchers to measure themselves against the best scientific minds worldwide as well as to build international networks and prestige.
Continuing uncertainty about the future shape of European Research and Innovation Programmes and the prospects for Switzerland's association is a critical risk for Switzerland-based research. The brief period of exclusion from Horizon 2020 in 2014 has had a lasting negative effect on the participation of Switzerland-based researchers. Even today, Swiss research has not reattained the participation level of the previous European Research and Innovation Programme.[5]
In the Multi-Year Programme, we assume a full association of Switzerland to Horizon Europe, and the SNSF is actively contributing in close coordination with the SERI to efforts to achieve this goal. It is, however, well aware of the existing risks and remains ready to react in the event of a non-association.

Women are still underrepresented in Swiss research

Swiss research must develop the broadest possible talent pool to drive discoveries. The poor representation of women in research in Switzerland is a limiting factor in this respect. Across all disciplines, Switzerland loses too many women, who drop out of science more frequently than men.[6] As Switzerland lies behind other countries in this respect, it most likely has not yet realised its full scientific potential.

The SNSF strives to be a strong voice for women in science. In the forthcoming funding period, it will step up its support for this cause through targeted measures (see chapter 2.1).

Use-inspired research is not yet well established in all disciplines

Innovation capacity depends on strong research capacities along the whole continuum from basic to use-inspired research. In Switzerland, important fields of use-inspired research, such as health or engineering, still have a less well-established scholarly tradition and greater practice orientation. The universities of applied sciences and of teacher education (UAS and UTE) therefore aim to reinforce their dual, science-based and practice-oriented profile.

With temporary support measures in selected fields, the SNSF will support the UAS in their efforts to develop research capacity (see chapter 2.1). This should prepare researchers to compete for project funding and eliminate the need for specific measures in subsequent funding periods.

Research collaboration needs to be stepped up

Many important research questions demand collaboration among a critical mass of researchers, bringing in different expertise, or partnerships with societal actors. While national competition strengthens the international competitiveness of Swiss research, competition alone is not enough. Collaboration is also required to develop a critical mass of research capacities and to gain international visibility. However, the research culture in many fields of research in Switzerland is not that collaborative as yet.

The SNSF will seek to bring together the brightest minds to develop new approaches in research with the potential for disrupting existing research fields. In the next funding period, it will develop its funding opportunities for collaborative and interdisciplinary research, enabling researchers to join forces to contribute to the development of research fields and the promotion of Swiss scientific leadership (see chapter 2.2).

Infrastructure requirements for open science are increasing

Excellent research can only have an impact if its results are available and made visible, not only inside the academic domain, but also in the science-driven Swiss economy, state administration and society as a whole. With digitalisation and the exponential growth of data, data infrastructure is indispensable as a basis for high-quality, reproducible research and an important foundation for an open science system. Demand for services to collect, store and share data is increasing massively.

The SNSF will continue its efforts in the transition to open science, including easy access to research data and publication of research findings for all. It will also seek to intensify its contribution to coordination and quality assurance of data infrastructures (see chapter 2.3).

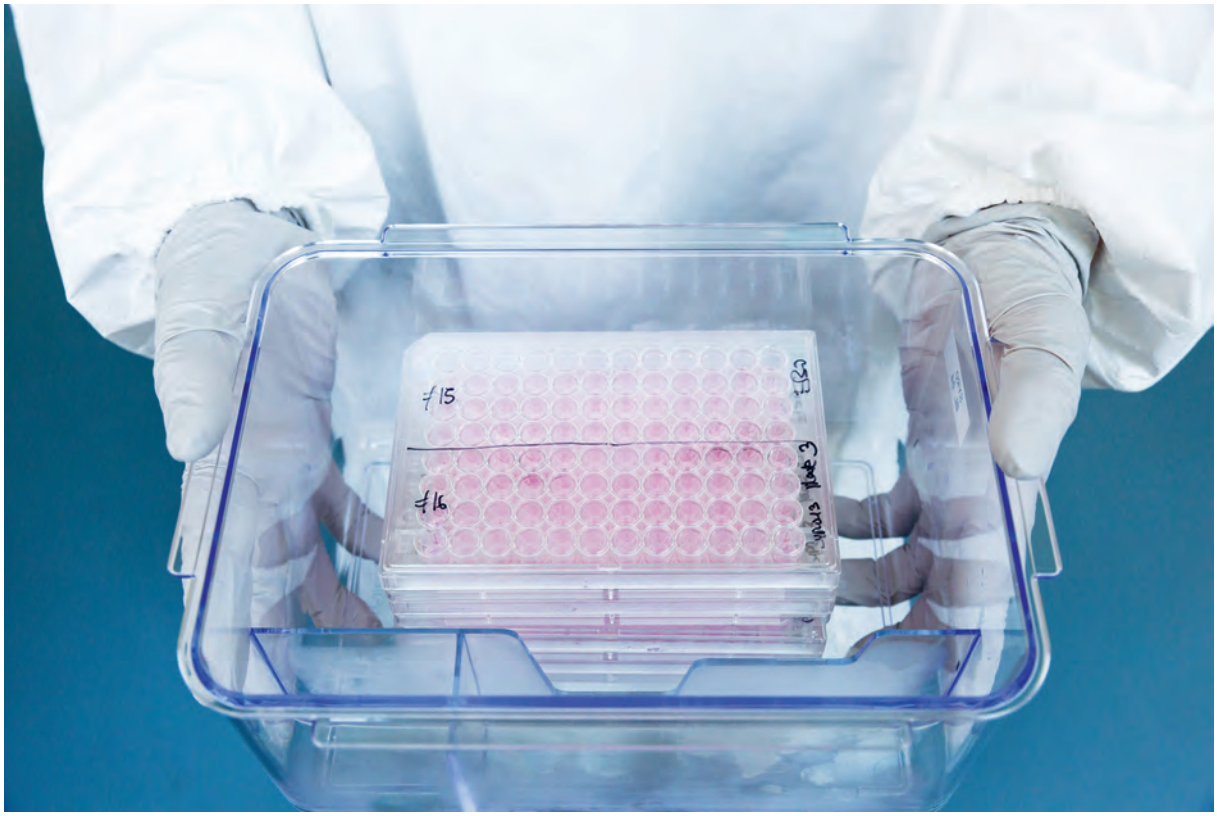
The potential of research findings is not yet fully harnessed

While Swiss research is on the whole very strong in terms of academic impact, there are indications that Switzerland is less good at translating research findings into practice.[7, 8] For example, Swiss companies are less successful at bringing their innovations to market and their willingness to collaborate with research labs is relatively low compared with other innovation metropoles.[9] Switzerland also performs less well in terms of social innovation.[10] At a time of formidable environmental and social challenges, Swiss research can and should contribute to evidence-based solutions, for example to support implementation of the UN Sustainable Development Goals (see text box).

In the next funding period, the SNSF will introduce new mechanisms to support the transfer of research results into practice (see chapter 2.4).

Research and sustainable development

In September 2015, the United Nations General Assembly formally adopted a set of 17 goals, the Sustainable Development Goals (SDGs), which constitute a framework for achieving the Agenda 2030 for Sustainable Development.[11] The SDGs are a blueprint for achieving a better and more sustainable future for all, including more developed and industrialised countries. They address the global challenges we face, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. All UN member states, including Switzerland, are called upon equally to play their part in finding shared solutions to the world's urgent challenges. Taking into account the complexity and magnitude of the challenges, science, and therefore science funders, have an important role in contributing to the effective delivery of the SDGs.



1.3
The SNSF's proposals for 2021–2024

With the measures proposed for the next funding period, the SNSF seeks to address the challenges outlined above, to secure the strength and diversity of Swiss research and to increase its potential for innovation. Switzerland's ability to master the challenges it faces, and to maintain its top position in research, depends on effective coordination across the Swiss research system. The SNSF has developed the proposed measures in close cooperation with partner institutions, aiming to break existing silos in the research landscape as well as between academics and potential users of research.

Chapter 2 outlines the SNSF's priorities for the 2021–2024 funding period:

— **Foster excellence through diversity** (see chapter 2.1).

— **Strengthen international leadership through collaboration** (see chapter 2.2).

— **Support data infrastructures and services for open science** (see chapter 2.3).

— **Enhance the value of research for society** (see chapter 2.4).

The implications of the priorities 2021–2024 and of the planned measures on the funding portfolio are described in chapter 3. Open funding formats, with few thematic or other requirements, will continue to account for the largest share of the requested budget and project funding will remain the main instrument.

