
NEW AREAS AND CURRENTLY FUNDED INFRASTRUCTURES ELIGIBLE TO APPLY IN THE CALL FOR INFRASTRUCTURE OF NATIONAL INTEREST 2021

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AREA DESCRIPTION: BY THE SWEDISH RESEARCH COUNCIL PRIORITIZED RESEARCH INFRASTRUCTURES ELIGIBLE TO APPLY IN THE 2021 CALL

This section contains descriptions of a number of areas in which there are research infrastructure needs that are considered to be of great national interest. The areas below are infrastructure needs that are considered to be of national interest and developed enough to be implemented in the near future which makes them eligible to apply in the 2021 call.

New areas eligible to apply in the 2021 call

ACTRIS

Aerosols, Clouds and Trace Gases Research Infrastructure (ACTRIS) is a pan-European distributed research infrastructure that coordinates operations where aerosols, clouds and trace gases are observed and studied. ACTRIS Sverige is the Swedish node.

Description of the area

The Earth's climate and human health are affected by aerosols, clouds and trace gases in the atmosphere. To understand the connections between human impact and natural processes in the atmosphere and biosphere, long-term quality-controlled and standardised measurements are needed of aerosols, clouds and trace gases. The issues addressed – such as air pollution and the greenhouse effect – are global, and observations therefore have to be made across borders and in different climate zones.

The data generated within ACTRIS are used in research fields such as climate research, environmental research, atmosphere research, ecology, hydrology, limnology and forestry research. Reliable air quality data are also important for environmental monitoring and for decision-making. Through coordinated collection and open access to observation data, ACTRIS can contribute to increased understanding of processes and better parameters for climate and air quality models, which in turn contribute to solutions to societal challenges and sustainability goals.

Development/need

The European research infrastructure ACTRIS has been included on the ESFRI roadmap since 2016. ACTRIS is currently in an implementation phase, with the goal of forming an ERIC in 2021 and being fully operational in 2025. ACTRIS' European organisation safeguards the collection of calibrated, standardised and quality-controlled observation data at the different national nodes, and is responsible for making these data accessible.

A well-established national infrastructure as the Swedish node is a precondition for Swedish membership of ACTRIS-ERIC. Membership also means that the Swedish node has access to services and support from the international organisation.

ACTRIS is an important complement to related research infrastructures, such as ICOS, which measures greenhouse gas flows, and the field station infrastructure SITES. Continued co-location and

coordination with these are desirable, and is expected to lead to integrated measurements and thus to better understanding of links between the biosphere and atmosphere, including effects on climate caused by aerosols. Clear added values from co-location and coordination are expected, not just scientifically but also logistically.

Use of the infrastructure

ACTRIS' data are openly accessible to all via the ACTRIS Data Portal. Physical access to, among others, laboratories and mobile equipment is allocated following an application procedure and according to scientific excellence.

Infrastructure for digital humanities

Digital humanities refers to, among others, digitisation, storage and computation, and to various digital methods for investigating scientific questions in the area. Currently, there exists a consortium of laboratories and databases with the potential to develop a national infrastructure.

Description of the area

Much of humanities research is becoming ever more quantitative, multidisciplinary and methodologically advanced. In conjunction with this, it generates and uses data in ever increasing amounts and complexity, which requires technology, computational resources and adapted analysis methods. An integrated infrastructure for digital humanities would give researchers access to (a) advanced research techniques, such as measurement of eye movements (eye tracking), 3D scanning, and EEG, (b) computational resources and tools for visualisation, text analysis, and linguistics technology, and (c) expertise in data management and storage. Such an infrastructure should also function as a link between humanities and other research fields, and also between research and other socially relevant sectors, such as industry, education and cultural heritage institutions.

Development/need

The need consists of establishing an integrated infrastructure of national relevance for digital humanities, with the potential to cover all stages up to advanced analysis of cultural heritage data, via joint databases and digital technology that makes accessible and promotes both the use and the interpretation of data. To promote Swedish research within humanities and artistic research in particular, the establishment and coordination of an infrastructure is necessary, plus possibly increased internationalisation via the European infrastructure for artistic and humanities research, DARIAH-ERIC. At present, the resources are lacking coordination, and an integrated infrastructure for the rapidly growing field of digital humanities is of central scientific importance for Swedish humanities.

Researchers within art and the humanities are increasingly basing their work on digital content (such as artefacts in various cultural heritage collections, databases, data from social media, etc.) and associated services, tools and research methods. A challenge for researchers in Sweden today is that a large part of the necessary digital content, tools, services and facilities are not accessible or difficult to identify. An integrated infrastructure that provides digital content, associated tools, services, facilities and expertise from universities and related institutions in Sweden and abroad would strengthen Swedish research.

Use of the infrastructure

The users are researchers at Swedish higher education institutions, but also researchers and other personnel at governmental and private organisations, such as museums, libraries and related cultural heritage institutions. In addition to national users, another potential user group are international researchers.

Infrastructure for solar physics

The Swedish solar telescope, SST, is located on La Palma in the Canary Islands and is operated by the Institute for Solar Physics, which is hosted by Stockholm University. The EU is making plans for the next generation of solar telescopes, EST.

