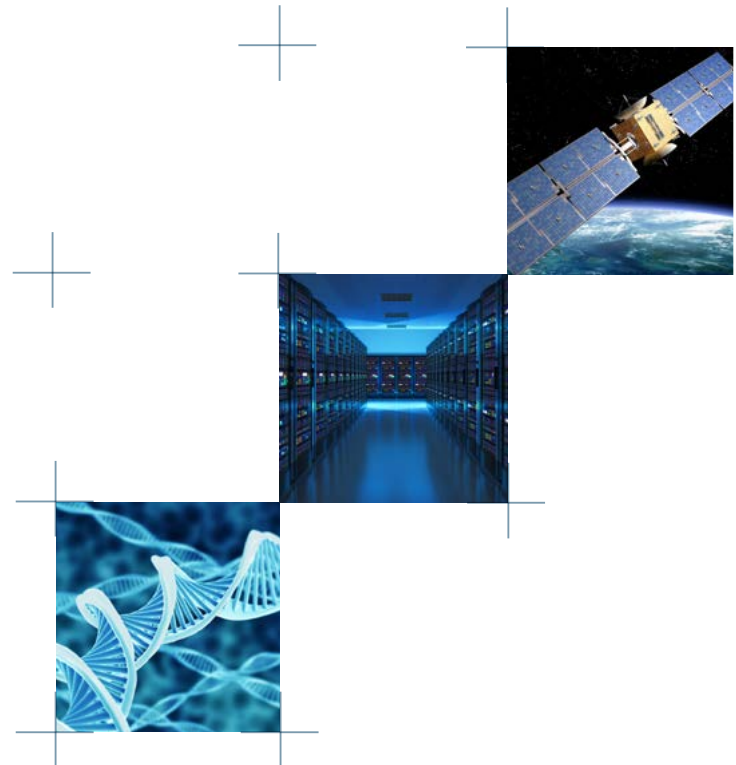


# Norwegian Roadmap for Research Infrastructure 2016

Tools for Research  
– Part II



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Visiting adress: Drammensveien 288

The Research Council of Norway

P.O.Box 564

NO-1327 Lysaker

Telephone: +47 22 03 70 00

post@rcn.no

www.rcn.no/english

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# About the Research Council of Norway

The Research Council of Norway serves as the chief advisory body for the government authorities on research policy issues, and distributes roughly NOK eight billion to research and innovation activities each year. The Research Council works to promote international cooperation and increase participation in the EU framework programme on research and innovation. The Research Council creates meeting places and provides a platform for dialogue between researchers, users of research and research funders.

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# Introduction

## Preface

The first version of the Norwegian Roadmap for Research Infrastructure was published in 2010, in line with similar roadmaps drawn up in other countries. The roadmap is revised after each major funding announcement under the National Financing Initiative for Research Infrastructure issued by the Research Council. The first and second revision was published in 2012 and 2014, respectively. The Norwegian Roadmap for Research Infrastructure 2016 is thereby the third revision of the roadmap. The updated Norwegian Roadmap for Research Infrastructure 2016 thus supports the recommendations set out in [Tools for Research - Part I](#) of increasing the investment volume in, and ensuring long-term funding of, research infrastructures in the years to come.

The Norwegian Roadmap for Research Infrastructure 2016 has two main parts:

1. A description of the strategic basis for the Research Council's priorities regarding research infrastructure in specific disciplines, thematic areas and technology areas, called area strategies.
2. A presentation of large-scale research infrastructures of national importance, which have either received funding after the call for proposals in 2014 or previously, or are considered as "worthy of funding" by the Research Council. They are referred to in this document as "roadmap projects".

The area strategies in part 1 describe the research objectives, existing infrastructure and possible future needs for infrastructure in the respective areas. The roadmap projects are presented under the specific area strategies, making it easier to see the strategic value of investment in the projects ([see the Norwegian version of the Roadmap](#)). The research infrastructures presented in part 2 are included on the roadmap based on assessments made after the call for proposals in 2014 or previously, or are considered as "worthy of funding" by the Research Council.

Most of the Roadmap Projects presented in part 2 have already been financed. This means that after a period of about 6 years with the National Financing Initiative for Research Infrastructure an increased share of new investments will now be allocated toward renewal and upgrading of important national research infrastructures. In addition, there is still a considerable need for investments in a range of novel infrastructures as indicated in the area strategies and by the received applications to the National Financing Initiative for Research Infrastructure.

The need for e-infrastructure and open access to research data is a major challenge in all areas of research, and is discussed in a separate chapter. In addition, the Norwegian participation in international research infrastructures is presented in a separate chapter.

The roadmap is not meant to be a static document, and it will be revised in the wake of each major funding announcement. Compared to earlier versions of the roadmap, part 2 contains some new projects, while others have been removed. As a general rule, projects that have been listed on two consecutive editions of the roadmap without receiving funding will be removed. Roadmap projects that have received funding in an establishment phase, but no longer receive funding through the National Research Infrastructure, are listed in a separate table. The area strategies will continually be evolving. For this reason the most recent electronic version of the [Norwegian roadmap](#) will be the updated version at any given time.

*Please note that this English translation is not a complete version of the Norwegian Roadmap for Research Infrastructure.*

Arvid Hallén  
Director General of the Research Council of Norway

# Background

The previous government's white paper on research called *Climate for Research* (2008–2009), assigned the Research Council of Norway the responsibility for drawing up a Norwegian roadmap for investments in research infrastructure. The roadmap substantiates and presents the national and international large-scale research infrastructures which the Research Council recommends funded in the near future – within a realistic budget framework. The Research Council selects research infrastructure investments to be included on the roadmap based on stringent criteria in terms of quality as well as strategic relevance.



## The function of the roadmap

The roadmap will:

- highlight major research infrastructures that are essential for achieving research policy objectives;
- communicate the strategic basis for the Research Council's priorities relevant to emerging funding announcements under the *National Financing Initiative for Research Infrastructure*;
- provide a guide for public and private funders of research infrastructures by presenting thoroughly reviewed projects that are quality-assured and considered worthy of support, but are in need of full or partial funding;
- emphasize Norwegian participation in international research infrastructures and demonstrate the balance and proportionality between such participation and national investments.

# Selection of projects for inclusion on the roadmap

After each major funding announcement under the *National Financing Initiative for Research Infrastructure*, the Research Council administration will assess which projects to be highlighted on the roadmap. The assessment will be based on three criteria, which must be fulfilled. Please go to Tools for Research – Part I: Norway’s national strategy for research infrastructure 2012-2017 for a more detailed description of criteria and terminology.

## **Criterion 1: The infrastructure has a national status and performs national tasks**

*The National Financing Initiative for Research Infrastructure* only allocates funding to projects with certain characteristics of national importance. These are defined as follows:

- Infrastructure that is of widespread national interest;
- Infrastructure that will be limited to only one or a few locations in Norway, as a general rule;
- Infrastructure that lays a foundation for internationally cutting-edge research;
- Infrastructure that will be made accessible to relevant researchers and industries.

## **Criterion 2: The grant proposal has been assessed as outstanding, both scientifically and strategically**

The projects highlighted on the roadmap have been reviewed as “Outstanding” after a thoroughly scientific review by international referees. They have further been considered to be of major strategic importance for Norwegian research by the Research Council.

## **Criterion 3: The project involves a large-scale, comprehensive research infrastructure**

To be considered for inclusion on the roadmap, a project must not only be of great national importance, but must also entail a high investment level compared to other research infrastructures within the respective field.

## **Decisions at the ministerial level**

The Research Council assesses grant applications for research infrastructure involving investment costs starting at NOK 2 million and up to a maximum of NOK 200 million in project funding. After consultation with the Ministry of Research and Education, research infrastructure involving investments that exceed NOK 200 million may be included on the roadmap, provided that the project proposal has been reviewed and assessed by the Research Council as having high scientific merit and strategic value.

## **Projects on the ESFRI Roadmap**

The Norwegian roadmap also includes projects listed on the European Roadmap for Research Infrastructures in which Norway has entered into binding agreements. All such projects have undergone a thorough review by the *European Strategy Forum on Research Infrastructures* (ESFRI) and are considered by the Research Council to be of major strategic importance for Norwegian research. ESFRI-projects that have received funding from the Research Council have been assessed on the same terms as other projects under the *National Financing Initiative for Research Infrastructure*. The decision on whether Norway should apply for membership in an ESFRI project is made at the ministerial level.



## Assessment of projects

Projects listed on the Norwegian Roadmap for Research Infrastructure that are considered "worthy of funding", but have not yet been funded must compete for funding with new project proposals on equal terms. This will ensure that priority always is given to the projects of highest merit and strategic value when allocating grant awards. It will also allow adequate consideration to be given to new needs and political priorities that may have emerged during the timespan between funding announcements.



## The strategic basis

The description of the strategic basis for the Research Council's priorities regarding research infrastructure in specific disciplines, thematic areas and technology areas, called area strategies, has not been translated to English.