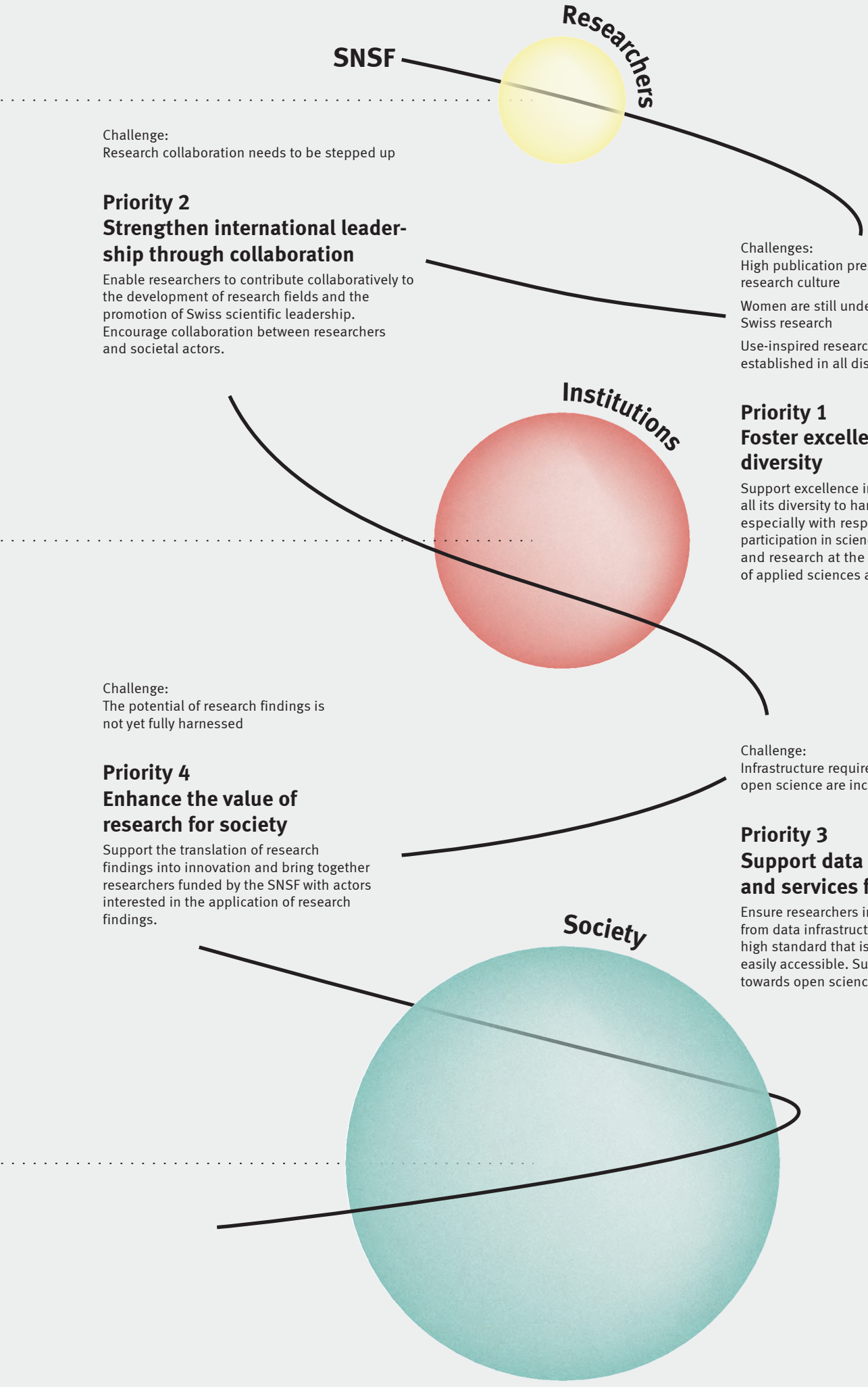
Chapter 4 considers the consequences for the work performed by the Research Council and the Administrative Offices, as well as the financial implications of the proposed funding measures.

The SNSF has set four priorities to address the current challenges during the 2021–2024 period. We have developed the relevant measures together with our academic partners.

With its Multi-Year Programme 2021–2024
the SNSF aims to empower researchers
to compete, collaborate and do excellent research …

… in close coordination with
other actors in the research system …

… for the benefit of society as a whole.



Challenge:
Research collaboration needs to be stepped up

Priority 2
Strengthen international leadership through collaboration

Enable researchers to contribute collaboratively to the development of research fields and the promotion of Swiss scientific leadership. Encourage collaboration between researchers and societal actors.

Challenges:
High publication pressure hampers research culture

Women are still underrepresented in Swiss research

Use-inspired research is not yet well established in all disciplines

Priority 1
Foster excellence through diversity

Support excellence in Swiss research in all its diversity to harness its full potential, especially with respect to women's participation in science, use-inspired research and research at the universities of applied sciences and teacher education.

Challenge:
The potential of research findings is not yet fully harnessed

Challenge:
Infrastructure requirements for open science are increasing

Priority 4
Enhance the value of research for society

Support the translation of research findings into innovation and bring together researchers funded by the SNSF with actors interested in the application of research findings.

Priority 3
Support data infrastructures and services for open science

Ensure researchers in Switzerland benefit from data infrastructures and services of a high standard that is well coordinated and easily accessible. Support the transition towards open science.

2. Strategic priorities 2021–2024

2.1 Foster excellence through diversity

The SNSF's mission is to support excellent research in Switzerland in all its diversity, with a particular focus on basic research.[12] The SNSF will maintain this focus in the next funding period, but strive for greater diversity in research types and groups of researchers as an important means of fostering excellence.

Diversity does not imply quality, but is an important prerequisite for it. The poor representation of certain groups in the research community means that Switzerland cannot realise its full scientific potential. Studies have shown that various types of diversity, including scientific discipline, gender, ethnicity, and nationality, are beneficial for teams and make new discoveries more likely.[13] We must also ensure that research excellence is understood broadly, to reflect and reward all relevant scientific contributions.

Assessing researchers' qualifications and achievements

In the context of diversity, the evaluation of the scientists' qualifications and record of accomplishments, also called their track record, is particularly relevant. For example, research indicates that evaluation of the track record is susceptible to gender bias. Several studies have shown that women's track records are evaluated more harshly than those of men, whereas there seems to be no difference in the assessment of the research proposal itself.[14]

The SNSF will investigate if and how the assessment of track records can be improved to better support the objectives formulated in DORA and to make the evaluation fairer and more balanced so that it leads to more original and more impactful research. Improvements in this regard have the potential to contribute to various types of diversity, for example by ensuring that different career paths and career breaks are taken into account systematically, that risk-taking, collaboration and interdisciplinarity are rewarded, and that all the benefits of research, for science and beyond, are fully acknowledged.

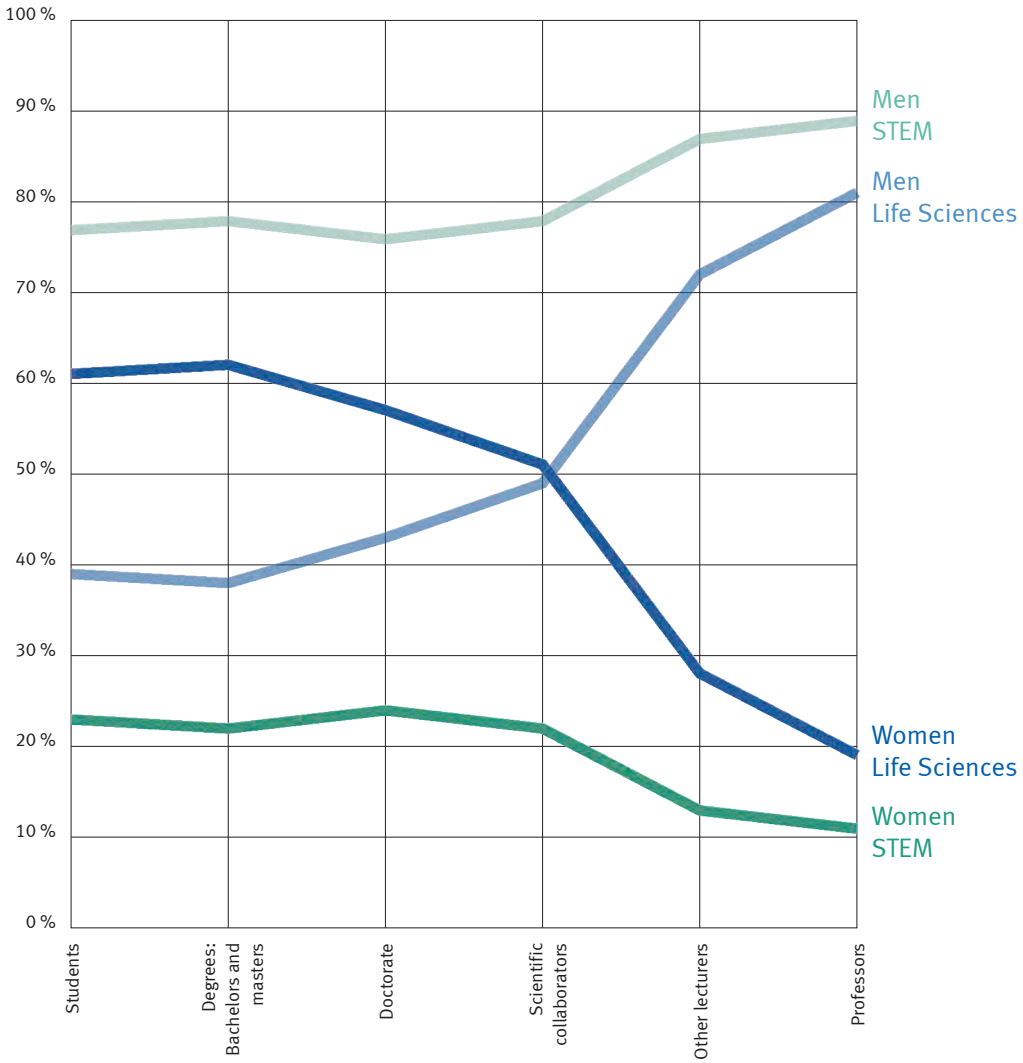


Figure 3. Percentage of women and men per career stage in Switzerland in the STEM disciplines and the Life Sciences. Source: FSO, SIUS, own calculation. Data: 2016.