Description of the area

Research in solar physics focuses on understanding the structure and dynamics of the solar atmosphere. Increasing the understanding of these processes, as well as the impact the Sun has on Earth, is important for research areas such as astrophysics, geophysics, climate research, space physics and biology. Research in solar physics requires access to both ground-based telescopes and space-based equipment. ISF is receiving an operational grant from the Swedish Research Council until the end of 2020.

Development/need

The Swedish 1-metre solar telescope (SST) has been operational since 2002. SST and its instrumentation is developed and operated by the Institute for Solar Physics, and has long been a world-leader in terms of image quality and instrumentation. SST is optimised for the 'major questions' within solar physics of the future, such as understanding the heating and dynamics of the hottest layers of the solar atmosphere: the chromosphere and the corona. The most powerful instruments for scientific studies at SST are CRISP and CHROMIS, which study the upper chromosphere. A third instrument, HeSP, will be installed to study the magnetic fields in the same layer.

As SST also functions as a testbed for instrumentation for the planned large European solar telescope, EST, it is important that the Swedish expertise can be transferred to the next generation solar telescope. This is also a precondition for ensuring the expertise that has been built up at the Institute for Solar Physics is further developed and able to contribute to continued high-quality Swedish research relating to the Sun. The need consists of continued operational support to maintain the institute as a national and international resource.

Use of the infrastructure

The telescope will primarily be used by researchers from Sweden and Spain, as well as from other partner organisations that usually buy access time.

InfraVis: infrastructure for visualising scientific data

InfraVis is planned to be a distributed infrastructure for visualising scientific data, and consists of nine centres at various Swedish higher education institutions, forming a consortium.

Description of the area

Visualisation of scientific data is becoming an increasingly important data analysis support tool to keep up with increasing computing capacity, new methods and analytical tools, and due to increased demand within many research fields that handle large amounts of data. Among them are research areas such as engineering sciences, medicine, humanities and social sciences, but also computing sciences and AI. The infrastructure will include support via a national helpdesk as well as management of specific data and software challenges.

Development/need

Data analysis is an increasingly important part of the work flow for research in all research disciplines. The data volumes generated are rapidly becoming both larger and more complex, which is a challenge for scientific development. Visualisation of data can be used in many areas and also in multidisciplinary research, and can provide both new insights and result in practical applications. New and improved visualising methods have the potential to improve data analysis support considerably, and facilitate the management of large and complex data sets, which can create competitive advantages for researchers in Sweden. InfraVis can provide expertise within visualisation and visual analysis, software solutions and research communication, and also access to advanced data and visualisation laboratories. User training will be arranged in the form of courses, seminars and online documentation. To establish an infrastructure of national interest, the operation needs to focus on and specialise in the most urgent techniques. Furthermore, prioritisation needs to be carried out in relation to which centres to include, and what expertise needs to be present at each one.

Context databases

Sweden has a large number of high-quality context databases in social sciences, and Swedish research in several of the areas where the databases are used is of high international standard.

Description of the area

Context data is data at a higher level (such as in a 'context') that are relevant to link to data about analysis objects at a lower level (such as individuals, companies, etc.). Swedish researchers have managed to build up several databases for context-based data, which include items such as systematic information about the development of democratic institutions, armed conflicts, corruption, the quality of governmental governance, and social security. There is great potential for coordinating and linking different databases in order to create synergy effects that can facilitate ground-breaking research. Examples are global challenges, such as the UN's sustainable development goals for 2030, but also regional and local analyses where great contextual variation may exist in relation to factors such as population composition, or political actions and regulatory frameworks. The research infrastructure DEMSCORE (Research Infrastructure for Democracy, Environment, Migration, Social policy, Conflict, and Representation), the purpose of which is to coordinate a number of context databases, has received a grant from the Swedish Research Council since 2020.

Development/need

The national and international need of an infrastructure for context databases is assessed as being very great. Coordinated organisation of context databases based on long time-series enable and facilitate analysis of causes of institutional and societal changes and their consequences for individuals at various stages of life. The focus can change from descriptive to causal analyses.

The DEMSCORE infrastructure aims to fulfil the research needs of Swedish social sciences for access to infrastructure resources and tools through providing access, use and advanced analysis of context data. The current funding from the Swedish Research Council covers the work of establishing the infrastructure itself. An upgrade aims also to safeguard the continuous collection of data, which would enable ground-breaking research, without which the consortium risks becoming obsolete. Through continued data collection in the future, Sweden's position as a strong research nation within social sciences, in areas such as democracy development and social policy, can be both maintained and strengthened.

MOSAIC - instrumentation for ELT

The Extremely Large Telescope (ELT) is being developed by the European Southern Observatory (ESO), where Sweden is one of the member countries. The telescope is being constructed in Chile and, with a diameter of 39 m, will be the world's largest optical/infrared telescope. Researchers from Sweden plan to participate in the development of the MOSAIC instrument at ELT.