*Please note that the descriptions of the area strategies are only in Norwegian.*

## Projects on the roadmap

Due to the strict prioritization process, the roadmap will only include a limited number of projects. Projects that have been listed on two consecutive editions of the roadmap without obtaining funding must submit a new grant proposal in the next application phase.

# Norway`s participation in international research infrastructures

International cooperation gives Norwegian scientists access to research infrastructures and opens opportunities to participate in innovative and costly research that would otherwise be impossible to achieve with national means alone. Membership in international cooperation on infrastructures for research also represents a significant potential for technology transfer and may in the longer term have an impact on business and technology.

Norwegian scientists have for many decades participated actively in international research organisations. The cooperation in these organisations is based on international agreements where member fees for each individual country is determined based on a contractual calculation key where the gross domestic product or an equivalent is the main factor. Table 1 shows the memberships in international research organisations which are funded by government ministries.

**Table 1. Norway's participation in international research organizations funded by government ministries.**

CERN	European Organization for Nuclear Research <a href="http://home.cern/">http://home.cern/</a>	Member since 1954
EMBL/EMBC	European Molecular Biology Laboratory <a href="http://www.embl.org/">http://www.embl.org/</a> The European Molecular Biology Conference <a href="http://embc.embo.org/">http://embc.embo.org/</a>	Member since 1985
ESRF	European Synchrotron Radiation Facility <a href="http://www.esrf.eu/">http://www.esrf.eu/</a>	Member since 1989
IARC	International Agency for Research on Cancer <a href="http://www.iarc.fr/">http://www.iarc.fr/</a>	Member since 1987
ESA	European Space Agency <a href="http://www.esa.int/ESA">http://www.esa.int/ESA</a>	Member since 1987
OECD Halden	Halden Reactor project <a href="http://www.ife.no/en/ife/halden/hrp/the-halden-reactor-project">http://www.ife.no/en/ife/halden/hrp/the-halden-reactor-project</a>	Established in 1958

European Strategy Forum on Research Infrastructures (ESFRI) was formed in 2002 by the Research Ministers of the Member and Associate Countries in EU, working together to develop a joint vision and a common strategy for research infrastructures. ESFRI has participants from all 28 member states and the 11 associated countries to the EU's Research Framework Programme. ESFRI's mandate is to develop a strategic roadmap (ESFRI Roadmap) reflecting the needs for new or upgraded pan-European research infrastructure in Europe within all scientific disciplines, and follow up the implementation of the infrastructures. ESFRI roadmap has stimulated many countries to develop national roadmaps for research infrastructures and to make more apparent national priorities of new investments. ESFRI Roadmap was first published in 2006 and updated in 2008, 2010 and 2016. Even in Europe today, characterised by economic crisis, research infrastructures have high priority both nationally and internationally. European collaboration in research infrastructures is considered to be of crucial importance in order to meet major societal challenges within health, climate, environment, food and energy. Investments in research infrastructure, which is too costly for a single country alone, can be realised through such cooperation.

The establishment of CERN, ESRF, EMBL and corresponding infrastructures are based on international agreements that took years to negotiate and approve in the parliaments. The EU



Commission, in cooperation with ESFRI, has therefore prepared the ERIC framework to facilitate the establishment and operation of joint research infrastructures across borders.

Norwegian research communities planning to participate in international infrastructures, including membership in infrastructures on ESFRI Roadmap, must apply for funding under the National Financing Initiative for Research Infrastructure (INFRASTRUKTUR). The applications will be assessed on equal footing with other Norwegian projects of national importance. Participation in international research infrastructures must be seen in the context of investment in research infrastructure located in Norway. This will ensure that only those projects with the highest quality and relevance to Norwegian research priorities will be granted. The Research Council of Norway prepares recommendations for Norwegian participation to relevant sectorial ministries which takes a final decision on Norway's membership after each application process in INFRASTRUKTUR.

Norwegian research communities have actively participated in the preparatory phase of 24 projects on ESFRI Roadmap. So far Norway has entered into binding participation in 12 of the pan-European infrastructures. Further five research infrastructures on ESFRI Roadmap were granted and recommended for Norwegian membership after the application process in 2014.

Norwegian scientists and researchers participate also in other international cooperation initiatives on research infrastructure. These are either financed by the research institutions, through research programs and other instruments in the Research Council or by other public funding initiatives.

**Table 2. Norwegian participation in infrastructures on ESFRI Roadmap**

Area	Name	Full name	Status	Project marking
Societal Science and Humanities	CLARIN ERIC*	Common Language Resources and Technology Infrastructure <a href="http://www.clarin.eu/">http://www.clarin.eu/</a>	ESFRI Roadmap NL host nation	(1)
	ESSurvey ERIC*	European Social Survey <a href="http://www.europeansocialsurvey.org/">http://www.europeansocialsurvey.org/</a>	ESFRI Roadmap UK host nation	(1)
	CESSDA (ERIC*)	Council of European Social Science Data Archives <a href="http://cessda.net/eng">http://cessda.net/eng</a>	ESFRI Roadmap NO host nation	(1)
Natural Science and Technology	EISCAT_3D	European Next Generation Incoherent Scatter radar <a href="http://blog.eiscat3d.org/">http://blog.eiscat3d.org/</a> European Incoherent Scatter Scientific Association <a href="http://www.eiscat.se/">http://www.eiscat.se/</a>	ESFRI Roadmap SE host nation. Member in EISCAT since 1975	(1)
Climate and Environment	Euro Argo ERIC*	European contribution to the Argo programme <a href="http://www.euro-argo.eu/">http://www.euro-argo.eu/</a>	ESFRI Roadmap FR host nation	(1)
	ICOS ERIC*	Integrated Carbon Observation System <a href="https://www.icos-ri.eu/">https://www.icos-ri.eu/</a>	ESFRI Roadmap FI/FR host nation	(1)
	EPOS (ERIC*)	European Plate Observing System <a href="http://www.epos-eu.org/">http://www.epos-eu.org/</a>	ESFRI Roadmap IT host nation	(2)
	SIOS	Svalbard Integrated Arctic Earth Observing System <a href="http://www.sios-svalbard.org">http://www.sios-svalbard.org</a>	ESFRI Roadmap NO host nation	(1)

<b>Biology and Medicine (Life Science)</b>	ELIXIR (EMBL)	European infrastructure for biological information, supporting life science research and its translation to medicine, agriculture, bioindustries and society <a href="https://www.elixir-europe.org/">https://www.elixir-europe.org/</a>	ESFRI Roadmap UK host nation	(1)
	BBMRI ERIC*	Biobanking and Biomolecular Resources Research Infrastructure <a href="http://bbmri-eric.eu/">http://bbmri-eric.eu/</a>	ESFRI Roadmap AU host nation	(1)
	EATRIS ERIC*	European Advanced Translational Research Infrastructure in Medicine <a href="http://www.eatris.eu/">http://www.eatris.eu/</a>	ESFRI Roadmap NL host nation	(1)
	EU-OPENSREEN (ERIC*)	European Infrastructure of Open Screening Platforms for Chemical Biology <a href="http://www.eu-openscreen.eu/">http://www.eu-openscreen.eu/</a>	ESFRI Roadmap DE host nation	(2)
	ECRIN ERIC *	European Clinical Research Infrastructures Network <a href="http://www.ecrin.org/en/">http://www.ecrin.org/en/</a>	ESFRI Roadmap FR host nation	(2)
	Euro-BioImaging (ERIC*)	Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences <a href="http://www.eurobioimaging.eu/">http://www.eurobioimaging.eu/</a>	ESFRI Roadmap FI/IT/DE host nations	(2)
	ISBE	Infrastructure for Systems Biology Europe <a href="http://project.isbe.eu/">http://project.isbe.eu/</a>	ESFRI Roadmap	(3)
	EMBRC	European Marine Biological Resource Centre Lenke...	ESFRI Roadmap	(3)
	AnaEE	Infrastructure for Analysis and Experimentation on Ecosystems <a href="http://www.anaee.com/">http://www.anaee.com/</a>	ESFRI Roadmap	(3)
<b>Energy</b>	ECCSEL (ERIC*)	European Carbon Dioxide Capture and Storage Laboratory Infrastructure <a href="http://www.eccsel.org/">http://www.eccsel.org/</a>	ESFRI Roadmap NO host nation	(1)
	WindScanner	European WindScanner Facility <a href="http://www.windscanner.eu/">http://www.windscanner.eu/</a>	ESFRI Roadmap	(3)
<b>Analysis</b>	ESS ERIC*	European Spallation Source <a href="https://europeanspallationsource.se/">https://europeanspallationsource.se/</a>	ESFRI Roadmap SE/DK host nations	(1)
	ESRF - EBS	European Synchrotron Radiation Facility - Extremely Brilliant Source <a href="http://www.esrf.eu/">http://www.esrf.eu/</a>	ESFRI Roadmap FR host nation	(1)

\* ESFRI project that is or will apply to become, an ERIC (European Research Infrastructure Consortium). This is an optional legal framework designed as a regulation in the EU. The framework can be used by member states and associated countries to regulate countries' cooperation in the establishment and operation of pan-European research infrastructures. The ERIC-regulation is incorporated into the EEA Agreement and the Norwegian ERIC-law was passed in the Parliament on November 10<sup>th</sup> 2015.