Promoting women in research

The representation of women in research is substantially lower in Switzerland than in many other countries. Across disciplines, women drop out of science more frequently than men do. The proportion of women decreases with increasing career progression, from PhD to full professorship.[15] This "leaky pipeline" is particularly strong in the life sciences as well as in the social sciences and humanities. In science, technology, engineering and mathematics (STEM), the dropout rate is less marked, but the proportion of women is much lower from the outset (see Figure 3).

The main responsibility for gender equality lies with the research institutions, whose hiring strategies influence the composition of the research staff. Education is also key, since social biases and structural inequalities take their effect very early on in life. Gender and family policies in the public and private sector also play a decisive role in women's decision to pursue a research activity or leave academia. As long as childcare facilities in Switzerland are less developed than in other countries, Swiss research will remain at a disadvantage in the competition for the best minds in the market.

Within its remit, the SNSF complements the ongoing efforts by all players in the system. Its existing measures focus on the postdoctoral level. Aiming to be an even stronger voice for women in research in the future, the SNSF will provide excellence grants for female doctoral candidates in the STEM disciplines and the life sciences.

Objective
By introducing women-only doctoral grants in the life sciences and STEM, the SNSF expects to encourage and motivate women to consider a research career[16] (especially relevant in STEM) as well as to increase their chances of success throughout their careers.

Key features
Grants will be similar to Doc.CH grants in the social sciences and humanities, which will be continued for both women and men. They enable young researchers to apply for a PhD grant themselves, to choose their own host institution and to propose their own project idea.

Expected impact
Receiving this grant in a highly competitive national contest is a sign of excellence. Hence, the SNSF expects these grantees to become independent at an earlier stage in their career and assumes that more of them will stay in academia. Although women do not abandon their scientific careers primarily during the doctoral phase, strong support at this career stage will complement existing measures for postdocs, especially PRIMA, and should have a motivational effect beyond the doctoral phase, reducing the dropout rate during the later career stages. Grantees will act as role models in fields where women are currently underrepresented. The signalling effect is particularly important in STEM, where the number of female researchers is low from the outset.

In the STEM disciplines and life sciences, the SNSF will award grants to female doctoral candidates. In doing so, it aims to increase the number of women aspiring to an academic career.

In addition, the SNSF intends to introduce a quota to ensure a minimum representation of women in the National Research Council (NRC). This supports a fair gender balance in decision-making positions and increases the visibility of excellent female researchers in Switzerland. The quota will be defined in line with the share of female researchers in corresponding fields, so as not to burden women with a disproportionate workload.

At the end of the day, the role of the SNSF with respect to gender equality remains a subsidiary one. National standards for gender equality – agreed amongst all stakeholders – might be needed to achieve a significant improvement for women. In other countries, for example the UK, Ireland and Germany, a share of institutional funding is linked to gender policies and their implementation. A similar mechanism could provide further incentives for increasing diversity at research institutions in Switzerland.

Strengthening use-inspired research at the universities of applied sciences

The SNSF is the main source of public research funds for the UAS, which have a legal responsibility to conduct use-inspired research and aim to reinforce their dual, science based and practice-oriented profile. While they are well funded by Innosuisse for research-based innovation activities, Innosuisse does not fund research itself. Supporting all types of scientific research, including use-inspired research, is the mandate of the SNSF.

By setting high standards of scientific practice for all types of research, the SNSF supports the UAS's own efforts to develop research capacity and to integrate their institutions into national and international networks. This, in turn, fosters diversity in the entire system.

For the next funding period, the SNSF intends to specially encourage health and engineering research at the UAS through a temporary funding measure.

Objective
The SNSF will support the UAS in their efforts to develop research capacity, with a special focus on health and engineering research. Both fields are of considerable importance for Switzerland and a focal point of the UAS' strategy for the next funding period. They have a less well-established scholarly tradition and greater practice orientation. Today, they participate only marginally in SNSF funding.

Key features
The measure will be temporary. Grants will be similar to project funding grants, but open only to researchers from the UAS working in the fields of health and engineering.

Expected impact
The measure should stimulate use-inspired research and have a positive effect on research quality if researchers submit applications and endeavour to meet the SNSF funding requirements. The former instrument DOREsearch, which followed a similar motivation, succeeded in strengthening use-inspired research in fields such as social work, arts, education or applied psychology. In these fields, researchers from the UAS and UTE are now competing successfully with the universities, and the demand for SNSF funding from these domains has been increasing continually.

We aim to boost use-inspired research in engineering and health sciences in particular, namely by implementing a temporary funding measure for universities of applied sciences. It will provide additional support for promising projects at these institutions.

Existing measures aimed at supporting UAS and UTE
The SNSF has adapted, and will continue to adapt, its funding schemes as far as possible to the needs of the UAS and UTE. It has also taken measures to ensure the adequate evaluation of use-inspired grant proposals (broader impact as criterion for use-inspired research, more experts from practice in the peer-review process). In addition, the pilot "Spark", scheduled for 2019, as well as the proposed new funding scheme for collaborative consortia and BRIDGE (see chapters 2.2 and 2.4) should be well suited to researchers from UAS and UTE.
Specific additional measures may be necessary temporarily. Already during this funding period, a temporary measure for the UAS and the UTE, Practice-to-Science, will support the recruitment of excellent researchers from practice to the UAS / UTE at assistant professor level.

2.2
Strengthen international leadership through collaboration

Scientific research is globalised and, at the same time, ever more specialised. Many important research questions require complementary expertise. Collaborative research may take place between individuals, between research groups at one or several institutions, between academic researchers and non-academic knowledge producers, and, finally, across national borders.

Important discoveries often take place when many fields of expertise join together to address a shared question. For example, physiological studies, neuroscience, and behavioural studies in animals, but also complementary studies with humans may be required to advance clinical research and support the development of treatments. To retain its top position in research, Switzerland needs to be competitive in research fields that require collaboration among a critical mass of scientists.

Developing new research fields and international scientific leadership

Currently, a promising type of research collaboration falls through a gap in the SNSF's funding portfolio, between the smaller project funding and Sinergia grants, on the one hand, and the NCCRs and NRPs, which are larger and have specific structural or use-inspired objectives, on the other hand. A new scheme for medium-sized research consortia proposed for the next funding period will fill this gap in the current range of funding options for collaborative research.

Objectives
The aim of the new scheme is to enable researchers in Switzerland to collectively maintain and develop scientific leadership at international level. With the new scheme, the SNSF will support thematically open, curiosity-driven research collaborations by medium-sized consortia in flexible and integrative ways, without structural requirements. The scheme should channel resources to important and timely research questions, while maintaining a research-driven funding mechanism. It should be highly responsive to and supportive of the development of research fields.

Key features
The scheme will be open to all disciplines and research institutions. Consortia should comprise at least five research groups and may include a certain number of international research groups. All partners and projects must be essential for success and synergies. The consortia may or may not be interdisciplinary and application-oriented. Since the scheme aims to keep Switzerland at the forefront of research developments, the evaluation procedure should not be much longer than it is in project funding. The research funded must have a potential for developing international scientific leadership by researchers from Switzerland on specific issues.

Expected impact
The new instrument will set incentives for researchers to think in terms of bigger questions and projects and contribute to a more collaborative research culture. The expectation is that encouraging collaborative research on salient issues will contribute to the development of new research fields and to the international positioning of Swiss research.

Research funded within the scheme should become internationally more visible. Consortia could for example develop into a National Research Programme, an NCCR or a large-scale European project. Information on research funded in the scheme could be useful to the Swiss State Secretariat for Education, Research and Innovation (SERI) as a knowledge base during NRP selection, or to research institutions when deciding which NCCR proposals to back. The scheme will also make Swiss researchers more attractive for international schemes, which require a deeper understanding of collaborative formats.

Due to its flexibility and the intermediary size of projects, the new instrument will be more easily accessible to UAS/UTE than for example the NCCRs. The participation of research groups from UAS/UTE in the consortia would increase their visibility and support the UAS and UTE's efforts to strengthen their integration into national and international scientific networks.

Supporting collaboration between academics and societal actors

A second line of development concerns collaboration between academics and societal actors, who can participate in knowledge production processes in many different ways: co-creation in a broad sense involves stakeholders and citizens not only in the research process but also in the development of research questions and projects. Patient associations may for example contribute to the definition and prioritisation of biomedical research questions. Stakeholder involvement has the potential to increase the visibility and impact of research and increasingly becomes international best practice.[17] The SNSF will therefore enhance its support for this type of collaboration between academics and societal actors involved in knowledge production processes, which will in turn contribute to research diversity and enhance the value of research for society (also see chapter 2.4).

The SNSF is creating a funding scheme for joint projects involving at least five research groups doing research on a topic of their own choosing. Thanks to closer collaboration, researchers will be able to explore new fields and strengthen their international leadership.

2.3
Support data infrastructures and services for an open science system

In modern societies and economies, data and data infrastructure are becoming ever more important as drivers of efficiency and growth. Research data in particular are among the most important strategic resources of a knowledge driven society. To guarantee their quality, collection, storage and accessibility and thus increase the overall reproducibility and impact of science, specialised infrastructure is necessary.

