

Sammendrag fra skissene sendt inn til utlysningen "Obligatorisk skisse som grunnlag for søknad om forskningsinfrastruktur" (frist: 21.6.2023)

Prosjektnummer: 346062
INFRASTRUKTUR-arbeidstittel: COAT Basic
Vertsinstitusjon: UiT

Sammendrag:

Climate-ecological Observatory for Arctic Tundra (COAT) is a long-term research initiative that will enable real-time documentation of climate change impacts on terrestrial arctic ecosystems. COAT aims to provide an adaptive knowledge system and open access services that underpin rational management actions & policy decision and that shall inform the society about the state of arctic ecosystems. As similar observatories are entirely lacking from the Eurasian Arctic, COAT will considerably strengthen Norway's position as an international leader in research and management of arctic environments. The importance of COAT has become accentuated as the vast Russian Arctic is currently locked out of the international research community. COAT has received substantial funding from various sources that has enabled the development and establishment of its observation system; i.e. the infrastructure components that will facilitate the generation and storage of long-term time series of ecosystem and climate state variables from both high-Arctic (Svalbard) and low-Arctic (Finnmark). Due to these investments, COAT is ready to be fully operational towards the end of 2023. However, the costs associated with the operations to maintain the basic functions of the observation system will be higher than what is available from the COAT partners' internal budgets - and presently from external funders - because: (1) COAT's geographically distributed infrastructure with the maintenance of a large number of sensors and experimental devices at remote Arctic locations, (2) the requirement of processing big and diverse raw data into operational ecosystem state variables for various users, and (3) the ambitions of maintaining an active user interphase. While other nations have established dedicated funding channels for long-term ecosystem observatories, Norway is in lack of such. These are the reasons for why COAT seeks partial funding of its operation cost from RCN-Infrastructure for the first 5 years of its operations (2024-2028).

Prosjektnummer: 346283

INFRASTRUKTUR-arbeidstittel: Norwegian Brain Initiative (NORBRAIN) – a large-scale infrastructure for 21st century neuroscience: Stage 4

Vertsinstitusjon: Norwegian University of Science and Technology (NTNU)

Sammendrag:

NORBRAIN is a national infrastructure for neuroscience with nodes at NTNU, UiO, and UiB. The three infrastructure units are complementary. NTNU has electrophysiology and optical imaging setups for advanced functional analyses of neural networks and systems in freely moving animals, as well as a 7T MR scanner for functional brain imaging in humans. UiO has optical imaging systems for structural and functional neural systems at whole brain, cell-, and molecular levels, while UiB has technologies for visualization of neural mechanisms at molecular levels with optic manipulation of activity at single synapses. As an open national infrastructure, NORBRAIN has enabled ground-breaking discoveries and technological innovations that have revolutionized neuroscience and laid the ground for extensive international collaborations.

For Norwegian neuroscience to excel in the future, and for laboratory research to be translated for use in clinical populations, researchers must both develop and obtain access to next generation advanced instruments and e-infrastructure. This can be accomplished with continued investments in NORBRAIN. In the 4th stage of NORBRAIN, we shall develop and set up instruments needed to record and perturb, at unprecedented scale and speed, the activity of thousands of neurons in hitherto inaccessible brain structures during free behavior in rodents, and in humans. The instruments will be implemented for use in Norwegian Centres of Excellence as well as ERC-funded activities.

Technological developments in laboratory settings will be accompanied by new hardware and software for high-resolution brain scans and genetic profiling from clinical patient populations, to maximize the impact of basic research on the understanding and prevention of neural disease.

NORBRAIN is an open infrastructure, with training-assisted access to external users interested in acquiring technologies at a stage when it is not yet available elsewhere in the world. Unlike previous generations of the infrastructure, NORBRAIN4 will have an extensive emphasis on data sharing, obtained through new mechanisms for advanced data management and analysis in line with internationally established principles (FAIR, TRUST, CARE). NORBRAIN4 will through the Norwegian national EBRAINS node connect Norwegian neuroscience to the European digital research infrastructure EBRAINS for open neuroscience. As an integrated part of EBRAINS, NORBRAIN4 will build on European solutions and develop a national service for data and knowledge sharing that will ensure that research results produced with the NORBRAIN infrastructure becomes internationally leading in reproducibility and replicability. By establishing routines and workflows for sharing sensitive research data in agreement with national and international legislation, the project will pioneer operational routines for controlled and restricted sharing of sensitive research data in line with Norwegian and European legislation.