*(1) ESFRI projects in which Norway has entered into binding agreements. These projects are specifically highlighted in the Norwegian Roadmap for Research Infrastructure.*

*2) The Research Council has allocated funds after ordinary application process in INFRASTRUKTUR and has or will recommend KD and relevant sectorial ministries that Norway should participate in the ESFRI project. The national infrastructure has been specifically highlighted in the Norwegian Roadmap for Research Infrastructure.*

*(3) ESFRI projects for which Norway so far has not taken a position on participation in the establishment. Norwegian research groups participate in the preparatory phase, but the Research Council has either not received an application to INFRASTRUKTUR about Norway's participation or the application evaluation gave no basis for that project to be specifically highlighted in the Norwegian Roadmap for Research Infrastructure.*

# Area strategies

*Descriptions of the area strategies are only in Norwegian ([see the Norwegian version of the Roadmap](#)).*

# Projects on the Norwegian Roadmap for Research Infrastructure

## Energy

14-17

**ECCSEL** European Carbon Dioxide Capture and Storage

**NorBioLab** Norwegian Biorefinery Laboratory

### Norwegian Fuel cell and Hydrogen Centre

**NSST** Norwegian Laboratory for Silicon-based Solar Cell Technology

**OBLO** Norwegian Offshore Wind Energy Research Infrastructure

**SmartGrid** National Smart Grid Laboratory & Demonstration Platform

**ZEB Lab** Norwegian Zero Emission Building Laboratory

**Multiphase Lab (IMF)** National Research Infrastructure for Multiphase Flow

**ULLRIGG** Upgrade of Ullrigg Drilling and Well Centre

### Virtual Arena

### Remote Gas Research Laboratory

### National Laboratory for the Utilization of Natural Gas

## e-infrastructure

18

**E-INFRA 2014** A national e-infrastructure for science

## Environment

19-23

### Arctic ABC Development

**COAT** Climate-Ecological Observatory for Arctic Tundra

**EISCAT\_3D** European Incoherent Scatter

**EPOS** European Plate Observing System-Norway

**ICOS** Integrated Carbon Observation System, Norway

**LoVe** Lofoten-Vesterålen Cabled Observatory

### NORWEGIAN GEOTEST SITES

**NMDC** Norwegian Marine Data Centre

**NorArgo** A Norwegian Argo Infrastructure

**NorBOL** Norwegian Barcode of Life Network

**NORMAP** Norwegian Satellite Earth Observation Database for Marine and Polar Research

**NORMAR** Norwegian Marine Robotic Facility

**NorDataNet** Norwegian Scientific Data Network

**SIOS** Svalbard Integrated Arctic Earth Observing System

## Health and Food

24-28

**Biobank Norway** A National Infrastructure for Biobanks and Biobank related activity in Norway

**EATRIS** Centre Norway A Norwegian node for the European Advanced Translational Research Infrastructure in Medicine

**HELSEREGISTRE** Health Registries for Research

**NORBRAIN** Norwegian Brain Initiative: a Large-scale Infrastructure for 21st century neuroscience

**NorCRIN** Norwegian Clinical Research Infrastructure Network

**NorMIT** Norwegian Centre for Minimally Invasive Image Guided Therapy and Medical Technologies

**ELIXIR.NO** A Norwegian ELIXIR-node

**NALMIN** Norwegian Advanced Microscopy Imaging Network

**NCS-PM** National Consortium for Sequencing and Personalized Medicine

**NNP** The Norwegian NMR Platform

**NOR-OPENSREEN** The Norwegian EU-OPENSREEN Node

**CELLMASS** Norwegian Mass Cytometry Infrastructure for Single Cell

**AQUAFEED** Aquafeed Technology Centre

**Pilot Plant Facilities for Food Processing at Campus Ås**

## Societal Science and Humanities

29-32

**CLARINO** Common Language Resources and Technology Infrastructure

**INESS** Infrastructure for the Exploration of Syntax and Semantics

**LIA** Language Infrastructure made Accessible

**CESSDA** Council of European Social Science Data Archives

**eVIR** eInfrastructure for Video Research

**ESS** European Social Survey

**HISTREG** National Historical Population Register for Norway 1800-2024

**NORD-i** Norwegian Open Research Data Infrastructure

**RAIRD** Remote Access Infrastructure for Register Data

**PSI** Peace Science Infrastructure

## Physical Sciences and Engineering

33-34

**ESRF-EBS** Extremely Brilliant Source

**ESS Lund** European Spallation Source

**MARINTEK** The Marine Technology Laboratories

**NcNeutron** Norwegian Centre for Neutron Research

**NorFab** Norwegian Micro- and Nano-Fabrication Facility

**NORTEM** The Norwegian Centre for Transmission Electron Microscopy

# Energy

## ECCSEL – European Carbon Dioxide Capture and Storage Laboratory

### Infrastructure

**Status:** ESFRI project in implementation phase



**National coordinator:** NTNU

**Partners:** Netherlands, Poland, France, Italy, United Kingdom, Switzerland, Spain and Greece with a total of 43 research facilities.

Global warming caused by anthropogenic greenhouse gas emissions is possibly the most severe environmental challenge the world is facing today. The ECCSEL research infrastructure, working on CO<sub>2</sub> capture and Storage (CCS), offers a route to reduce these emissions and help mitigate the presently uncontrolled global temperature rise.

ECCSEL NORWAY RI is the Norwegian node of the ESFRI project ECCSEL and aims at gathering Norwegian laboratories working on CCS in one integrated research infrastructure with excellence, relevance and complementarity as key issues.

Norway coordinates the ESFRI-project ECCSEL.

## NorBioLab – Norwegian Biorefinery Laboratory

**Status:** Under establishment/in operation



**Project owner:** PFI

**Partners:** NTNU, SINTEF, NMBU

The NorBioLab will be a national infrastructure for biorefining accessible to national stakeholders and international partners for the development of processes for the sustainable conversion of Norwegian land and marine based biomass to novel, benign biochemicals, biomaterials and biofuels.

Modern biorefinery technology developed by NorBioLab opens up a series of opportunities for the exploitation of biomass and will be of great significance for the forestry industry and other circular economics.

## Norwegian Fuel cell and Hydrogen Centre

**Status:** Under establishment/in operation



**Project owner:** SINTEF

**Partners:** Sør-Trøndelag University College, NTNU, IFE

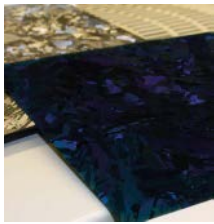
Hydrogen is an attractive energy carrier to be used with fuel cells in the transport sector, as water is the only emission. It is also of high interest for energy storage and other stationary applications. Hydrogen can be produced from renewable energy sources by electrolysis of water, which is in principle a reverse fuel cell process.

As Hydrogen technologies have become more mature, larger scale equipment is needed to further develop and demonstrate the technologies. This research infrastructure focuses specifically on testing of fuel cells and electrolysis; from single cells to system integration and verification. Through this infrastructure, Norwegian actors will be well positioned to secure a significant share of the rapidly expanding markets within fuel cell and hydrogen technologies which will be key enabling technologies for a future zero emission society.



## NSST – Norwegian Laboratory for Silicon-based Solar Cell Technology

**Status:** Under establishment/in operation



Solar energy is of high priority in Norway and Norway is on the international forefront of research in silicon based photovoltaic technology.

The consortium wishes to further strengthen this collaboration within silicon solar cell technology as well as strengthen the consortium's scientific standing and opportunities.

**Project owner:** SINTEF

**Partners:** IFE, UiO, NTNU

The new infrastructure is an important national investment that utilizes Norway's natural advantages such as the low cost of renewable energy, highly skilled people and a strong motivation to create new high tech manufacturing industry.

## OBLO – Norwegian Offshore Wind Energy Research Infrastructure

**Status:** Under establishment/in operation



**Project owner:** UiB

**Partners:** NTNU, SINTEF, IFE

The infrastructure offers mobile measurement and observation equipment which may be placed in the ocean, e.g. on floating platforms. The equipment is used for measuring and charting wind resources to ensure the optimal localization and operation of offshore wind farms.

OBLO is intended to provide and operate state-of-the-art instrumentation and measurement capabilities for a wide range of atmospheric and oceanographic parameters relevant for offshore wind energy application.

## SmartGrid - National Smart Grid Laboratory & Demonstration Platform

**Status:** Under establishment/in operation



**Project owner:** NTNU

**Partners:** SINTEF, NCE Smart Energy Markets, Narvik University College

A national laboratory for smart grid technology is established in Trondheim, and remote access to the lab for research groups from other parts of Norway is an integrated part of the project.