Today, data infrastructures for research receive funding from research performing organisations and funding agencies, but their set-up and long-term financial support mostly lack coordination and long-term sustainability.

At the same time, data infrastructures face increasing demands by specific scientific communities to expand their offer far beyond today's typical services, such as data curation and data storage. In addition, user communities expect support with the management of periodical surveys and data collections as well as advice on the linkage of data. This transforms data infrastructures into structures offering a wide variety of data services that are crucial for a specific community to perform research. They are also a key driver of the development of an open science system.

Funding policy for research enabling data infrastructures and services

In Switzerland, several actors have initiated, developed and funded data infrastructures and services: the SERI, the Swiss Academies of Arts and Sciences, the SNSF, swissuniversities and the research performing organisations. Pooling these activities would improve the coordination of the different infrastructure funding initiatives. Furthermore, in view of the open science movement and the increased accessibility and interconnectedness of scientific data to be offered by the European Open Science Cloud (EOSC), data quality and the use of novel data preservation technologies will be of the utmost importance.

Based on a mandate from the SERI, the SNSF aims to contribute to these new developments and extend its portfolio to include the promotion of data infrastructures and services (DIS). The SNSF can help in improving the overall quality of research-enabling DIS by implementing rigorous and transparent selection and evaluation procedures. This ensures that the scientific community can rely on data services that are the state of the art in terms of data quality, accessibility and interoperability.

The SNSF will provide seed money for data infrastructures. Such infrastructures play a vital role in making research results accessible and shareable. Cohort studies will also be funded in this context.

The SNSF will support research-driven DIS of national importance. These DIS constitute a unique research and strategic resource for Switzerland and are essential for enabling scientific research and enhancing its impact. Funded DIS must be in the joint interest of scientists and their institutions and provide unique and high-quality services to a specific research community, that go beyond the capabilities of individual institutions. Their services may comprise surveys, research and data archiving. They are located at one or more Swiss research institutions while being legally and financially independent and having dedicated governance structures. They are internationally integrated and ensure interoperability of their data with other data collections, facilitate collaboration and linkage with big data studies and maintain a link to the EOSC.

Funding portfolio for data infrastructures 2021–2024

Various DIS fall within the scope of this policy. It is necessary to establish dedicated evaluation panels and to define special criteria covering a wide range of DIS in different scientific fields. For this reason, the SNSF aims to build up its activities in this area gradually, starting with the 2021–2024 funding period.

In this first phase, and in accordance with the mandate from the federal government, the SNSF will take over the funding and evaluation of some research-enabling DIS which have been identified by the SERI and the Federal Office of Public Health (FOPH) as being of high national importance. This includes:

— the Swiss Centre of Expertise in Social Sciences (FORS),

— the Data and Service Centre for the Humanities (DaSCH),

— the Swiss HIV and the Swiss Transplant Cohort Studies.

These entities will serve as a basis for developing evaluation criteria for future DIS of this kind. At the same time, the existing DIS will be required to align with these newly defined criteria. The SNSF proposes to develop its funding activities in subsequent funding periods based on the experience and funding concepts made in 2021–2024.

In order to respond to the increasing need for specialised DIS, and in parallel with the specific mandate for already established DIS of national importance, the SNSF also proposes to provide start-up and development grants for emerging data infrastructure requirements that have sufficient potential to acquire this level of importance. This includes cohort studies not covered by the special SERI mandate. Funding for data infrastructure that is not considered to be of national importance will usually be limited to a start-up phase of 10 years, in line with the SNSF's overall funding policy for research infrastructure.

Based on a mandate from the SERI, the SNSF will fund existing data infrastructures in the humanities and social sciences (FORS, DaSCH) as well as cohort studies in medicine (HIV, transplants).

2.4
Enhance the value of research for society

While the SNSF's core responsibility is to support the Swiss scientific community and to fund excellent investigator-initiated research, the results of this research realise their full potential outside academia. Swiss research is very strong in terms of academic impact, but there are indications that Switzerland is less good at translating research findings into practice, as well as in respect of social innovation.[7–10] Yet Switzerland's prosperity depends not only on the constant renewal of the knowledge base, but also on our ability to translate scientific results into applications. In the light of the long list of massive environmental and social challenges – climate change, reduced biodiversity, an ageing population, digital change – research can and should contribute evidence-based answers.

Facilitating research-based innovation

To support the uptake of research results, the SNSF cooperates with Innosuisse (see text box). Together, the two organisations fund projects at the interface between research and science-based innovation through BRIDGE.

BRIDGE, which was introduced in 2017, gives researchers the opportunity to further explore research results with high implementation potential with a view to realising innovations. It consists of two lines of funding:

— Proof of Concept is aimed at young researchers who wish to develop an application or service based on their research results.

— Discovery is aimed at experienced researchers who want to explore and realise the innovation potential of research results.

It is already evident today that BRIDGE meets an important need, as the available funds have not been sufficient by far to finance all the high-quality proposals. In Proof of Concept the success rate was 11 % in the first call in 2017. It has fluctuated between approximately 20 % and 30 % in later calls, as the number of applications has stabilized. In BRIDGE Discovery, the success rates are even lower, starting at an extremely low 4 % in the first call and going up to 14 % in the second call. One of the reasons for this increase was the allocation of additional funds to this funding line by the SNSF.

Objective
Together with Innosuisse, the SNSF will strengthen and develop BRIDGE in the period 2021–2024 in order to:

— further increase the successful implementation of project results and set the course for entrepreneurship at an early stage in all research and innovation areas,

— be in a position to fund all promising projects of high quality, also in Discovery,

— continually increase the visibility of BRIDGE as a useful scheme supporting the transition from basic research to practice and innovation among the relevant stakeholders and potential applicants, especially at the UAS and in the social sciences and humanities.

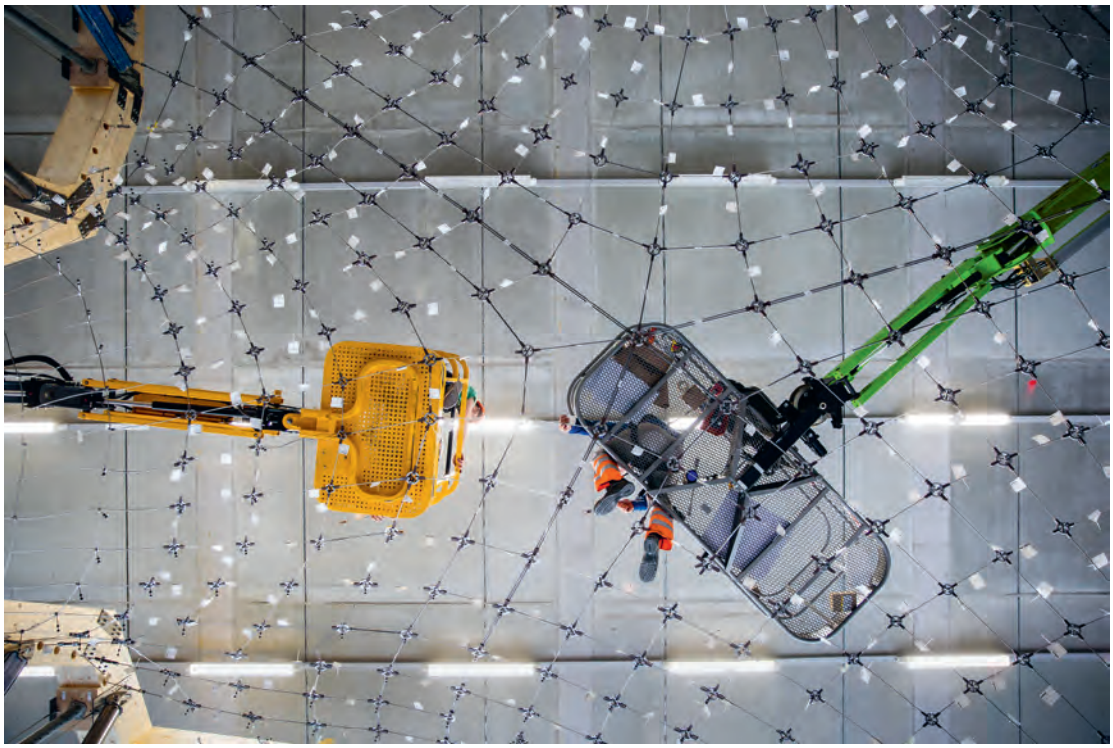
The SNSF and Innosuisse will increase the budget for the BRIDGE programme to facilitate more projects at the interface of basic science and innovation. The "Discovery" funding line will be open to all academic disciplines.

Key features
With regard to Proof of Concept, different accompanying measures will be initiated to create an integrated funding package that maximises the chances of successful implementation. This could include extended coaching, support for networking activities with potential investors or for relocation to a startup-oriented environment.

For Discovery, two developments are planned. First, funding will be extended beyond the technology fields to all research areas, accompanied by targeted communication measures. Second, more attention will be paid to the implementation of research results from the outset. Additional funds will be required to fund all promising projects (see chapter 4.2).