Description of the area

ELT is being constructed on the Cerro Armazones mountain in Chile, and will have a light collection capacity that is 13 times greater than that of the current largest optical telescope. Using ELT, researchers in astronomy and astrophysics will be able to study features such as exoplanets, star populations, super-massive black holes and our early universe. The MOSAIC instrument will have a broad area of use, and will enable observations of both stars at the centre of the Milky Way as well as the most distant galaxies in the universe. This will make it possible to study the development of galaxies and how matter spreads in the universe. The Swedish ELT consortium (SELTIC) is operated from Stockholm University with participation from the universities in Uppsala and Lund.

Development/need

The potential of ELT is entirely dependent on the instruments the telescope will be equipped with, and the opportunities for researchers from Sweden to conduct early ground-breaking research is largely dependent on their participation in the design of the instruments. As the instruments are very complex, they are developed within major international consortiums. Researchers from Sweden are currently involved in the development of two of the instruments at ELT: Hires and MOSAIC. The Swedish Research Council has previously awarded a grant for hardware development within the instrument consortium for the high-resolution spectrograph Hires, and the current proposal relates to participation in the development of the multi-object spectrograph MOSAIC. This would mean that researchers from Sweden and Swedish industry becomes closer tied to the development of instruments at ELT, which would strengthen Sweden's active role.

Use of the infrastructure

To participate in the instrument development, it is necessary to be a member of one of the consortiums building the instruments. In Sweden, the SELTIC consortium is led by Stockholm University. Observation time at ESO's telescope is allocated following scientific assessment via an application procedure. Researchers from countries that participate in instrument development are guaranteed a certain proportion of the time. Data from ESO's telescope are accessible after a qualifying period.

NordSIMS-Vegacenter

NordSIMS-Vegacenter at the Swedish Museum of Natural History is a national laboratory for high-resolution micro-analysis of samples for research within geosciences, environmental changes and the development of the solar system.

Description of the area

Using NordSIMS-Vegacenter's high-resolution mass spectrometers, researchers can study the isotope composition of different materials, and in this way learn more about their origin, development and age. The dynamic processes that control the development of Earth and the solar system give rise to different distributions of isotopes. Some isotope compositions vary according to location, others change over time and can then be used as a 'clock' for determining age, while others still are distributed in differing ways, depending on the processes that the material has undergone. Together with other observations, this provides us with knowledge of the development of Earth and the solar system.

Development/need

NordSIMS ion micro-probe was built up in the 1990s as a joint Nordic resource for geoscience research, and has been operated and upgraded at various stages with the help of grants from Swedish and other Nordic funding bodies. In the 2010s, NordSIMS became a Swedish national infrastructure, and was also complemented with a laser ablation instrument with associated mass spectrometers (Vega). The NordSIMS-Vega laboratory is operated by the Swedish Museum of Natural History and is used by Swedish and international researchers. NordSIMS-Veg has an operational grant from the Swedish Research Council until the end of 2020. The need consists of continued operational support to maintain the laboratory as a national resource, and minor upgrades to improve the quality of the analyses.

Use of the infrastructure

NordSIMS-Vega is primarily used by Swedish and international researchers, and to some extent also by industry and public agencies that buy analysis time at the instrument.

Ultra-high field MR 7T platform

The national 7T platform for medical imaging of the brain in particular, but in the longer term also other organs, is located at Lund University.

Description of the area

Medical imaging has revolutionised our ability to diagnose diseases and understand biological processes in the human body. One of the imaging techniques that are driving research forward is Ultra-High Field Magnetic Resonance Imaging (UHF MRI), which is available at the Swedish 7T platform in Lund at the university's Bioimaging Center. UHF MRI provides very high resolution in studies of the brain and its blood flows, and has resulted in new medicines for epilepsy, for example. The current hope is that the technology will also drive development forward in research into organs other than the brain.

Development/need

The construction of the Swedish 7T MRI facility has previously been funded by the Swedish Research Council, and the facility was inaugurated in 2015. The facility offers advanced services within medical imaging, and needs upgrading in order to continue to be relevant and to enable it to fulfil its role as a national infrastructure. The upgrade will also lead to the technology becoming accessible for other research fields, such as cancer and metabolic diseases. The need also covers operation, and in particular improved user support for national users.

Use of the infrastructure

The national infrastructure 7T MRI is open to all researchers, and offers advice and personnel to carry out studies.

Upgrade of the ALICE experiment

ALICE is one of the experiments at the Large Hadron Collider (LHC) at the CERN accelerator facility in Switzerland. ALICE investigates fundamental aspects of heavy ion collisions and collective phenomena in sub-atomic particles.

Description of the area

ALICE enables studies of the quark-gluon plasma, a condition where free quarks and gluons exist under extremely high temperature and/or pressure. The very high collision energies between heavy ions (lead ions are usually used) that are achieved in the LHC accelerator make it possible to use ALICE to study the characteristics of the quark-gluon plasma. These experiments are important for understanding the characteristics of matter during the early development of the universe, which is central to particle physics.

Development/need

The need to upgrade the ALICE experiment is partly driven by the significantly higher luminosities that will be achieved after the upgrade of the LHC. The upgrade proposed for the ALICE detector entails thinner detector layers than any previous similar instrument. This leads to a great improvement in the precision and effectiveness of tracing particles from the collisions. After the upgrade, ALICE will focus on areas such as measuring hadrons with charm quarks; measurements that with the current detector are limited by considerable uncertainties.