The implementation of a smart grid system is important to achieve national goals in the energy and climate policies. For example will an increasing amount of variable energy challenge both the energy system and the power grid. Improved energy efficiency and flexibility and closer energy integration with Europe are other trends that will have an impact on the electrical grid.

Advancing the progress on interoperability and integration of new grid components in the Norwegian power system requires a laboratory infrastructure of national scale, which has not been available in Norway up to now. The Smart Grid Lab will give researchers and industry access to both real and laboratory power systems in order to design, develop and test smart grid technologies. The interaction with individual or multiple end-users of the system through specific Use cases will be an important activity in the laboratory.

## ZEB Lab - Norwegian Zero Emission Building Laboratory

**Status:** Under establishment/in operation



**Project owner:** NTNU

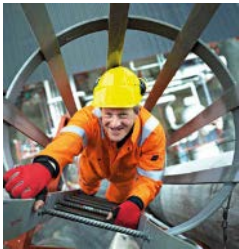
**Partners:** SINTEF

The building sector accounts for a large proportion of the energy use in the world. In order to get below the two-degree target for global warming, this energy consumption and the related CO<sub>2</sub> emissions have to be reduced. The ZEB Lab is a full scale test-facility which will consist of a building containing both offices and teaching facilities. The ZEB Lab will give a unique possibility to test and develop new materials and solutions in a building which is fully operational. ZEB Lab will be essential to test new energy efficient and climate friendly solutions in practical use. The laboratory will also enable research on the energy flexible buildings and how they can be a part of an energy system by delivering electricity and thermal energy to the grid.

The new lab provides opportunities to develop new technologies that reduce greenhouse gas emissions. NTNU and SINTEF want to create arenas for future solutions together with industry and the public sector.

## Multiphase Lab (IMF) – National Research Infrastructure for Multiphase Flow

**Status:** Under establishment/in operation



**Project owner:** IFE

**Partners:** SINTEF, Statoil, NTNU, UIO

SINTEFs multiphase laboratory at Tiller and simulation models for multiphase transport developed by IFE (Institute for Energy Technology) constitute the backbone of multiphase technology in Norway, and has had enormous significance for the Norwegian oil industry and for the economic development in Norway. The two Multiphase Lab infrastructures are complimentary and together they offer a state-of-the-art experimental infrastructure for multiphase flow, utilizing an optimal combination of the unique knowledge and existing experimental capabilities at SINTEF and IFE. The laboratories give students and researchers from academia and industry access to unique world-class research facilities.

## ULLRIGG – Upgrade of Ullrigg Drilling and Well Centre

**Status:** Under establishment/in operation



**Project owner:** IRIS

The Ullrigg Drilling and Well Centre is a research infrastructure for testing and qualification of new product concepts in the international oil and gas industry. Major upgrades and extensions of the infrastructure will ensure Norway's world leading position within development of drilling- and well technology. International research and industrial frontrunners are expected to search for Norwegian cooperation not limited to oil and gas RTD only, but also for future RTD topics such as geothermal energy and CO<sub>2</sub> handling.

## Virtual Arena

**Status:** Under establishment/in operation



**Project owner:** IRIS

**Partners:** UiS

The Virtual Arena infrastructure will establish a unique research infrastructure using the world's most advanced simulation models to replicate the physical processes during drilling and well operations. The infrastructure will operate together with the test rig ULLRIGG, combining the use of real equipment and a virtual response. Virtual Arena will become important for research communities working to improve methods and technology for safer and more cost-efficient drilling and well operations. In addition, Virtual Arena will enable realistic simulated scenarios necessary to practice on critical incidents, and to study changes in organization and work processes when new technology is implemented.

## Remote Gas Research Laboratory

**Status:** Worthy of funding



**Project owner:** SINTEF

**Partners:** NTNU

A significant portion of the world's natural gas is located in remote areas. New technologies and innovative solutions are needed for production and transportation of natural gas from remote areas in a sustainable and profitable way. The Remote Gas Research infrastructure shall contribute to a boost of innovative next-generation solutions for remote gas to commercially available technologies.

## National Laboratory for Utilization of Natural Gas

**Status:** Worthy of funding



**Project owner:** SINTEF

**Partners:** NTNU

The primary objective of the project is to establish a national laboratory for the utilisation of natural gas, to provide infrastructure for research into the use of natural gas in the metallurgical and petrochemical processes, tying together the research communities of metallurgy and petro chemistry to mirror future industrial clusters.

# e-infrastructure

## E-INFRA 2014 - a national e-infrastructure for science

**Status:** Under establishment/in operation



UNINETT Sigma2 is responsible for the procurement and operation of the national e-infrastructure for computer science in Norway, offering services based on HPC (Notur) and data storage systems (Norstore) for scientific data. The lifetimes of such systems are 4-5 years due to the technical development and the cost of maintenance. The objective of this project is to replace outdated systems to ensure cost effective services that cover the users need both in terms of functionality and capacity. In order to reduce the need of moving data, the new e-infrastructure systems will be based on a data centric structure with tight coupling between data storage and equipment for HPC and other services.

**Project owner:** UNINETT  
Sigma2

**Partners:** UiO, UIB, UiT,  
NTNU

# Environment

## Arctic ABC Development

**Status:** Under establishment/in operation



**Project owner:** UiT

**Partners:** UNIS, NTNU, SAMS

Arctic ABC Development will develop and deploy autonomous drifting observational platforms to be frozen into the Arctic Ocean pack ice and the fjords on Svalbard. The instrumentation includes acoustic and optical sensors, in addition to standard oceanographical sensors. Data from the platforms will be available in real time on land, either through satellite connections or data harvesting using drones. The Arctic ABC observational platforms is intended to provide a direct and first-hand insight into climate changes in the Arctic, providing essential data for evaluating the biological consequences of a continued reduction of the Arctic pack ice.

## COAT - Climate-Ecological Observatory for Arctic Tundra

**Status:** Under establishment/in operation



**Project owner:** UiT

**Partners:** NINA, MET.NO, NPI, UNIS, UiO, NTNU, Hedmark University College, NIBIO

COAT is a long-term research initiative that will enable real time documentation and understanding of climate impacts on terrestrial arctic ecosystems. The observatory will function as an adaptive knowledge system. Such a system is a useful tool for environmental management when trying to counteract detrimental climate impacts on biodiversity and vulnerable ecosystems. COAT will expand on existing ecological long-term time series from both high- and low-arctic Norway and integrate these with a new climate observation network. As similar observatories are entirely lacking from the whole Eurasian Arctic, COAT will considerably strengthen Norway's position as an international leader in research and management of arctic environments.

## EISCAT\_3D – European Incoherent Scatter

**Status:** ESFRI-project in planning phase



**Host nation:** Sweden

**Partners:** EISCAT Scientific Association is organising the project.

Since its inception in 1975, EISCAT has offered state-of-the-art technology for scientific studies of the upper atmosphere, the ionosphere and the northern lights, and for warning of "space weather" and solar eruptions. Part of this infrastructure now needs upgrading.

The new radar system (EISCAT\_3D) will constitute a world-class research infrastructure using a three-dimensional imaging radar for studies of the atmosphere and near-Earth space environment above the Fenno-Scandinavian Arctic as well as for support of solar system science and radio astronomy. The radar system is designed to investigate how the Earth's atmosphere is coupled with space but it will also be suitable for a wide range of other scientific targets.

Sweden is the host nation for the ESFRI project EISCAT\_3D.

## EPOS- European Plate Observing System-Norway

**Status:** ESFRI-project in implementation phase



**National coordinator:**  
UiB

**Partners:** NORSAR, NGU,  
UiO, CMR, Kartverket

European Plate Observing System (EPOS) aims at creating a pan-European infrastructure for solid Earth science to support a safe and sustainable society. EPOS integrates the existing (and future) advanced European facilities into a single, distributed, sustainable infrastructure taking full advantage of new e-science opportunities. The EPOS-Norway project is the Norwegian national contribution to the EPOS in Europe and intends to address the three basic challenges in Earth Sciences:

- Unravelling the Earth's deformational processes in order to understand the Earth system evolution in time.
- Understanding the geohazards, as well as risks and their implications to society.
- Contributing to the safe, environmentally friendly and sustainable exploration, exploitation and use of georesources.

EPOS-Norway is the Norwegian node in the ESFRI project EPOS.

## ICOS – Integrated Carbon Observation System, Norway

**Status:** ESFRI-project in implementation phase



**National coordinator:**  
UNI Research

**Partners:** UiB, NPI,  
NIBIO, IMR, CICERO, NILU

ICOS (Integrated Carbon Observation System) is a European Research Infrastructure that was created to establish an observation system for unraveling the Earth's greenhouse gas balance, enabling high quality climate change research and to increase usability of the research data.

ICOS builds a network of measurements of key Greenhouse Gas concentrations on land, sea and air, at various sites, and integrates the data into harmonized and coherent data products. ICOS-Norway is the integrated Norwegian component of ICOS. The infrastructure will deliver high-quality carbon data from different sites and platforms from Norwegian territories and the North Atlantic. These include air monitoring stations in southern Norway and at Svalbard, a forest station in south-eastern Norway, and the use of two research ships and two commercial ships in the North Atlantic, the Nordic Seas, and the areas around Svalbard. Norway will also co-host the ICOS OTC (Ocean Thematic Centre) in co-operation with the UK.