Expected impact
With the extension to all research fields, Discovery projects will offer an excellent opportunity for cooperation across disciplinary boundaries. Today more than ever, the economy and society as a whole depend on innovations that build on a broad spectrum of scientific disciplines, combining different competencies. They are increasingly based on a systematic pursuit of innovation. The SNSF and Innosuisse will continue to monitor implementation success in both funding lines.

Strategic partnership with Innosuisse
The SNSF and Innosuisse are important institutional partners and drivers of the innovation process spawned by research in Switzerland. While the SNSF funds all types of research aimed at the acquisition of new knowledge, Innosuisse funds research-based innovation activities. The interface between research (funded by the SNSF) and innovation (supported by Innosuisse) is fuzzy. To address this issue, the two organisations have jointly launched BRIDGE. BRIDGE finances activities in the transition phase between research and innovation and is aimed at closing any potential gaps between the funding portfolios of the two organisations.



Connecting researchers and potential users of research

Research findings develop their full value once they have been integrated into a wider context. For this reason, the SNSF sees great potential in fostering collaboration across different communities, from academia, industry and the public sector to science communication and civil society.

Objectives
As an additional mechanism to better harness research results and speed up their translation into applications, the SNSF will promote "implementation networks" that bring together researchers and potential users of research. The initiative should in particular contribute to implementation of the UN Sustainable Development Goals (SDGs), which depend on such collaboration. If possible, the SNSF will cooperate with Innosuisse, the Swiss Agency for Development and Cooperation (SDC) and Swiss Federal Offices, or with research-funding organisations abroad.

Key features
The networks will facilitate exchanges about specific topics between researchers and potential partners who are interested in applying the results in practice (private businesses, public institutions, NGOs, traditional as well as social media, etc.).

They will focus not on new research activities, but on the use of existing research findings through transformation and translation activities. The SNSF, if possible together with other actors, will provide funding for the construction and basic functioning of the networks, as well as for exchange and communication activities within the networks.

Although research activities will not be funded in this context, it is very likely that the networks will also result in new research ideas, which could be funded through existing schemes.

A call for proposals for new thematic implementation networks will be launched periodically. SDG-related topics are particularly welcome. Proposals will be evaluated and selected based on the topic's relevance for society as well as on the proposed network's potential to achieve its tasks.

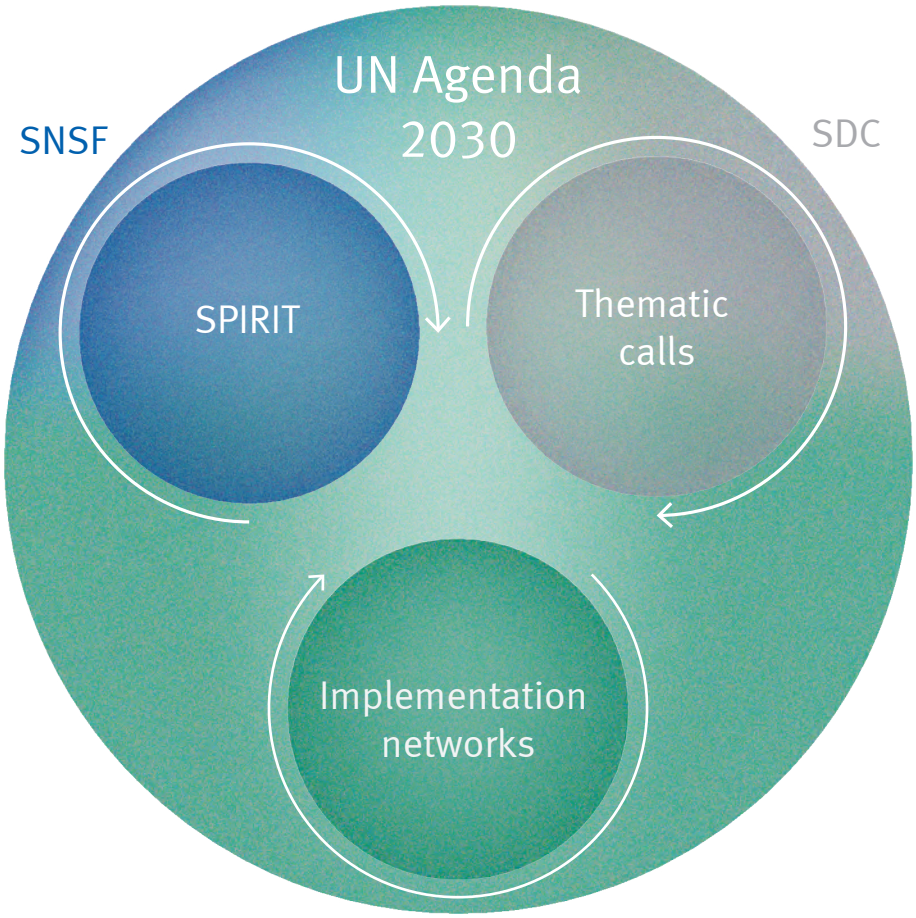
The implementation networks will be based on SNSF-funded projects, which span all fields of research and institutions across Switzerland. Drawing on its knowledge about these projects, the SNSF can act as a catalyst for the development of new networks and incite geographically or institutionally dispersed actors to cooperate. Information about the research contributions from funded projects can be gained by applying data mining techniques and complemented by the expertise of Innosuisse and the SDC.

The initiative complements existing efforts within research institutions and by the Swiss Academies to support the transfer of research findings.

Expected impact
Significant progress and further implementation work in areas of importance to society and for sustainable development are made possible by an effective and innovative networking of skills and actors from different fields that have so far been working in separate silos. The SNSF hopes to stimulate and support this exchange, thereby contributing to intensifying, diversifying and speeding up the translation of research results into practice.

Researchers should have exchanges with companies, organisations and government offices that wish to apply research results. We want to support such networks, with a special focus on sustainable development goals.

Strategic partnership with the Swiss Agency for Development and Cooperation (SDC)
The SNSF and the SDC have a shared objective: contributing to the sustainable development framework set by the UN Agenda 2030. By entering into a strategic partnership, they can build on their complementary missions and competencies in order to contribute more effectively to the implementation of the SDGs (see figure). One of the components of the partnership is the SNSF's funding scheme SPIRIT, which aims to strengthen research cooperation with low-and middle-income countries. As a second component, the SDC may want to set specific priorities for research on development through thematic calls. The SNSF is ready to take on evaluation and implementation tasks with respect to thematic calls if mandated accordingly by the SDC, as well as to involve the SDC in the evaluation of SPIRIT proposals as an observer. The proposed implementation networks constitute the third component of the partnership. Depending on the field, other partners will be involved, in particular Innosuisse.



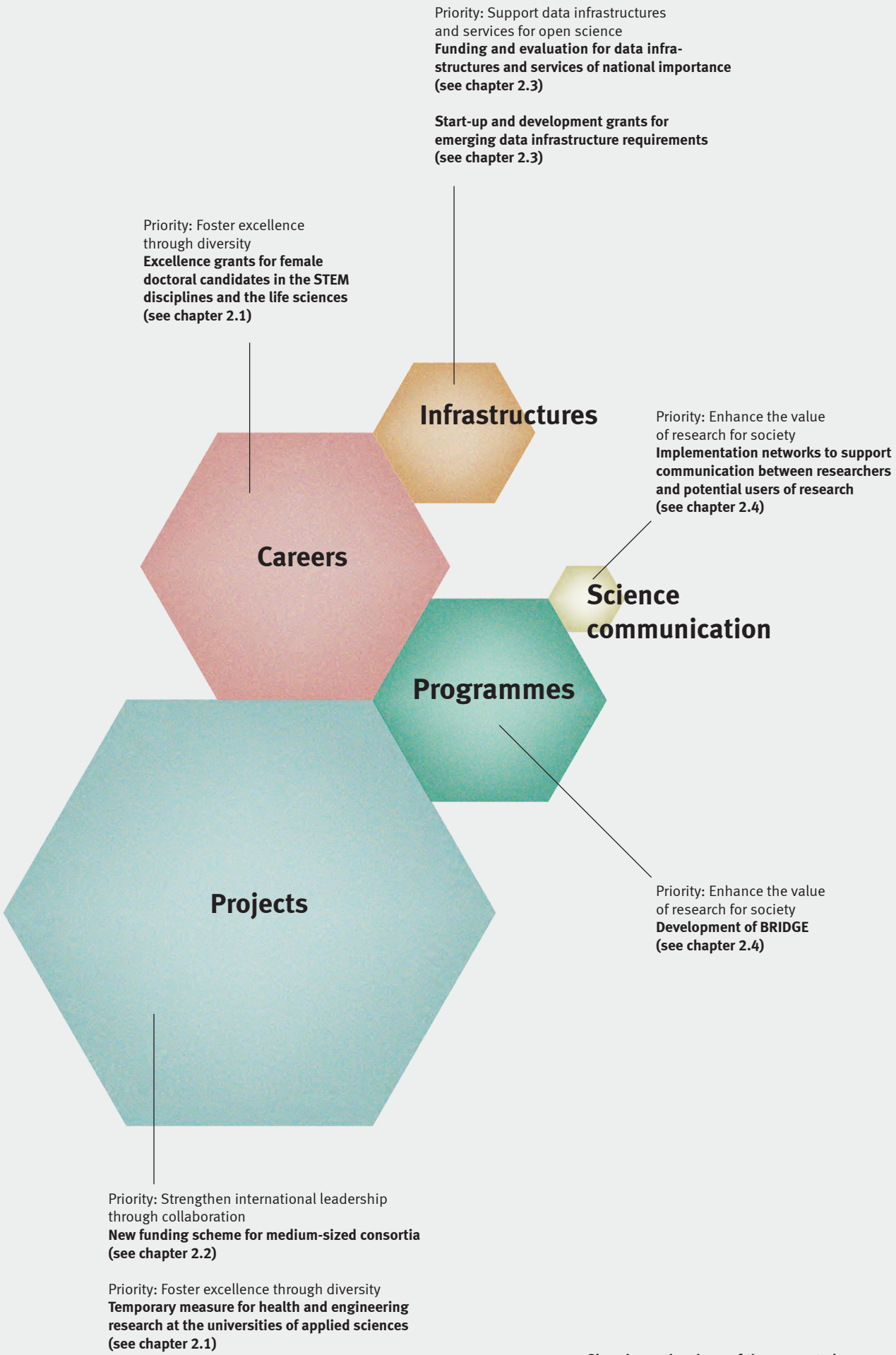
SNSF and SDC are strategic partners in supporting the implementation of the UN Agenda 2030.