The management of the ALICE experiment has estimated that vital parts of the detector can be upgraded, and therefore regard an extended operating period for ALICE beyond the “Long Shutdown 3” (2025–2027) as possible and scientifically highly interesting. The formation of different quarks in the quark-gluon plasma could be studied with even greater precision, provide increased understanding and lead to new discoveries and insights about physics beyond the standard model.

Use of the infrastructure

ALICE is operated and used by an international collaboration from 100 contributing institutions in 30 countries. The Swedish ALICE participation is managed from Lund University.

Digital archaeology

A research infrastructure for digital archaeology would include both collection of data and also coordination and analysis of the data. There is a need to both improve the quality of data already collected, and coordinate existing data.

Description of the area

Sweden has a long tradition of collecting archaeological data. Each year, more than a thousand excavations are carried out, and the so-called digital revolution has resulted in comprehensive digital data with geographical reference points. This type of data are, however, under-utilised in research, often because they are fragmented and spread across several databases, but also because they are not adapted for analysis at aggregate level.

A research infrastructure for digital archaeology would provide great opportunities for Swedish research to be influential in various areas, both by improving the quality of data already collected, and by coordinating data for the purpose of providing access to an entirely new generation of research data that lead to new knowledge. A research infrastructure for digital archaeology would lay the foundation for increased national and international collaboration between archaeological research and research in areas such as ancient DNA, climatology, history, quaternary geology, agrarian history, geography and osteology.

Use of the infrastructure

Potential users of an infrastructure for digital archaeology can be found among the research institutions and other knowledge actors in Sweden that work with issues relating to landscape use and interaction between humans, society and the environment in a long-term perspective.

EPOS-ERIC

The European Plate Observing System (EPOS) has since 2018 operated as an ERIC, with registered location in Italy. The purpose of EPOS is to link together and make accessible data from European research infrastructures related to solid Earth. EPOS is expected to become fully operational as from 2023.

Description of the area

Greater in-depth understanding of the Earth's chemical and structural development and its dynamic processes may lead to better prediction of natural catastrophes, greater opportunities for safe and environmentally-friendly use of natural resources, and more well-developed models for the climate system. New, multi-disciplinary research can be conducted more easily, as data from different sources with varying formats, from international, national and local observations systems, can be collected and made more easily accessible. EPOS aims to facilitate multidisciplinary research about solid Earth through implementing standards for this type of data, and building up an e-infrastructure platform for data distribution, validation, visualisation and modelling. EPOS is relevant for researchers in the areas mentioned above, but also opens the door for entirely new research questions. Swedish membership of EPOS-ERIC would entail an investment in coordination and increased accessibility to data, both nationally and internationally.

Use of the infrastructure

EPOS data will be available with open access. EPOS also intends to enable physical access to facilities and laboratories, via an application procedure and based on scientific excellence.

Infrastructure for electron microscopy

ARTEMI aims to become a national research infrastructure for electron microscopy, where what are currently local facilities at several Swedish higher education institutions are proposed to form national nodes.

Description of the area

Advanced electron microscopy is an important and well-established tool within many scientific fields, such as physics, chemistry, materials science and neighbouring areas. Advanced electron microscopy supplements the existing infrastructures MAX IV and ESS. These facilities have a broad user base, and together create a strong support for Swedish research. Users at the ARTEMI nodes at Swedish higher education institutions currently consist of more than 300 researchers within materials science, materials chemistry, inorganic chemistry, nano science, applied physics, engineering, and other fields. The need consists of coordinating electron microscopy resources at several universities, and making specialists available to meet the challenges of research.

Use of the infrastructure

Currently, the instruments at the various nodes are used by local users, and they are also open to external parties via an application procedure.

Infrastructure for chemical biology

The Chemical Biology Consortium Sweden (CBCS) uses small molecules as tools for studying biological systems, for the purpose of understanding and influencing cellular processes at molecular level. In addition to the host university Karolinska Institutet, CBCS is also established at Umeå University and is a part of SciLifeLab.

Description of the area

Chemical biology is a multidisciplinary field, where the interaction between small molecules and biomolecules are used as a tool for identifying, studying and modulating biological processes. The purpose is to understand cellular processes at the molecular level, and to influence these. The greatest need for chemical biology exists within biomedical research, but the area is also closely linked to pharmaceutical development and also to health and medical care. It is also used within several other research disciplines. The work involves features such as designing cellular or molecular analysis systems (assays) to investigate a specific mechanism, management and design of small molecule libraries, large-scale screening to identify binder- and target molecules, as well as synthesis and modification of small molecules.

Swedish membership of the European infrastructure EU-Openscreen-ERIC, which links together European platforms for large-scale screening and medical chemistry, would give Swedish researchers

access to larger libraries of small molecules, more databases and an extensive network of European experts, and thereby benefit Swedish research within chemical biology.

Use of the infrastructure

Users of the infrastructure can be found both at Swedish higher education institutions and in industry. To use the infrastructure, the preconditions for the project are first discussed with representatives from the infrastructure before a potential application is evaluated by an independent evaluation committee.

Infrastructure for nuclear magnetic resonance

SwedNMR aims to coordinate instruments for nuclear magnetic resonance (NMR) at six Swedish nodes into a national infrastructure to benefit a broad Swedish user base.