ICOS-Norway is the Norwegian node in the ESFRI project ICOS.

## LoVe – Lofoten-Vesterålen Cabled Observatory

**Status:** Under establishment/in operation



**Project owner:** IMR

**Partners:** FFI, CMR, UiB,  
UNI Research, UiT,  
NERSC, SINTEF, Statoil  
and NCS SubSea

A transect of sensor platforms that crosses the continental shelf will be developed to gather information about the physical- and biological conditions in the Vesterålen and Lofoten area. Such information will enhance our understanding of the relationships between physical drivers and biological responses, a prerequisite for models that aim to reflect the true dynamics in marine ecosystems.

LoVe is the first cabled observatory transect along the Norwegian coast and is a test bed for establishing this concept as a key element in next generation marine monitoring of the High North. Real time streaming of data supports better modeling, which is a fundamental tool for handling hazards like oil spills and evaluating the impacts of human activity and exploitation on the marine environment and its resources. Such detailed information also supports the understanding of the impacts of climate variation and trends. What drives plankton blooms and how do drivers impacts fish recruitment.



## NORWEGIAN GEOTEST SITES

**Status:** Under establishment/in operation



**Project owner:** NGI

**Partners:** NTNU, SINTEF, UNIS, NPRA

The NORWEGIAN GEOTEST SITES research infrastructure creates a national research test site facility for geotechnical research. Five test sites will be located in Norway and on Svalbard as field laboratories for testing and verification of innovative soil investigations and testing methods. The test sites will serve as reference sites for industry, public authorities, research organizations and academia where benchmarked data can be used by scientists and engineers to develop soil material models, new investigation methods, new foundation solutions and advance the state-of-the-art. The five sites will be operative for at least 20 years. Improved geotechnical characterization and design will mitigate the effects of climate change and thereby reduce the ever increasing maintenance costs of the nation's infrastructure facilities. The research consortium will also initiate the "International Geo-Test Sites Network", where Norwegian users will have access to calibrated soil conditions, equipment and testing methods developed by leading scientists from abroad.

## NMDC - Norwegian Marine Data Centre

**Status:** Under establishment/in operation



**Project owner:** IMR

**Partners:** UiO, UiB, NTNU, UiT, CMR, FFI, UiN, NERSC, NINA, NIVA, NHS, UNI Research, MET.NO, NPI, NGU, NBIC, Akvaplan-NIVA, BCCR

The Norwegian Marine Data Centre (NMDC) comprises 17 institutions collaborating to provide national as well as international access to historical and contemporary marine data sets from Norwegian waters.

NMDC will be a focal access point for marine data in Norway by offering a general overview of and access to available datasets, as well as providing a system for user contribution of data and long term data storage.

## NorArgo – A Norwegian Argo Infrastructure

**Status:** ESFRI-project in operation



**National coordinator:** IMR

The science of climate dynamics and climate change is one of the most pressing issues of our century. Understanding and predicting changes in both the atmosphere and the ocean requires data sets of the highest quality.

NorArgo provides an ocean observation system for the Nordic Seas, with 10 autonomous profiling Argo floats, that deliver high-quality in-situ data, in near-real time, and at any time. This observation system is a part of a world-wide monitoring program. The floats are equipped with pressure, temperature, salinity, oxygen, and fluorescence (chlorophyll-a) sensors, and can be used as platforms for additional sensors. The observations are available, on the internet for all users, in near-real time, i.e. within 24 hours.

NorArgo is the Norwegian node in the ESFRI project Euro-Argo ERIC.

## NorBOL – Norwegian Barcode of Life Network

**Status:** Under establishment/in operation



**Project owner:** NTNU University Museum

**Partners:** UiO, UIB, UiT, NBIC/ NTNU, University of Guelph

Norwegian Barcode of Life Network (NorBOL), consisting of a network of 17 biodiversity institutions in Norway, builds a distributed national infrastructure for DNA barcoding with the goal to barcode 100 000 specimens of 20 000 species from Norway and the Arctic region.

DNA barcoding is a powerful tool that contributes to the identification of known species and the discovery of new ones. The method is based on a simple premise, that each species can be identified by a short standardized gene region, a DNA barcode. A DNA barcode library of species will have enormous scientific and practical applications for all human activities that require species identifications (e.g. food safety, pathogens) and be central for sustainable development in our society. Data will be made freely available in the international DNA barcode database (BOLD) and linked to other web-resources for species information (GBIF, Encyclopedia of Life, GenBank, etc).

NorBOL is an integrated part of the global Barcode of Life Initiative and the International Barcode of Life Project (iBOL).

## NORMAP – Norwegian Satellite Earth Observation Database for Marine and Polar Research

**Status:** Under establishment/in operation



**Project owner:** NERSC

**Partners:** MET.NO, KSAT, CERSAT (Ifremer in Brest)

Data from a large number of satellites, that make Earth Observations over the Northern and Arctic regions, are organized in the multidisciplinary database NORMAP. The importance of NORMAP for climate research and various industries related to the ocean is considerable.

The overall goal of NORMAP is to create and maintain a data repository. This includes metadata of the high latitude and Arctic regions based on Earth Observation data from satellites, to facilitate and stimulate high quality and original multidisciplinary Earth System research and education in marine, polar and climate sciences. NORMAP will also provide Earth Observation data for marine and climate research in the Svalbard Integrated Observing System (SIOS), an ESFRI infrastructure for Arctic research.

## NORMAR – Norwegian Marine Robotic Facility

**Status:** Under establishment/in operation



**Project owner:** UiB

**Partners:** CMR, IMR

The overall objective of the NORMAR facility is to provide state-of-the-art marine robotics to the Norwegian marine science community for cutting-edge and societally relevant marine research on a range of current challenges. The facility will: 1) be of strategic importance for a range of long and short-term goals nationally and internationally in marine science and marine resource management; 2) facilitate and coordinate the development and use of deep-sea marine robotics for research; 3) enable Norway to strengthen its position globally in marine research; and 4) through synergy effects lead to innovation with Norway's marine technology industry to address a broader range of research questions.

## NorDataNet - Norwegian Scientific Data Network

**Status:** Under establishment/in operation



**Project owner:** MET.NO  
**Partners:** NPI, IMR,  
NERSC, NILU

The Norwegian Scientific Data Network (NorDataNet) is an effort to create a virtual data management system. A number of existing subsystems will be adapted for distributed data management and linked through metadata to a virtual unified system. This simplifies the work undertaken by scientists to find, access and use scientific data. Although NorDataNet has a geoscientific perspective initially, the objective is to establish a framework for interdisciplinary data management through interaction with relevant national and international activities. A prerequisite to achieve this is that all subsystems implement and maintain harmonized interoperability interfaces to their systems.

## SIOS – Svalbard Integrated Arctic Earth Observing System

**Status:** ESFRI-project in planning phase



**Project owner:** UNIS

**Partners:** NERSC, NPI,  
MET.NO

**Host nation:** Norway

SIOS (Svalbard Integrated Arctic Earth Observing System) is an international research infrastructure for Arctic Earth System Science. The aim is to be a central node in the global monitoring of the High Arctic by coordinating and developing existing and new research infrastructure in Svalbard, as well as providing more openness, better access, data sharing and knowledge management for the international research community.

The SIOS-Knowledge Centre is the central hub of SIOS providing coordination services.

The SIOS Knowledge Centre is hosted by UNIS in Longyearbyen, Svalbard. The members of SIOS will be those national and international research organizations that own and operate permanent or campaign based research infrastructure in Svalbard.

Norway is the host nation for the ESFRI-project SIOS.

# Health and Food

## Biobank Norway – A National Infrastructure for Biobanks and Biobank related activity in Norway

**Status:** ESFRI-project in operation



**Project owner:** NTNU

**Partners:** UiO, UiB, UiT, NTNU, FHI, the four Regional Health Authorities in Norway

Biobank Norway (BN) was established as a national infrastructure in 2010 for optimal use of biobank resources. BN represents Norway in the management committee of BBMRI-ERIC, the legal European biobank research infrastructure. Both clinical and population based research biobanks have markedly increased in quality within this infrastructure. The infrastructure will be further upgraded to provide safe and efficient access to human biological materials and associated health data for research.

The infrastructure will increase the national and international impacts of biobank based research in Norway and make it easier for the research community to realize the enormous research potential stored in Norwegian biobanks. Cooperation with other related national research infrastructure platforms, e.g. within bioinformatics/biostatistics, registry data and high-throughput analysis, will also be strengthened.

Biobank Norway is the Norwegian node in the ESFRI project BBMRI-ERIC.