New measures in the funding portfolio 2021–2024

The new strategic priorities and measures described in chapter 2 entail changes to various funding categories, but do not fundamentally alter the focus and structure of the SNSF's funding portfolio.

Responsive-mode funding formats, without thematic constraints and with limited organisational requirements, will continue to account for 80 % of the requested funding budget.

Indirectly, the new measures will enhance the effectiveness of SNSF funding across the portfolio – for example by encouraging changes in research culture or by supporting the implementation of SNSF-funded research findings.



Size shows the share of the requested funding budget 2021–2024

3. Funding portfolio 2021–2024

3.1 Projects

Projects represent the responsive mode of funding, enabling researchers in all disciplines to request funding for projects with self-chosen topics and goals with a view to pursuing and implementing new ideas.

— Project funding is and will remain the backbone of the SNSF's funding portfolio. Project funding grants enable researchers to implement their ideas and projects. Within project funding, the SNSF has enough flexibility to set up one-off calls in response to emerging needs (such as Digital Lives in 2017). With the pilot "Spark", to be launched in 2019, the SNSF will enable researchers to rapidly test or develop new scientific approaches, methods, theories, standards, ideas for applications etc.

— With Sinergia, the SNSF promotes relatively small-sized interdisciplinary collaboration between two to four groups of researchers who propose to engage in breakthrough research. This funding scheme was recently realigned (2016) and has already attracted a large number of high-quality submissions. For this reason, the budget for Sinergia will be increased in the forthcoming period (see chapter 4.2).

— **New**: In the next funding period, the SNSF will offer a new funding scheme for collaborative research in medium-sized consortia (see chapter 2.2 for details). It is aimed at enabling researchers to develop new research fields and take on international leadership on specific issues.

— **New:** For the funding period 2021–2024, the SNSF will also offer a temporary measure for the UAS, which is aimed at supporting efforts to increase research capacities in health and engineering (see chapter 2.1 for details).

The SNSF will adapt the remuneration of project staff to increases in nominal wages.[18] Except for this, it will maintain new project grants at today's level, overall, with a certain reallocation of funds from project funding towards collaborative grants and Sinergia (see chapter 4.2).

Projects on self-chosen topics again comprise the largest funding category in the 2021–2024 period – a speciality of the SNSF compared to research funders in other countries. This enables the researchers to pursue topical and creative ideas.

3.2
Careers

The career funding schemes focus on early-career researchers. In close coordination with the higher education institutions, the SNSF seeks to offer young researchers clear-cut career prospects. Recent innovations in career funding have streamlined funding opportunities at the postdoctoral and assistant professor levels. With these changes, which will be maintained and monitored, the SNSF has increased its investment in career funding. Since the increase in new grants only gradually translates into additional financial needs, additional funds will be needed in the forthcoming period to support these measures, even if new grants are kept stable (see chapter 4.2).

As of 2020, the consolidated portfolio will include the following schemes:

— Eccellenza enables highly qualified early-career researchers to form a research team and to improve their qualifications with a view to obtaining a permanent professorship at a university, UAS or UTE. The pilot "Practice-to-Science", to be launched in the current period, enables qualified experts with proven practical experience to be employed at professorship level at a UAS or UTE. If the pilot proves successful, the SNSF will integrate Practice-to-Science as a funding line into Eccellenza.

— Ambizione allows young researchers to gain independence and build a scientific profile by conducting a substantial project of their own.

— PRIMA aims to allow excellent women researchers to qualify for a permanent professorship and should contribute to increasing the share of female professors in Switzerland.

— Mobility fellowships enable doctoral students and postdoctoral researchers to do research at a higher education institution abroad. Since the fellowships will be subject to taxation, even though grantees do their research abroad, the SNSF will increase the funding to maintain the scheme's appeal.

— Doc.CH offers fellowships for doctoral students in the social sciences and humanities (SSH).

New: Changes in the upcoming period will concern the doctoral level, where the SNSF's role is subsidiary to the research institutions. The SNSF will aim to consolidate its funding opportunities for this career stage. Doc.Mobility Fellowships will be discontinued and funding focused on excellence grants for doctoral candidates (Doc.CH is currently only available in the SSH), which will be extended to the STEM disciplines and the life sciences, albeit only for women (see chapter 2.1 for details).

The SNSF complements the higher education institutions in providing career funding for young researchers. We award fellowships, grants for doctoral candidates, and project grants. The recently introduced innovations have generated greater financial requirements.

3.3 Programmes

Programmes aim to address specific policy objectives and have predefined basic parameters, which may be of a conceptual/organisational or thematic nature. Research questions and approaches nevertheless emanate from the research community, which submits proposals for grants within the scope of the individual programmes. Programmes are allocated between 10% and 15% of the SNSF's funding budget.

— The ongoing series of NCCRs will be continued in the forthcoming period. Their aim is to strengthen Swiss research structures and networks in areas of strategic importance for the future of Swiss science, business and society. The new NCCRs of the 5th series will start their research work in early 2020. The decision on the launch of a 6th series will be taken by the SERI in the current period, but is not likely to have a financial impact prior to 2024.

— The National Research Programmes (NRPs) are relevant both scientifically and politically as the knowledge they generate helps to resolve issues of great importance to society. They will be continued based on a mandate from the federal government.

— The SNSF will also continue to fund investigator-initiated clinical trials as a special funding programme for clinical research in biology and medicine. The focus is on topics that are not in the industry focus and as yet under-researched.

— The Swiss Programme for International Research by Scientific Investigation Teams (SPIRIT) was launched by the SNSF in 2019. It strengthens Switzerland's cooperation with low- and middle-income countries. SPIRIT consolidates funding for international cooperation. It replaces the former scheme SCOPES and, in the medium-term, the Swiss Programme for Research on Global Issues for Development (r4d programme until 2023). Research for development will still be a component of the strategic partnership with the SDC (see chapter 2.4).

— **New:** The joint BRIDGE programme, launched by the SNSF and Innosuisse in 2017, has already attracted a large number of high-quality applications. In the 2021–2024 funding period BRIDGE will be developed and extended to all disciplines. It provides funding for use-inspired projects at the intersection of basic research and science-based innovation, thereby supplementing the funding activities of the two organisations (see chapter 2.4 for details).

For programmes, the SNSF sets out the topics or the organisational aspects, thereby encouraging research teams from various institutions to join forces. The researchers integrate their own ideas into this framework. Our funding of NRPs and NCCRs is based on a government mandate.

Support for international cooperation across the funding portfolio
The SNSF aims to promote cooperation between researchers in Switzerland and abroad in all funding schemes and without any geographic restrictions. It supports the international mobility of young researchers with fellowships and allows international project partners in all projects. Several joint mechanisms with funding organisations in other countries are in place to facilitate cross-border collaboration and the international mobility of grant recipients (Lead Agency, International Co-Investigator Scheme, Money follows Researcher). The SNSF actively works with other funders to develop these mechanisms. In addition, SPIRIT (see chapter 3.3) funds collaborative research projects with countries that receive development assistance in order to raise scientific capacities in these regions to an international level and give Swiss researchers access to research groups in the relevant countries.

3.4 Infrastructures

The funding of infrastructures can be decisive for the development of entire groups of disciplines and will in the future be based even more strongly on strategic decisions and orientations.

— In the current period, the SNSF has consolidated its portfolio for infrastructure funding and transferred some tasks to the Swiss Academies. Funding for research infrastructures supported at the end of the current period will be continued at a similar level.

— With R'Equip the SNSF awards grants for the acquisition and development of large-scale apparatuses in all areas of science.

— FLARE (Funding Large International Research projects) is based on a special mandate from the SERI and is aimed at facilitating the development, construction, maintenance and operation of research infrastructures for major international experiments in particle physics, ground-based astrophysics and astroparticle physics.

— **New:** In future, the SNSF intends to focus specifically on data infrastructures. Based on a mandate by the SERI it will include the funding and evaluation of nationally important data infrastructures and services (DIS) in its infrastructure portfolio, including funding for FORS, DaSCH and biomedical cohort studies (see chapter 2.3 for details). In addition, the SNSF will provide start-up grants to cover emerging needs for data infrastructure in all disciplines.