Description of the area

Nuclear magnetic resonance (NMR) is a technology with a broad area of use for many research projects with great scientific potential, in areas such as life sciences, chemistry and physics. Access to NMR instruments at the forefront of research can with great probability lead to groundbreaking research and new opportunities for researchers. NMR is an important technology for a large group of researchers in Sweden, and the proposed SwedNMR involves all major Swedish universities and research centres. The need consists of establishing a unified Swedish infrastructure within NMR, where user support and instrument investments are coordinated at national level. Existing NMR facilities shall be coordinated for best possible user support, and where new investments can be made jointly with instrumentation of the latest technology.

Use of the infrastructure

Existing facilities, which are proposed as future nodes of SwedNMR, are already being used regularly by both Swedish and international users. With SwedNMR, user support and coordination of resources are expected to increase further and national access to NMR instruments for researchers from relevant research fields will be safeguarded.

Infrastructure for protein production

A national infrastructure that coordinates different competences within protein production can meet the research need for access to recombinant proteins.

Description of the area

Proteins are necessary for all processes in living cells, and access to recombinant proteins with an active structure is crucial for many areas of biomedical research. Research fields in chemistry and environmental studies, as well as more applied research within areas such as drug development, biotechnology and foods, also have great need of high-quality proteins. The complexity of proteins places great demands on the production process in order to safeguard the functionality of the individual protein. A coordinated national infrastructure with expertise within protein purification and complementary competences within production methods, where either bacteria, insect cells or other eukaryotic cells are used, could provide material to a broad spectrum of applications, and at

the same time connect to several of the major national infrastructure initiatives, such as MAX IV, SciLifeLab and ESS.

Use of the infrastructure

An infrastructure for protein production could be used by researchers at Swedish higher education institutions in particular, but there are also interest and users within industry.

The Oden ice-breaker

Oden is one of the world's most powerful ice-breakers, and currently one of the primary research platforms in the polar oceans. The ship is owned by the Swedish Maritime Administration, and the Swedish Polar Research Secretariat plans and coordinates the research expeditions.

Description of the area

The hard-to-access polar regions are key areas for understanding the climate and changes to it. Thanks to its great ice-breaking capacity, the Oden ice-breaker is one of very few ships in the world that can provide opportunities for multidisciplinary in-situ measurements in and around the Arctic and the Antarctic.

Oden provides an important platform for researchers within a large number of scientific fields, such as climate, environment, meteorology, geology, marine sciences and glaciology. Oden can also be used as a mobile laboratory for field measurements in hard-to-access land areas, and is therefore also a resource for researchers who are not traditionally dependent on ships. By offering space on Oden for researchers from other countries, researchers in Sweden in turn get access to international research collaboration and facilities.

To ensure that Oden can continue as a world-leading research platform during its remaining life span of operation, upgrades and maintenance of the research equipment on board are necessary.

Use of the infrastructure

The Swedish Polar Research Secretariat is responsible for planning and coordinating research expeditions onboard the Oden ice-breaker. Information about upcoming expeditions are communicated via the Swedish Polar Research Secretariat's website.

New instrumentation at DESIREE

The Double Electrostatic Ion Ring Experiment (DESIREE) is a facility at Stockholm University for studying atomic and molecular ions at cryogenic temperatures in well-defined quantum conditions.

Description of the area

DESIREE consists of two ion storage rings, with a joint straight section where two cryogenically cooled ion beams overlap and where reactions between individual pairs of ions can be studied in detail. Research that uses the infrastructure covers a number of different areas, such as stability and decay of positive or negative ions of atoms, molecules and atom clusters at well-controlled and low energies, as well as fragmentation and binding reactions in biomolecular systems. Experiments with

fusioned beams between stored ions and neutral atoms and molecules are of particular interest to astrophysics. The proposed upgrade of DESIREE would broaden the infrastructure's area of use and make the operation even more interesting from an international perspective. DESIREE currently is currently receiving an ongoing operational grant from the Swedish Research Council up to and including 2024.

Use of the infrastructure

DESIREE is used by researchers from both Sweden and abroad, and experiment time is allocated based on an open application procedure.

CURRENTLY FUNDED RESEARCH INFRASTRUCTURES THAT ARE ELIGIBLE TO APPLY IN THE CALL 2021

Infrastructures that are currently funded by the Swedish Research Council for which the grant period ends in 2020 or 2021 are described in the following section. Here additional instructions are given in the end of the infrastructure description for the infrastructures it concerns.

CORS – Comparative Research Center Sweden

CORS is a research infrastructure within the field of social sciences research and includes five of the largest and best known comparative social sciences survey-based research programmes in Sweden: European Social Survey (ESS), European Values Study (EVS), International Social Survey Programme (ISSP), Survey of Health, Ageing and Retirement in Europe (SHARE) and the Swedish National Election Studies Program (SNES). The CORS organization also includes the Laboratory of Opinion Research (LORE), which conducts data collection via internet surveys with particular focus on experiments and panel studies.

The focus of CORS' research is on studying how human behaviour, values, attitudes, health and quality of life differ, both between countries and between regions, and also within populations and at individual level. This means that changes in social phenomena can be studied in relation to events at institutional level. A relevant example of such changes is a special focus on COVID-19 in several of these surveys.