## EATRIS Centre Norway – A Norwegian node for the European Advanced Translational Research Infrastructure in Medicine

**Status:** ESFRI-project in implementation phase



**Project owner:** UiO

**Partners:** UiB, NTNU, UiT, OUS, Haukeland University Hospital, UNN

EATRIS is a European, globally competitive infrastructure for biomedical translational research, and provides broad access to state-of-the-art facilities, training and supporting services to researchers across Europe to optimise the outputs of both basic and clinical research. The infrastructure is built around national translational centres, containing all necessary expertise and technologies for bringing discoveries from proof-of-principle to proof-of-concept. EATRIS Centre Norway constitutes the Norwegian node in the ESFRI project EATRIS.

EATRIS will provide an important international anchoring of biomedical science and innovation to strengthen Norway's strategic and competitive positioning in Europe.

## HELSEREGISTRE – Health Registries for Research

**Status:** Under establishment/in operation



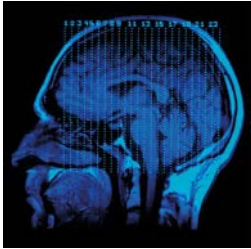
**Project owner:** UiB

**Partners:** UiO, UiT, NTNU, FHI, the four Regional Health Authorities in Norway, Norwegian Directorate of Health/NPR

Norway has invested considerable resources in collection, storage and management of health data in national registries. A main purpose of these registries is research. Health registry research is an area where medical research in Norway has a clear competitive advantage over most non-Nordic countries. Better use of these resources requires investments in data- and analyses support for researchers. The Health Registry for Research (HRR) infrastructure will strengthen the use of national health registry data for research in Norway through the development of support systems and services for the Norwegian research community and by building secure solutions for data access, transfer and management for research.

## NORBRAIN – Norwegian Brain Initiative: a Large-scale Infrastructure for 21st century neuroscience

**Status:** Under establishment/in operation



**Project owner:** NTNU

**Partners:** UiO

NORBRAIN is a large-scale national infrastructure offering new generations of research tools to neuroscientists with different backgrounds to provide insight into how complex mental functions and dysfunctions emerge from distributed neuronal activity in a local brain circuit. The infrastructure consists of high-resolution microscopes and other imaging technologies used to determine how cells and molecules in the brain function and interact. The infrastructure also includes equipment to record how the brain reacts to various influences. A new clinical 7T MR scanner will be unique on an international level, because it will be completely vertically integrated, from atomic and cellular analyses in simple model systems to studies of brain systems in living, thinking humans. Breakthroughs in basal neuroscience can be translated into research on human brain function that may help combat the health challenges associated with major brain disorders, such as dementia and Alzheimer's disease.

## NorCRIN – Norwegian Clinical Research Infrastructure Network

**Status:** ESFRI-project in operation



**Project owner:** St.Olavs Hospital

**Partners:** OUS, Haukeland University Hospital, SUS, AHUS, UNN

NorCRIN was established in 2010 by the University Hospitals in Norway, and will constitute the Norwegian node in the ESFRI project ECRIN. The multinational and shared infrastructure of ECRIN makes the European Union an integrated area for clinical research, providing researchers across Europe access to state-of-the art facilities, training and support services to study prevention, diagnosis and therapy. Hence, the active participation of NorCRIN in ECRIN will prove valuable for Norwegian research. The main ambition of NorCRIN is to build an attractive research infrastructure for clinical research in Norway in order to strengthen and facilitate national clinical research collaboration and integrate this work with clinical research in the Nordic Countries and Europe, for both industrial and academic collaborators.

NorCRIN is the Norwegian node in the ESFRI project ECRIN.

## NorMIT – Norwegian Centre for Minimally Invasive Image Guided Therapy and Medical Technologies

**Status:** Under establishment/in operation



**Project owner:** St.Olavs Hospital

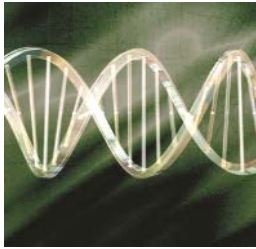
**Partners:** OUS, SINTEF

NorMIT is an infrastructure for research within medical technology with special emphasis on minimally invasive image guided therapy, training/simulation for optimal patient treatment and workflow and communication. The NorMIT overall ambition is to be an attractive research infrastructure for clinical and interdisciplinary technological and translational research in Europe for the academia, hospitals and the industry. The infrastructure project is a partnership between the Operating Room of the Future (ORF) at St.Olavs Hospital/NTNU and the Interventional Centre (IVS) at the Oslo University Hospital.



## ELIXIR.NO – a Norwegian ELIXIR-node

**Status:** ESFRI-project in operation



**Project owner:** UiB

**Partners:** UiO, NTNU, UiT, NMBU

ELIXIR is a distributed infrastructure for life science information, uniting Europe's leading life science organisations in managing and safeguarding the increasing volume of data being generated by publicly funded research. It coordinates, integrates and sustains bioinformatics resources across its member states and enables users in academia and industry to access vital data, tools, standards and computing and training services for their research. The Norwegian node offers unique bioinformatics services to Norwegian users in academia and industry and serves ELIXIR with unique competence and resources within marine genomics and human biobanks. The infrastructure is coordinated by the University of Bergen and includes the universities in Oslo, Trondheim, Tromsø, and Ås.

ELIXIR.NO is the Norwegian node in the ESFRI project ELIXIR.

## NALMIN – Norwegian Advanced Microscopy Imaging Network

**Status:** ESFRI-project in implementation phase



**Project owner:** UiO

**Partners:** UiB, NTNU, UiT, OUS

The NALMIN research infrastructure will offer the broad Norwegian life science community the most advanced light microscopy technology through a national network of cutting-edge microscopes. The network consists of 5 national nodes located in Oslo (2 nodes), Bergen, Trondheim and Tromsø, each with specialized competence. All the nodes are members of the national NorBioImaging infrastructure organization. Three of the nodes are associated with Norwegian Centres of Excellence (CCB, CIR and CEMIR). An additional goal for NALMIN is to introduce and develop new imaging techniques and to actively support and educate users within a broader range of life science disciplines through basic courses and advanced training. Research groups in Norway will have access to both the national centres and the international EuroBioimaging nodes for their specific research, providing cutting-edge imaging techniques to a broad community.

## NCS-PM – National Consortium for Sequencing and Personalized Medicine

**Status:** Under establishment/in operation



**Project owner:** OUS

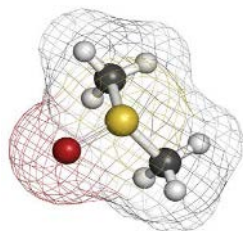
**Partners:** UiO, UiB, NTNU, Haukeland University Hospital, St. Olavs Hospital

The Norwegian Sequencing Centre (NSC) was established in 2010, and provides sequencing services to researchers all over Norway. The NSC research infrastructure will serve as a hub in an expanded consortium – The National Consortium for Sequencing and Personalized Medicine (NCS-PM), with partners from Oslo University Hospital, University of Oslo, Haukeland University Hospital, University of Bergen, The Norwegian University of Science and Technology (NTNU) and St. Olavs Hospital. NCS-PM will acquire state of the art equipment for high throughput DNA sequencing allowing low cost DNA sequencing of human whole genomes and exomes as well as other sequencing applications, with focus on facilitating the development of personalized medicine. NCS-PM will through educational courses, health care innovation and national standardization efforts facilitate the implementation of personalized medicine into mainstream healthcare in Norway.



## NNP – The Norwegian NMR Platform

**Status:** Under establishment/in operation



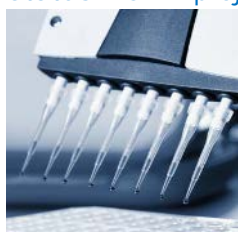
**Project owner:** UiB

**Partners:** UiO, NTNU

The NNP research infrastructure offers services in NMR (Nuclear Magnetic Resonance) for detailed structural and dynamic information at the molecular level, covering the needs of Norwegian research communities, health institutions and commerce for NMR acquisition and research support. NNP will strengthen and structure the national NMR activity. The NMR technology is frequently used in research in many disciplines; in research on CO<sub>2</sub> capture, development and production of new drugs and chemicals, development of new materials and characterization of proteins and polysaccharides. The new equipment will replace old technology at the universities of Oslo, Bergen and Trondheim and make it possible to determine the structure of very complex biological structures.

## NOR-OPENSREEN – the Norwegian EU-OPENSREEN Node

**Status:** ESFRI-project in implementation phase



**Project owner:** UiO

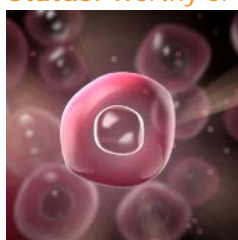
**Partners:** UiT, SINTEF, UiB

NOR-OPENSREEN represents the chemical biology and marine bioprospecting expertise in Norway and will establish a distributed national network, providing local state-of-the-art compound libraries, high-throughput screening facilities and expertise within natural products drug discovery. Chemical biology technology is an emerging field in Norway and there is a strong need to build up a national research infrastructure with open access for researchers from both the academia and the industry. This will create new opportunities for basic science as well as for innovation and commercialization.