Besides data infrastructures, other infrastructures are also becoming increasingly important for research. The SNSF will continue to finance the purchase and development of large apparatuses as well as of instruments for physics experiments.

3.5
Science communication

The SNSF promotes exchanges between scientists as well as dialogue between scientists and the public. In future, it will also focus on communication between researchers and potential users of research.

— The Agora scheme encourages researchers to communicate their current research to a lay audience. It will be continued with the changes recently made based on an external evaluation.

— The scientific exchanges and publication grants will also be continued.

— **New:** To enable and facilitate exchange between researchers and potential users from government, the private sector, international organizations or non-governmental organisations (NGOs) and to support knowledge transfer, the SNSF will fund implementation networks (see chapter 2.4 for details).

Science communication addresses all stakeholder groups. The SNSF promotes exchanges amongst researchers and dialogue between researchers and the public, as well as networking activities with those who apply research results.

4. Service provision and financial requirements

4.1 Service provision

The strategic priorities 2021–2024, the changes to the funding portfolio and the continuing development of the organisation place new demands on the Research Council, the members of evaluation bodies and the Administrative Offices.

Continuous improvement of peer review processes
The SNSF continuously improves its services to researchers and the quality of its evaluation procedures. In the period 2021–2024, it will drive forward the internationalisation of its evaluation bodies, which ensures that Swiss researchers are measured against international standards of scientific excellence. It will sensitise evaluators to international best practice in research evaluation and step up quality assurance in the evaluation processes. Particular attention will be given to the mitigation of conflicts of interest and the implementation of the DORA principles (see chapters 1.2 and 2.1). Panel chairs and representatives from the Research Council and Administrative Offices will receive training and bear greater responsibility in this regard. Additional expertise will be developed in the evaluation bodies for new activities with respect to collaborative research, data infrastructures and the valorisation of research (see chapters 2.2, 2.3 and 2.4).

Evidence-based funding policy
To support these improvements, the SNSF needs to expand its knowledge of the functioning of research funding activities and their impact, drawing on the latest findings from research on research. It will continue to build up expertise in this regard and is seeking an active exchange with the relevant research communities. In this way, it hopes to contribute to evidence-based funding policy in Switzerland and beyond.[19] The SNSF is already an active player in different areas of funding policy, notably with respect to open science. It supports Switzerland's participation in international research policy networks through SwissCore, the liaison office to the EU for the entire ERI sector and organisationally a part of the SNSF.

Impact of funding
The SNSF will also increase its efforts to analyse the impact of its funding, considering the broad range of effects research can have, and make data publicly available for further analysis through a new data portal. The launch of the Career Tracker Cohorts (see text box) is a first step in this direction.

Career Tracker Cohorts (CTC): a closer look at research careers
Through the Career Tracker Cohorts (CTC), launched in 2018, the SNSF will gain a better understanding of the career paths of applicants to its post-doctoral career funding schemes, and of the medium- and long-term impact of these schemes. The results will allow a needs-oriented and evidence-based development of career funding policies and instruments. At the same time, the CTC will provide valuable data for research on the conditions, motives and career perspectives of researchers. The CTC are designed as a longitudinal panel study with annual cohorts. The target group are all applicants to career funding schemes at the postdoctoral level. These include Early Postdoc.Mobility, Postdoc.Mobility, Ambizione, PRIMA, and Eccellenza. Each year an online survey among all new and former applicants will be carried out.

Information systems
The online grant administration system mySNF offers state-of-the-art functionalities and researchers consider the grant application processes to be lean in comparison to those of other funding organisations. However, mySNF has been operating for more than ten years and its technical framework needs to be reviewed. Functionalities will be developed to increase the integration and digitalisation of processes, support compliance with regulations, reduce the workload for the Administrative Offices and the evaluators, and improve support for researchers.

Budget requirements for service provision
The SNSF depends on a well-functioning 'militia' system that provides scientific and policy expertise at the highest level and is optimally supported by the Administrative Offices. To reduce the workload of the evaluators and governing bodies, the Administrative Offices have stepped up their services, for example with regard to quality assurance, the recruitment of international experts and the development of funding policy.
The SNSF expects that it will be able to cover service costs within the current ceiling of 7 % compared to the overall budget (excl. overhead).

We will continue to develop our selection procedures based on the latest scientific findings about research funding.
The digital service range on the mySNF platform will be expanded.
The SNSF provides all of its services using 7 % of its budget.

4.2
Financial requirements

The overall financial requirements for the 2021–2024 period have been derived as follows.

Prior financial commitments
The SNSF generally funds projects over several years so that researchers are able to work under a stable framework that allows them to plan and think ahead. In addition, it is required by law to divide amounts approved for a project into annual instalments, which are paid out successively. Funding decisions in one period therefore lead to payments in the forthcoming period, which entails high financial obligations in the future. The SNSF expects that it will have prior commitments deriving from previous funding decisions in the order of CHF 1.8 billion at the end of the current period, to be paid out in the next funding period. This corresponds to more than 35 % of the overall budget request for 2021–2024.

In existing funding schemes, the SNSF in principle plans to keep the funding awarded with new grants similar to the level of 2020. The increase in funding awarded in the 2017–2020 period, however, still increases financial requirements in the 2021–2024 period, as a part of the grants will be paid out only then. This is the case even if new funding decisions remain constant in the next period. In particular, additional funds are required to maintain the current level of investment in career funding (see chapter 3.2).

Overall, a budget of CHF 4.6 billion, with an increase of CHF 231 million compared to 2020, is necessary for the period 2021–2024 merely to maintain new grants in existing funding lines at a similar level to 2020.

Necessary adjustments to existing funding schemes
Small necessary adjustments are required to existing funding schemes, for a total cost of CHF 61 million:

Necessary adjustments to existing funding schemes	Additional funds for 2021–2024 period compared to the level at the end of the previous period (2020)
Adaptation of the remuneration of project staff to increases in nominal wages (see chapter 3.1).	CHF 45 million
Increase of fellowships for young researchers, due to the fact that they will be subject to taxation, even though the grantees do their research abroad (see chapter 3.2).	CHF 16 million
Total	**CHF 61 million**

Requirements for new strategic priorities

The new measures aimed at promoting the SNSF's strategic priorities entail additional costs of CHF 104 million for the four-year period, compared to funding levels in 2020:

New strategic priorities and measures	Additional funds for 2021–2024 period compared to the level at the end of the previous period (2020)
Foster excellence through diversity	
Excellence grants for female doctoral candidates in the STEM disciplines and the life sciences – to contribute to a better representation of women in Swiss research (see chapter 2.1).	CHF 17 million
Temporary measure for health and engineering research at the UAS – to support the development of research capacity for use-inspired research (see chapter 2.1).	CHF 24 million
Strengthen international leadership through collaboration	
New funding scheme for medium-sized consortia – to enable researchers to collaboratively develop new research fields and international leadership (see chapter 2.2).	Reallocation within funds for projects
Support data infrastructures and services for open science	
Funding and evaluation for data infrastructures and services (FORS, DaSCH and cohort studies of national importance) – to increase coordination and quality assurance (see chapter 2.3).	CHF 28 million (additional mandate)
Start-up and development grants for emerging data infrastructure requirements (see chapter 2.3).	CHF 10 million
Enhance the value of research for society	
Development of BRIDGE – to fund promising projects in all research fields and boost their implementation success (see chapter 2.4).	CHF 18 million (additional mandate)
Implementation networks – to support communication between researchers and potential users of research and the transfer of research results into practice (see chapter 2.4).	CHF 7 million
Total	**CHF 104 million***

* incl. additional mandates from the government in the amount of CHF 46 million in total

No compensation for increasing costs of research

The demand for funding is increasing across the entire funding portfolio. The SNSF expects this trend to continue, as:

— The number of professors in Switzerland is likely to continue rising, albeit more slowly than in the past, with growth of about 1 % per year until 2023.[20]

— Costs for equipment, infrastructure or open access to publications and to data increase continually, and so does the average annual funding granted per project at the SNSF.

The SNSF is the only research funder that supports all types of research in Switzerland and awards grants based on a competitive procedure. Researchers whose applications are rejected have fewer other options to obtain grants than in some other countries. The SNSF is aware that a too low success rate could be detrimental to research diversity and result in resources being wasted, both for the applicants and for the evaluators. Adequate success rates contribute to the attractiveness of Switzerland as a place to do research and, since the quality of Swiss research is high, researchers applying for SNSF funds are also likely to be high achievers.

Even so, to create space for new priorities, the SNSF does not request additional funds to cover higher research costs; rather it accepts a potential decline in financial success rates should the demand for funding continue to increase.

Reallocation of funding for new strategic priorities

In addition, a certain degree of reallocation from existing funding lines to new initiatives is unavoidable to achieve the targeted increase in the innovation power of Swiss research.

— To push for funding opportunities for collaborative and interdisciplinary research, the SNSF will reallocate funds from project funding to the new scheme for medium-sized consortia and Sinergia, accepting a reduction in new grants and in the financial success rate. Project funding, Sinergia and the envisaged funding scheme for collaborative research offer very flexible, thematically open funding opportunities to experienced researchers. Responsive-mode funding, without thematic constraints and limited organisational requirements, will continue to account for 80 % of the SNSF's budget.

— In accordance with the SERI, there will be a slight decrease in funding for NRPs and NCCRs. The budget for the NCCRs covers the series running to date, including the 5th series.