Two of the surveys that make up CORS are Swedish nodes in ERIC consortiums (both located at Umeå University): ESS-ERIC and SHARE-ERIC. These infrastructures are also listed as ESFRI landmarks.

Infrastructure for research and development of fusion reactors

As members of EUROfusion, Swedish fusion researchers will have access to the largest and most advanced facilities under European auspices, such as the JET fusion experiment in the United Kingdom and the pioneering research reactor ITER, which is under construction in the south of France.

Fusion research strives to build up the sustainable, environmentally friendly energy sources of the future based on the utilization of the energy that is released when two light atomic nuclei merge into a heavier one. In addition to the fact that fusion energy is environmentally friendly, it also, unlike other sustainable energy sources such as wind power and solar energy, has the potential to contribute to inertia in the electricity grid, which has a stabilizing effect. The involved Swedish groups work in several areas such as the development of theory, modeling of the fusion processes, studies of the interaction between fusion plasma and surrounding materials, plasma heating methods, diagnostics and control of the fusion reactor. The construction phase of the research facility ITER is

ongoing and aims forward towards the full-scale facility DEMO, which enables opportunities for large industrial orders.

A Swedish fusion research unit carries out the work related to EuroFusion, ITER and DEMO. The working group has participants from Uppsala-, Chalmers- and KTH universities.

IceCube - Neutrino detector at the South Pole for astroparticle physics

The world's leading neutrino telescope, IceCube Neutrino Observatory, consists of light-sensitive detectors located within a cubic kilometre area deep below the ice surface of the South Pole. The primary aim of the observatory is to investigate high energy neutrinos – a type of elementary particle that is difficult to detect.

Using neutrinos in the atmosphere, neutrino oscillations are studied. A few years ago, IceCube observed its first cosmic high energy neutrinos. Belgium, Sweden, Germany and USA started IceCube, and currently twelve countries participate in the project. The four original members monitor the project through a control group, where the Swedish Research Council is represented.

Additional instruction: Funds can be applied for infrastructures that is already today financed by SRC (i.e. continuation of previous grants) and for upgrades that are described in the results of the needs inventory 2019. Upgrades need to be described in modules that are separate from the continuation grant.

The ISOLDE experiment at CERN

ISOLDE, which stands for Isotope Separator On Line DEvice, is a facility that produces radioactive ion beams and is located at CERN on the French-Swiss border. Sweden has been a member since ISOLDE started in 1967.

At ISOLDE, with the help of CERN's accelerator complex, short-lived radioactive nuclei are produced where the half-life typically lies in the millisecond range. These nuclei are used for experiments with relevance to nuclear physics, nuclear astrophysics, atomic physics, materials physics, biophysics and medical physics. Among other things, ISOLDE investigates the strong force in atomic nuclei and how stable nuclei are created inside exploding stars. Exotic forms of atomic nuclei are also investigated, which break the charge-parity symmetry (so-called cp-violation) in ways that cannot be explained by the standard model of particle physics. Increased understanding of such phenomena could explain the matter-antimatter asymmetry that cannot be described by neither the Big Bang model of cosmology nor the standard model of particle physics.

ISOLDE is a collaboration between 16 member states and 6 "ex-officio" countries with a user base of about 500 researchers. Swedish membership is coordinated through Lund University's Department of Physics.

NEAR - National E-Infrastructure for Ageing Research

NEAR is a research infrastructure that aims to promote and facilitate Swedish research on ageing by integrating a number of national longitudinal population-based projects and databases on ageing and health. The aim of this integration is to enhance the quality and generalizability of research results and to intensify international collaboration.

The purpose of NEAR is to develop a technical platform for handling and coordinating high-quality population-based databases (in Sweden) in order to give researchers access to the information and thereby create prerequisites for future high-quality research.

NEAR integrates the following projects/databases: The Betula Project (examining memory changes over time), COSM (The Cohort of Swedish Men – part of SIMPLER), SMC (The Swedish Mammography Cohort – part of SIMPLER), KP (The Kungsholmen Project), SNAC (Swedish National Study on Aging and Care)-Kungsholmen, -Nordanstig, -Blekinge, -Skåne, SWEOLD (Swedish Panel Study of Living Conditions of the Oldest Old), SALT (Screening Across the Lifespan of Twins), SATSA (Swedish Adoption /Twin Study of Aging), AGECAP (Centre for Ageing and Health/Gothenburg H70 (Centre for Ageing and Health/the Gothenburg H70 Birth Cohorts Studies), GENDER (Gender Differences in Health Behaviour and Health among Elderly), OCTO-Twin (The Origins of Variance in the Old-Old Study), and SHARE Sweden (Survey of Health and Retirement in Europe-Sweden).