NOR-OPENSREEN constitutes the Norwegian partner in the ESFRI project EU-OPENSREEN and will become the Norwegian node of the EU-OPENSREEN infrastructure.

## CELLMASS - Norwegian Mass Cytometry Infrastructure for Single Cell Analysis in Immunology and Cancer Biology

**Status:** Worthy of funding



**Project owner:** UiB

**Partners:** UiT, UiO, OUS, Haukeland University Hospital

The CELLMASS infrastructure introduces next generation single cell analysis combining the two key technologies flow cytometry and mass spectrometry, now providing >50 parameter analysis of molecular features on the surface or inside of a single cell. CELLMASS will establish novel capacities for multi-parametric drug screening, biomarker development, patient profiling and time-course analysis, leveraging national efforts in bioprospecting, chemical biology, clinical translation of biomedical research as well as initiatives to strengthen Norwegian biotechnology. The CELLMASS infrastructure will be distributed over four strategic sites in Norway, harboring world-class research and innovative environments within the fields of cancer and immunology research.

## AQUAFEED – Aquafeed Technology Centre

**Status:** Under establishment/in operation



**Project owner:** NOFIMA

**Partners:** UNI Research, UiB

The Aquafeed Technology Centre (ATC) will address challenges related to sustainability of the world aquaculture industry by offering research infrastructure dedicated to improved and novel utilization of ingredients based on available marine, plant, animal and single cell resources. Norway is the world-leading nation within farming of Atlantic salmon. Research on new and sustainable feed ingredients and formulations will fortify this position and strengthen the reputation of the Norwegian aquaculture industry.

There will be open access to the research infrastructure for all relevant users. ATC will be based in the centre of Bergen Marine Research Cluster and the NCE Seafood Innovation Cluster. The University of Bergen and UNI Research will be active project partners.

## Pilot Plant Facilities for Food Processing at Campus Ås

**Status:** Under establishment/in operation



**Project owner:** NMBU

**Partners:** NOFIMA

The research infrastructure provides services that meet the current and future needs of the food industry. The infrastructure offers state-of-the-art pilot plant facilities for foods to make Campus Ås an internationally outstanding arena for process development, research, education and contract work for the industry. The existing facilities encompass four units for processing of milk and dairy products, meat and fish products, vegetables, berries and cereals. These four units have been upgraded. In addition, a pathogen pilot plant has been established for processing of all the foods above.

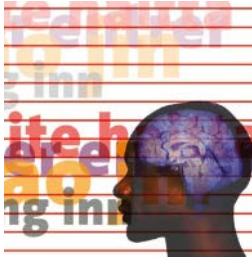
The updated facilities are important to strengthen and further develop Campus Ås to become an international centre of academic competence within strategically prioritized areas within the food sector.

# Societal Sciences and Humanities

## CLARINO – Common Language Resources and Technology Infrastructure

### Norway

**Status:** ESFRI-project in operation



**Project owner:** UiB

**Partners:** All relevant linguistic communities in Norway, National Library of Norway, UNINETT Sigma 2

The infrastructure is an essential tool for research on language as an object of study and as a carrier of content. CLARINO will allow Norwegian language databases to connect to the common European language infrastructure and ESFRI-project CLARIN. CLARINO will also provide access to a wide range of Norwegian and European language databases for Norwegian researchers. A network of centres has been established, each with clear national responsibilities in their area. Centres will:

- provide basic infrastructure services to connect to national and international CLARIN nodes, and to find or store and catalogue data securely and persistently
- provide language data services to filter, present, download or upload data, as well as a wide range of language analysis tools with transparent access to HPC when needed
- contribute with data, metadata and tools.

CLARINO is the Norwegian national contribution to the ESFRI project CLARIN.

## INESS – Infrastructure for the Exploration of Syntax and Semantics

**Status:** Under establishment/in operation



**Project owner:** UiB/UNI Research

**Partners:** National Library of Norway, UNINETT Sigma 2, Powerset, UiO, UiT, Kunnskapsforlaget

The INESS infrastructure provides access to detailed, high quality treebanks for Norwegian and other languages. Researchers can search for syntactic and semantic patterns in actual language data bases. This information will enrich our knowledge of the language and will be important for theoretical linguistics, historical linguistics, literary studies, and language teaching. The next generation of IT systems that understand language will be dependent on linguistic insights gained from treebanks. The infrastructure is closely linked to the ESFRI project CLARIN.

## LIA – Language Infrastructure made Accessible

**Status:** Under establishment/in operation



**Project owner:** UiO

**Partners:** UiB, UiT, NTNU, National Library of Norway, Norsk ordbok 2014, Humbolt-Universität zu Berlin, Penn State, UW

The LIA infrastructure will adapt currently unavailable Norwegian and Sami speech and language data into a user-friendly research infrastructure that will be accessible to researchers, industry and a larger audience alike. An advanced scientific database will be developed which includes digitised sound files, systematised meta-information on informants, place and linguistic properties. The LIA project is strengthened by its extensive national and international collaborative scheme, being a joint effort of the UiO, UiB, UiT and NTNU, plus Norsk Ordbok 2014, the National Library and UNINETT Sigma, with international partners including Humboldt University, University of Wisconsin and Pennsylvania State University, USA, plus the universities of Odense, Uppsala and Gothenburg.

## CESSDA – Council of European Social Science Data Archives

**Status:** ESFRI-project in operation



**National coordinator:** NSD

**Partners:** Cooperation between 14 European countries

Norway is the host country for an integrated data archiving system for social sciences and humanities research, including data archives in 16 European countries (15 member countries and 1 observer country).

CESSDA provides large scale, integrated and sustainable data services to the social sciences. It brings together social science data archives across Europe, with the aim of promoting the results of social science research and supporting national and international research and cooperation.

Its vision is to provide a full scale sustainable research infrastructure that enables the research community to conduct high quality research which in turn leads to effective solutions to the major challenges facing society today. CESSDA is an ESFRI Landmark institution.

Norway is the host nation and NSD is the Norwegian service provider.

## eVIR – eInfrastructure for Video Research

**Status:** Under establishment/in operation



**Project owner:** UiO

**Partners:** NSD, USIT

In the research on health, education and welfare context-sensitive data is used on a large scale. These data sets often contain sensitive personal information. It is important to develop routines for storing and processing sensitive data in this type of research. The project eVIR will solve the problems of fragmentation and ad-hoc routines in two ways:

- Develop a new national e-infrastructure for research using context-sensitive data that provides flexible solutions at different levels of security.
- Facilitate storage solutions that support accessibility and interoperability, including the establishment of a virtual video-lab and feasible indexing and meta-tagging systems.

## ESS – European Social Survey

**Status:** ESFRI-project in operation



**National coordinator:**  
NSD

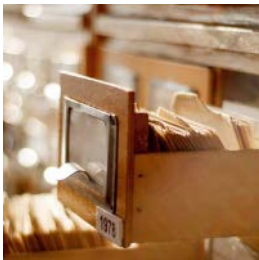
**Partners:** 15 European countries

The ESS infrastructure is an academically-driven social survey designed to chart and explain the interaction between Europe's changing institutions and the attitudes, beliefs and behaviour patterns of its diverse populations. The ESS infrastructure (ESS ERIC) is led by the ESS ERIC Headquarter at City University, London. NSD has a central role as one of six institutions in the Core Scientific Team (CST) which undertakes the design and coordination of the ESS. NSD is the official archive, and responsible for data processing, documentation and dissemination of the ESS data and metadata, and serves researchers world-wide. Norway became a member of ESS ERIC in October 2015 and has participated in all ESS survey rounds since the first survey in 2002. Norwegian participation in the ESS is considered to be essential for further development of cross-national survey research and for promoting internationalisation of empirical social and behavioural science in Norway.

ESS is the Norwegian node in the ESFRI project ESS ERIC.

## HISTREG- National Historical Population Register for Norway 1800-2024

**Status:** Under establishment/in operation



**Project owner:** UiT

**Partners:** The National Archives, SSB, NR, NLI, NHI, UiS, UiB, Snøhetta Publisher, Volda University College

HISTREG has established a national historical population registry for Norway. Microdata with information about individuals from different sources such as censuses and church registers are systematized and connected to a common digitized population register. Researchers in the fields of history, social sciences, medicine and health get access to longitudinal microdata covering the period back to the 1800s. Thus, the infrastructure will contribute to a better knowledge base for designing health and welfare policy.

## NORD-i – Norwegian Open Research Data Infrastructure

**Status:** Under establishment/in operation



**Project owner:** NSD

**Partners:** UK Data Archive, The University of Michigan

The NORD-i infrastructure will promote open and easy access to data resources from a variety of systems and sources for collecting data, be it the research community, the public statistical system or other public sources for data collection. The infrastructure will be open and accessible to Norwegian researchers across scientific domains and institutional affiliation, and open to cross-national use to the degree permitted by legal regulations. The project will establish a new state-of-the-art e-infrastructure for research data, including user-friendly tools and web-interfaces for deposit, management and access to data. The new infrastructure represents a major upgrade and to some extent a replacement of NSD's current solutions for archival storage, long-term preservation and dissemination of research data.