— The Swiss Programme for Research on Global Issues for Development (r4d) and the former SCOPES scheme will be integrated into SPIRIT and the strategic partnership with the SDC (see chapter 2.4). Funds for ongoing r4d grants will be required until 2023.

— Doc.Mobility, which funds research stays abroad for PhD candidates, will be discontinued.

For the SNSF to be able to promote research at the level achieved in 2020, its budget for the 2021–2024 period will have to be increased by 231 million francs. Additional 104 million francs are required for the proposed measures, and 61 million for necessary adjustments. All in all, an annual increase of 3.5 % to 4.8 billion francs will be necessary.

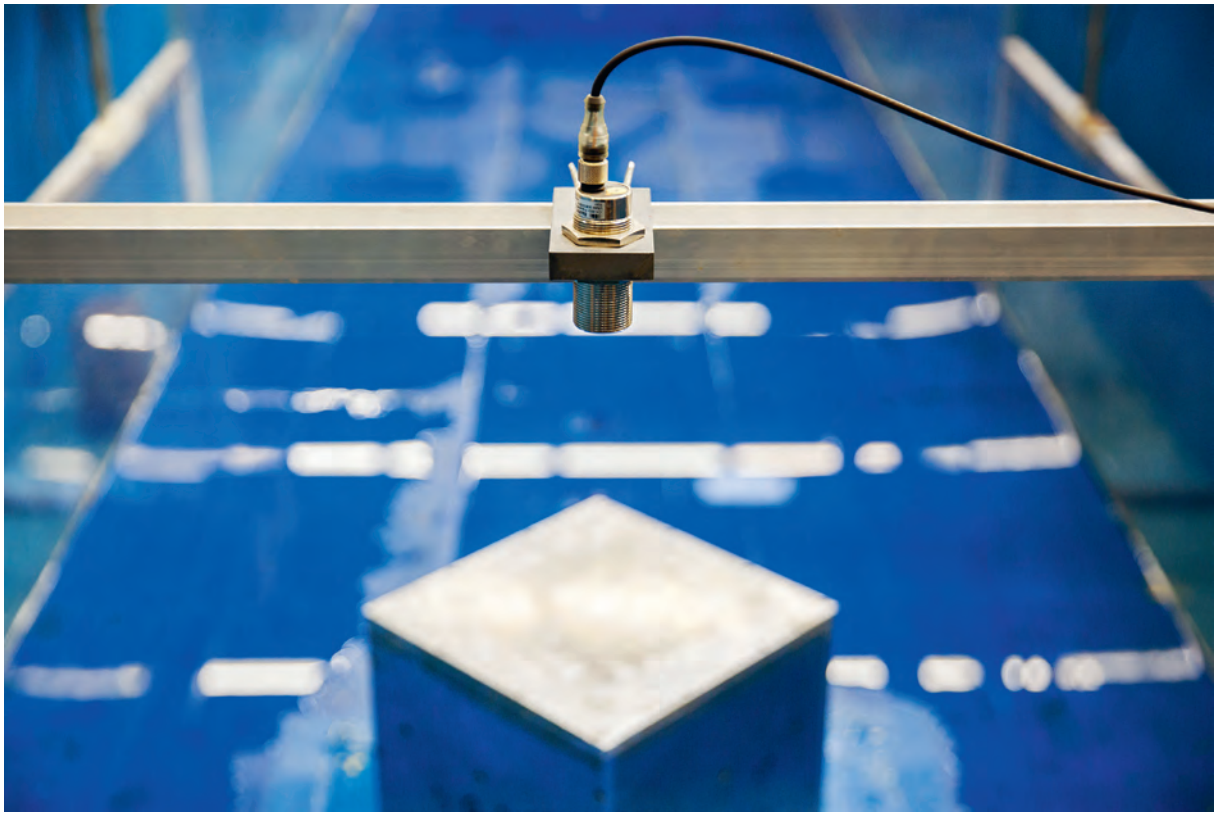
Service provision and overhead
The proportion of costs for service provision compared to the overall budget (excl. overhead) will remain stable at around 7 % (see chapter 4.1). Given the current overhead rate of 15 %, CHF 460 million will be needed for payment of the overhead contributions, which cover the indirect costs incurred at higher education institutions.

Overall, the SNSF envisages that it will need a total of CHF 4,759 million for the 2021–2024 period, which corresponds to an average annual growth rate of 3.5 %.

Overview of financial requirements
Since new funding schemes are built up progressively over more than one funding period, the priorities of the current period, especially the increased focus on career funding, are still visible in the financial plan for the next period. In fact, prior commitments have a stronger financial impact than the new priorities and measures.

Additional funds for 2021–2024 (CHF 396 million in total), compared to the level at the end of the previous period, in 2020, include:

- prior financial commitments and the continuation of new grants at a level similar to 2020 (CHF 231 million in total),
- small necessary adjustments to existing funding schemes (CHF 61 million in total),
- cost of new strategic priorities and measures (CHF 104 million in total).



Overview of financial requirements (in CHF million)

	2020	2021	2022	2023	2024	2021–2024	Additional funds for 2021–2024 period compared to the level at the end of the previous period (2020)
Projects Project funding including increase in staff salaries, Spark, Sinergia, **New:** Temporary measure for health and engineering research at the UAS, **New:** Funding scheme for medium-sized consortia	540	548	549	580	604	2,280	**120**
Careers Eccellenza, Ambizione, PRIMA, Postdoc.Mobility including compensation for taxation, Doc.CH, **New:** Excellence grants for female doctoral candidates in the STEM disciplines and the life sciences	185	200	228	232	240	900	**160**
Programmes International programmes, IICT	14	15	17	19	19	70	**12**
Infrastructures Research Infrastructures, R'Equip, Editions, Cohort studies, **New:** Start-up funding for emerging data infrastructure requirements	36	40	40	40	41	159	**15**
Science communication Publications, Agora, Scientific exchanges, **New:** Implementation networks	11	12	13	15	16	56	**11**
Total I	**787**	**814**	**846**	**885**	**919**	**3,465**	**318**
NCCR / NRP National Centres of Compentence in Research, National Research Programmes	86	89	77	75	75	316	**-26**
Additional mandates from the Federal Government							
Bilateral programmes/COST	15	15	15	15	15	60	**0**
Expanded: BRIDGE	13	17	18	18	18	70	**18**
FLARE	8	8	8	8	8	32	**0**
New: Data infrastructures and services of national importance	7	14	14	14	14	56	**28**
Total II	**915**	**957**	**978**	**1,015**	**1,049**	**3,999**	**338**
Service provision Continuous improvement of evaluation processes and evidence base for funding policy, development of information systems, public relations and Administrative Offices	69	72	74	76	79	301	**25**
Overhead Compensation for indirect costs at research institutions	107	100	117	119	124	460	**33**
Total III	**1,091**	**1,129**	**1,168**	**1,210**	**1,252**	**4,759**	**396**

Continuation of grants at level of 2020 | Necessary adjustments to existing instruments | New strategic priorities

Abbreviations

Academies	Swiss Academies of Arts and Sciences
CTC	Career Tracker Cohorts
DaSCH	Data and Service Centre for the Humanities
DIS	Data infrastructures and services
DORA	Declaration of Research Assessment
EOSC	European Open Science Cloud
ERI Dispatch	Federal Dispatch on the Promotion of Education, Research and Innovation
EU	European Union
FLARE	Funding LArge international REsearch projects
FOPH	Federal Office of Public Health
FORS	Swiss Centre of Expertise in Social Sciences
FSO	Federal Statistical Office
GERD	Gross domestic expenditure on research and development
GDP	Gross domestic product
Horizon Europe	European Framework Programme for Research and Innovation 2021–2027
Innosuisse	Swiss Innovation Agency
NCCR	National Centre of Competence in Research
NGO	Non-governmental organisation
NRC	National Research Council
NRP	National Research Programme
OECD	Organisation for Economic Co-operation and Development
PREF	Public Research Funding
PRIMA	Promoting Women in Academia
QSIT	Quantum Science and Technology
r4d	Swiss Programme for Research on Global Issues for Development
R’Equip	SNSF funding programme for research equipment
RNN	Recurrent neural network
RNNAI	RNN-based artificial intelligence
SCOPES	Scientific Cooperation with Eastern Europe
SDC	Swiss Agency for Development and Cooperation
SDGs	Sustainable Development Goals
SERI	Swiss State Secretariat for Education, Research and Innovation
SNSF	Swiss National Science Foundation
SPIRIT	Swiss Programme for International Research by Scientific Investigation Teams
SSH	Social sciences and humanities
STEM	Science, technology, engineering and mathematics
SwissCore	Swiss information and liaison office for European policies and programmes in research, innovation and education
UAS	Universities of applied sciences
UN	United Nations
UTE	Universities of teacher education

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Publishing information

Publishers:
Swiss National Science Foundation
Wildhainweg 3, P.O. Box
CH–3001 Bern
+41 31 308 22 22
desk@snf.ch
www.snsf.ch

Design
Heyday, Bern
www.heyday.ch

Printing
Stämpfli, Bern
www.staempfli.com

Image credits ©
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Number of copies
1200 German, 500 French, 500 English

Swiss National Science Foundation (SNSF)
Wildhainweg 3, P.O. Box, CH–3001 Bern
www.snsf.ch