Petra III Swedish node

Sweden has invested in a materials science beamline (SMS at port P21) that consists of an inline branch (P21.2) and a side branch (P21.1) high energy beamline, at the German national synchrotron PETRA III, situated at the DESY laboratory in Hamburg. To support and follow the Swedish use of this beamline a Swedish academic hosting has been decided. CeXS is the academic host/nod of the Swedish Material Science beamline and co-hosted by KTH and LiU. CeXS is tasked with securing Swedish interests at Petra III. CeXS protects Swedish interests by monitoring Swedish submissions, observing the review meetings where measurement time is prioritised, and collecting data about a) Swedish use of Petra III and b) everyone's use of the P21 beam at Petra III. Additional duties are raising awareness about the research possibilities at PETRA III in DESY, especially amongst researchers who are new to high-energy x-ray tools also providing training and support to Swedish researchers and industry about why, when and how to use high energy x rays also disseminating the results of Swedish research at PETRA III, DESY.

Additional instruction: In this call costs related to the tasks of the Swedish node can be applied for.

REWHARD – Relations, Work and Health across the life-course - A Research Data infrastructure

REWHARD is an infrastructure aimed at both enabling and facilitating research on how human health and living conditions are formed over time. A prerequisite for this, is a long-time perspective with data that spans the lifetimes of individuals and have links across generations. REWHARD aims to

coordinate documentation and harmonization of metadata, offer a user portal and build a platform for cross-fertilization between academic fields.

REWHARD comprises four complementary, longitudinal databases covering more than 12 million persons in total, for research on working life, social relations and health throughout life: SLOSH (The Swedish Longitudinal Occupational Survey of Health), LNU (Swedish Level of Living Survey), IMAS (Insurance Medicine All Sweden) and STODS (Swedish Twin project Of Disability pension and Sickness absence). These databases enable research into areas such as the ageing population, increasing economic disparity, sickness absence, immigration and integration, stress at work and work-life balance, and social exclusion.

Riksriggen

Riksriggen is a versatile platform for multidisciplinary subsurface research with a core drilling and testing capacity to 2.5 km depth. Main questions to be addressed by the infrastructure concern the evolution of the Earth's crust and processes ongoing within it at present, for example, mountain building and earthquakes. The infrastructure can also address societal challenges such as natural resources, natural hazards, underground construction and waste disposal. Geological samples recovered by the infrastructure is used to study topics such as the deep biosphere, chemical composition of rock and fluids, quality and quantity of groundwater resources, storage and extraction of geothermal energy, storage of nuclear waste or CO₂.

Riksriggen serves the Swedish drilling community through the entire life-cycle of scientific drilling and provides qualified support for the technical use of the infrastructure, both advisory and operational. There is a well-established contact area between Riksriggen and the International Continental Scientific Drilling (ICDP).

SIMPLER – Swedish Infrastructure for Medical Population-based Life-course and Environmental Research

SIMPLER is an individual-based database and a biobank based on 110 000 Swedish individuals primarily for the purpose of epidemiological research. The database consists of two population-based cohorts, Swedish Mammography Cohort and Cohort of Swedish Men, and covers a total of approximately 110 000 persons born 1914–1952, from the Swedish counties of Uppsala, Västmanland and Örebro. Data collection from the participants has been made continuously since 1987, through regular mailings of questionnaires and surveys, as well as linking to register-based data. A biobank with DNA and other biological samples from a large number of the participants is available.

Data and samples from SIMPLER are used for research into areas such as cancer, neurological disease, circulatory disease, digestive system disease, kidney disease, diabetes and osteoporosis.

The current SIMPLER consortium is coordinated by Uppsala University with participation by Chalmers University of Technology, Karolinska Institutet and Örebro University.

SITES – Swedish Infrastructure for Ecosystem Science

SITES (The Swedish Infrastructure for Ecosystem Science) is a distributed research infrastructure that coordinates a number (currently nine) of Sweden's field stations for land-based experimental ecology. SITES support researchers in areas such as climate-, environmental- and biodiversity research.

The purpose of SITES is to offer researchers at all the national higher education institutions and institutes well-functioning and accessible infrastructures for field-based experimental ecology research, and to provide access to data from experiments and monitoring programmes. Altogether, the field stations cover widely different types of nature and climate zones, from agricultural landscapes, forestland, mountain regions and wetlands, to various types of inland waters.

The basic operational costs of the research stations are financed by the universities and the Swedish Research Council contributes to coordination, support to external users, data management and station development in order to meet the needs of Swedish researchers in terms of access to state-of-the-art research infrastructures for experimental ecology.

SND – Swedish National Data Service

Swedish National Data Service (SND) has a primary function to support the accessibility, preservation, and re-use of research data and related materials. Together with a network of 35 universities and public research institutes, SND strives to create a national infrastructure for open access to research data.

As of 2018, SND is run by a consortium of universities. The consortium consists of University of Gothenburg (host university), Chalmers University of Technology, Karolinska Institutet, KTH Royal Institute of Technology, Lund University, Stockholm University, Swedish University of Agricultural Sciences, Umeå University, and Uppsala University.

In order to meet the growing demand for open research data the SND network is in the process of developing the network's model for cooperation on open data. Within the network, stakeholders are making research data accessible via the locally established Data Access Units, DAU. This new model facilitates handling of data in regards to restrictions, e.g. personal data and other data in increased need of protection.