## RAIRD – Remote Access Infrastructure for Register Data

**Status:** Under establishment/in operation



**Project owner:** NSD

**Partners:** SSB

The RAIRD infrastructure will offer a new method of access to administrative data and register data that will stimulate Norwegian and international research on these data sources. A Remote Access or Safe Data Service solution that handles the needs for statistical confidentiality and research needs for access to data will be developed. Key issues are: to provide easy, efficient, user-friendly and open access to large amounts of rich data resources for research purposes while at the same time protecting data confidentiality and the integrity of the data subjects. The infrastructure project is a collaboration between NSD and SSB.

## PSI – Peace Science Infrastructure

**Status:** Worthy of funding



**Project owner:** PRIO

**Partners:** UiO, Uppsala University

The PSI project will provide a comprehensive research infrastructure for the next generation of quantitative peace and conflict research. The infrastructure builds on PRIO's conflict database ACDC, containing information about both large and small conflicts around the world. The PSI infrastructure will develop a new system for consistent labelling of conflicts in time and space.



# Physical Sciences and Engineering

## ESRF-EBS – Extremely Brilliant Source

**Status:** ESFRI-project in implementation phase



19 countries are members of the ESRF. Norway is a member through the Nordic consortium NORDSYNC.

The ESRF - the European Synchrotron Radiation Facility - is the world's most intense source of synchrotron-generated light, producing X-rays 100 billion times brighter than the X-rays used in hospitals. These X-rays, endowed with exceptional properties, are produced at the ESRF by the high energy electrons that race around the storage ring, a circular tunnel measuring 844 metres in circumference. ESRF offers a tool for studying the molecular and atomic structure of solid matters and is particularly important in studies of materials and in molecular biology.

Following on from 20 years of success and excellence, the ESRF has embarked upon an ambitious and innovative modernisation project, the Upgrade Programme, implemented in two phases: Phase I (2009-2015) and the ESRF-EBS (Extremely Brilliant Source) (2015-2022) programmes.

## ESS Lund – European Spallation Source

**Status:** ESFRI-project in implementation phase



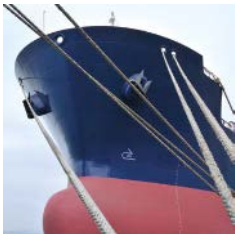
Norway is a member of ESS ERIC which includes 17 other European countries.

The European Spallation Source (ESS) will be a multi-disciplinary research centre based on the world's most powerful neutron source. This new facility will be up to 100 times more intense than today's leading facilities, enabling new opportunities for researchers in the fields of material science, life sciences, energy, environmental technology, cultural heritage and fundamental physics. The investment represents a major boost for material research in Europe.

Sweden and Denmark are co-hosting the ESFRI project ESS. Norway's contribution is 2.5% of the construction costs.

## MARINTEK – The Marine Technology Laboratories

**Status:** Under establishment/in operation



**Project owner:**  
MARINTEK (SINTEF)

**Partners:** NTNU

After many years of intensive operation, the laboratories at the Marine Technology Centre now need major upgrades, in order for the research environment to stay in the forefront of marine technology research.

The Marine Technology Centre has been instrumental in the development and establishment of Norway's Maritime industry. The centre currently comprises of three institutions, NTNU (The Department of Marine Technology), MARINTEK (an institute of the SINTEF group), and AMOS (A Centre of Excellence - for Autonomous Marine Operations and Systems). The Marine Technology Centre is one of the strongest research and educational institutions within Marine Hydrodynamics and Marine Structures worldwide.

## NcNeutron – Norwegian Centre for Neutron Research

**Status:** Under establishment/in operation



**Project owner:** IFE

**Partners:** UiO, UiS,  
SINTEF

The Norwegian Center for Neutron Research, NcNeutron, will be a neutron science and technology exchange center associated with the JEEP II research reactor at the Institute for Energy Technology (IFE). NcNeutron will prepare the ground for extended investigations on new materials relevant to energy, environment, health and nanotechnology.

NcNeutron will serve as a knowledge-base for Norwegian researchers using neutrons, and it will include expansion and upgrade of instrumental facilities at JEEP II as well as access to already available instrumentation.

## NorFab – Norwegian Micro- and Nano-Fabrication Facility

**Status:** Under establishment/in operation



**Project owner:** NTNU  
NanoLab

**Partners:** NTNU, UiO,  
SINTEF, USN

NorFab offers access to four Norwegian nanotechnology laboratories. The laboratories in NorFab are NTNU NanoLab in Trondheim, SINTEF MiNaLab and UiO MiNaLab in Oslo, and University college of Southeast Norway MST-Lab in Vestfold. All partners offer access to some basic nanoscale manufacturing- and characterization equipment and in addition each partner offers more specialized equipment for specific applications such as bio-nanotechnology, semiconductors, packaging of microsystems or small-to-medium scale manufacturing. The four laboratories have a complementary equipment profile and have committed to national coordination of investments and further development of the infrastructure.

Since the start in 2010 NorFab has provided services to a broad spectrum of users ranging from research groups that push the limits of the equipment in order to explore new phenomena, to innovative companies that have manufactured new prototypes or components in the reliable small scale production line.

## NORTEM- The Norwegian Centre for Transmission Electron Microscopy

**Status:** Under establishment/in operation



**Project owner:** SINTEF

**Partners:** UiO, NTNU

Transmission Electron Microscopy (TEM) is an essential tool in both fundamental and applied research within physics, chemistry and materials science. The understanding of materials at the nanoscale is of growing importance in several strategic areas for Norway, such as materials for sustainable energy, catalysis, light metals and nanotechnology. The Norwegian Centre for Transmission Electron Microscopy (NORTEM) will be a national Centre with two geographical nodes, in Oslo and Trondheim, and three project partners, NTNU, UiO and SINTEF. The aim of the Centre is to secure the high level TEM infrastructure and competence needed by academia and industry within the physical and material sciences in Norway.

# Abbreviations

Abbreviations	Institutions	Abbreviations	Institutions
<b>AHUS</b>	Akershus University Hospital	<b>NPR</b>	Norwegian Patient Registry
<b>BCCR</b>	Bjerknes Centre for Climate Research	<b>NPRA</b>	Norwegian Public Roads Administration
<b>CICERO</b>	Center for International Climate and Environmental Research-Oslo	<b>NR</b>	Norwegian Computing Center
<b>CMR</b>	Christian Michelsen Research	<b>NSD</b>	Norwegian Centre for Research Data
<b>FFI</b>	Norwegian Defence Research Establishment	<b>NTNU</b>	Norwegian University of Science and Technology
<b>FHI</b>	Norwegian Institute of Public Health	<b>OUS</b>	Oslo University Hospital
<b>HiOA</b>	Oslo and Akershus University College of Applied Sciences	<b>Penn State</b>	Pennsylvania State University
<b>IFE</b>	Institute for Energy Technology	<b>PFI</b>	Paper and Fibre Research Institute
<b>IMR</b>	Institute of Marine Research	<b>PRIO</b>	Peace Research Institute Oslo
<b>IRIS</b>	International Research Institute of Stavanger	<b>SAMS</b>	Scottish Association of Marine Science
<b>KSAT</b>	Kongsberg Satellite Services	<b>SINTEF</b>	The Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology
<b>MET.NO</b>	Norwegian Meteorological Institute	<b>SSB</b>	Statistics Norway
<b>NBIC</b>	Norwegian Biodiversity Information Centre	<b>SUS</b>	Stavanger University Hospital
<b>NERSC</b>	Nansen Environmental and Remote Sensing Center	<b>UiB</b>	University of Bergen
<b>NGI</b>	Geological Survey of Norway	<b>UiN</b>	NORD University
<b>NGU</b>	Geological Survey of Norway	<b>UiO</b>	University of Oslo
<b>NHS</b>	Norwegian Mapping Authority	<b>UiS</b>	University of Stavanger
<b>NIBIO</b>	The Norwegian Institute of Bioeconomy Research	<b>UiT</b>	UiT-The Arctic University of Norway
<b>NILU</b>	Norwegian Institute for Air Research	<b>UNIS</b>	The University Centre in Svalbard
<b>NINA</b>	Norwegian Institute for Nature Research	<b>UNN</b>	University Hospital of North Norway
<b>NIVA</b>	Norwegian Institute for Water Research	<b>USIT</b>	University Center for Information Technology
<b>NLI</b>	The Norwegian Institute of Local History	<b>USN</b>	University College of Southeast Norway
<b>NMBU</b>	Norwegian University of Life Science	<b>UW</b>	University of Wisconsin-Madison
<b>NPI</b>	Norwegian Polar Institute		



**The Research Council of Norway**

Visiting adress: Drammensveien 288  
P.O.Box 564  
NO-1327 Lysaker  
Telephone: +47 22 03 70 00  
post@rcn.no  
www.rcn.no

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