SuperADAM

SuperADAM is a GRG (Collaborative Research Group) instrument, a neutron reflectometer operated by Uppsala University at ILL (Institut Laue-Langevin) in Grenoble, France. The instrument has two settings: a high-flow setting that is used mainly for research into soft matter, and a low-flow/high-resolution setting that is suitable for measurements of magnetic materials and allows precise polarisation analyses. SuperADAM can be used to investigate average plane structure in thin films at a level that is between a couple of nanometres to hundreds of nanometres, and to show depth distribution of light elements in thin films, polymer interfaces and solid/fluid interfaces, as well as the magnetic structure of thin films.

The Swedish Twin Register - STR

The Swedish Twin Register is a population- and individual-based database of twins, which forms an infrastructure for research, primarily within medical epidemiology. The register is also relevant within many other fields of research such as pharmacology, genetics, clinical medicine and psychiatry, and within sociology, economics and political sciences.

The Swedish Twin Register has existed since 1959 and covers information about approximately 200 000 twins born after 1886 from all over Sweden. Twins are continuously invited to be part of the register when they turn 9 years old. For a large proportion of the twins, in addition to information on zygosity, surveys and linked register data, there is also data from clinical examinations and sample collections with DNA and serum.

The Swedish Twin Register enables research into areas such as heredity or investigations of familiar factors in studies of the causes of disease and behaviour, as well as research into the consequences of being born a twin, which often entails factors such as low birth weight.

The current consortium operating the Swedish Twin Register is coordinated by Karolinska Institutet, with participation from seven other higher education institutions.

SWEDPOP – Swedish population databases for research

SWEDPOP is an infrastructure aimed at making population data available for Swedish and international research through coordination of the most important historical population databases in Sweden. Together, they provide information on individual level about large parts of Sweden's population in the 19th and 20th centuries, and are suitable for both large-scale and micro-scale historical studies as well as for comparative studies. Data in SWEDPOP can be used to highlight the long-term demographic, social and economic processes that transformed Sweden from a traditional agrarian society to the current post-industrial welfare society, and to highlight how human health, social and economic living conditions were formed and changed in a long-time perspective. By linking to modern population registers, opportunities are provided for longitudinal studies over several hundred years, which also enables studies of intergenerational transfers (epigenetics).

The databases included in SWEDPOP are: DDB/CEDAR (Demographic Database 1650–1950, Census 1950), SEDD (Skåne's Economic-Demographic Database 1680–1968), SweCens (Censuses 1880–1940), the Ward Officer archive (population data from Stockholm 1877–1926), and GOPP (Gothenburg's population panel 1915-1943).

ETF – Evaluation Through Follow-up

ETF (Evaluation Through Follow-up) is a social sciences longitudinal survey in the field of education, based on a database which comprises ten samples of nationally representative students.

ETF is the only database of its kind in Sweden within the educational sciences area, and is also one of the oldest social sciences databases in Sweden. The longitudinal design means that the same individuals are followed from middle school (9–12 years) through the entire educational system. In this way, the effect of early prerequisites on later results and study choices can be studied.

To this day, ten follow-up surveys have been carried through, which all have been based on large and nationally representative samples from different year-groups of pupils. The first data collection was made in 1961. For each sample, administrative data, measurement of study prerequisites, questionnaire data and study results are collected. These measurements are in many cases comparable between different year groups.

The ETF surveys are part of the national evaluation of Swedish schools. Following an ethical review, ETF's variables can also be linked to other external variables. The database is used primarily within social science and humanities research.

SUPPLEMENTARY GRANT

Apart from for the infrastructures listed above, grants can also be applied for to fund increased Swedish involvement in international infrastructures in which Sweden already is a formal member. Supplementary grant should cover costs for clearly defined Swedish scientific activities such as calls for in-kind contributions or similar, where Swedish scientists intend to contribute and require additional funding to do so.

Conditions for the supplementary grant

- The infrastructure has initiated or will initiate a call or similar process in which researchers or organisations in the member states can apply to participate with scientific equipment and/or competence to the infrastructure.
- Only one university have to apply.

The instructions for the call are adjusted when applying for Supplementary grants, in the following ways:

Scientific plan: The instructions for the call should be followed. When information is asked for concerning an *infrastructure* this information should be given for the *specific scientific activities included in the Supplementary grant*. It should be clearly stated which scientific advantages for Sweden that the grant will entail, for example access to equipment or possibilities to participate for Swedish industry.

Description of the infrastructure and its activities (maximum 5 pages): The description should only be given for the *specific scientific activities included in the Supplementary grant* and only for the following topics:

- Time schedule,
- construction, development and operations of the infrastructure,
- risk analysis (mitigation plan),

and when applicable

- data handling and requirement for supporting e-infrastructure.

It should be clearly stated which economic and strategic advantages the grant will entail, for example a lower Swedish membership fee to the infrastructure.

Budget: In the budget-template only one section corresponding to one module should be used. The budget should only be presented for *specific scientific activities included in the Supplementary grant*. The budget should also describe how the in-kind contribution is counted in to the Swedish membership.

Key references: Present references that support the participating scientist's scientific merits (CV with a selection, maximum 20, scientific publications).

Support letters: The infrastructure's call for in-kind contributions or similar and a support letter from the infrastructure concerning the Swedish application should be attached in the appendix "Support letters". The support letter should indicate how the in-kind contribution is counted in to the Swedish membership, when applicable.