Prosjektnummer: 346880

INFRASTRUKTUR-arbeidstittel: Norwegian Small Experimental Fishes for Innovation, Science and Health (NORSEFISH)

Vertsinstitusjon: University of Oslo (UiO)

Sammendrag:

Mission Statement: The Norwegian Small Experimental Fishes for Innovation, Science and Health (NORSEFISH) will serve as a new national infrastructure platform for the in vivo study of biological and disease mechanisms, large-scale bioactivity screening of compound libraries for drug discovery, rapid toxicity risk assessment of environmental pollutants, and the development of safe food additives and feed ingredients, using the laboratory model fish species zebrafish (*Danio rerio*) and medaka (*Oryzias latipes*). Our mission is to strengthen research and technology development capabilities within Norway, using these aquatic model organisms in fundamental and translational research, by contributing to and facilitating mutually beneficial synergies towards excellence in scientific research, and promoting innovation through scientific discoveries, with the aim of creating value for society. The platform will deliver advanced knowhow and high-throughput whole-organism bioassay systems to the Norwegian research community, and to key industries in Norway.

NORSEFISH will function as a multi-nodal platform, coordinated by the University of Oslo (UiO), with partner nodes at the Norwegian University of Life Sciences (NMBU) in Ås, the University of Bergen (UiB), the University of Stavanger (UIS), The Norwegian University of Science and Technology (NTNU) in Trondheim and Nord University in Bodø (NORD). NORSEFISH will build upon and leverage established knowhow, existing infrastructure, and academic/industrial networks across the six partner nodes. The unique and complementary expertise offered by each node, combined with the versatility of the zebrafish and medaka models, is well placed to fulfill the mandate as recommended by the Ministry of Education and Research to parliament, regarding the 'National roadmap long-term plan for research and higher education, 2023-2032'. NORSEFISH has therefore aligned its key objectives accordingly.

Objectives

- To utilize the zebrafish and medaka model systems for addressing fundamental questions in biology and the biomedical sciences, and thereby contribute new knowledge to society
- To elucidate disease mechanisms that enable the development of novel therapies and vaccines
- To accelerate the discovery of bioactive small molecules and natural bioresources with significant commercial potential as pharmaceuticals or as functional food or feed ingredients
- To characterize environmental factors or multiple stressor effects on ecosystems and human health
- To contribute towards the development of new technologies for the preservation and protection of our ecosystems and natural resources

- To provide high quality education and training to support career development opportunities in academia and industry in Norway

Prosjektnummer: 346899

INFRASTRUKTUR-arbeidstittel: Development of Cold Climate Technology Research Laboratory Infrastructure (CTRL)

Vertsinstitusjon: UiT- The Arctic University of Norway

Sammendrag:

Human industrial activities are increasingly extending into the high north/Arctic areas of Nordic regions, where cold climatic conditions (low temperature, ice, snow & freezing rain) are challenging from operational, maintenance, safety, and financial perspectives. These can affect human activities especially related to construction industry (buildings, communication towers and ski lifts), energy production (wind and solar power infrastructure), energy distribution (power conductors, insulators, and towers), transportation (roads, rail, bridges), maritime (ships, fish farms, oil rigs) and aviation sector (airplanes, drones, and ground conditions) etc. Climate change has also started to play a role affecting snow/icing cycles. Stronger weather variability and rapid changes in meteorological conditions, which are projected responses to climate change, can affect the snow and ice conditions. To address these challenges, it is essential to improve scientific knowledge and develop optimal technological solutions. This proposed project aims to establish a state of art research laboratory/field infrastructure in Norway to address the cold climate, atmospheric icing, snow, and freezing rain related challenges. Norway is an ice/snow prone country, but currently no organized research laboratory infrastructure exists in Norway to address these challenges. Keeping in view the future strategic needs of Norway related to Arctic and high north regions, this proposed infrastructure can be a leading step forward in this regard. Project also meets UiT 2030 strategy towards, 'Developing the high north' and UNIS strategic objectives on research in a changing Arctic.

Prosjektnummer: 346917

INFRASTRUKTUR-arbeidstittel: Norwegian Infrastructure for Microbial Genomics (NIMG)

Vertsinstitusjon: Norwegian Institute of Public Health (NIPH)

Sammendrag:

Rapid elucidation of whole genomes of microbes involved in all kinds of infections has a determinant impact on our understanding of infectious disease transmission and evolution, and how to fight them. This was clearly illustrated during the global threat elicited by SARS-CoV-2: analysis of the first complete virus genomes from human patients elucidated the original spread of this new coronavirus and, with now more than 15 million of coronavirus genomes sequenced, identification of different phylogenetic viral lineages has helped predict hot spots of disease transmission and surge.

The Norwegian Infrastructure for Microbial Genomics (NIMG) is a national initiative bringing together the leading research environments within microbial genomics in Norway. NIMG aims to promote the use of advanced sequencing technology, to provide means for handling large amounts of sequencing data and to develop and implement new bioinformatics tools to better understand all aspects of the biology of microbes. This includes challenges related to antimicrobial resistance (AMR), vaccine development and vaccine escape, the development of virulence and the epidemiological spread of pathogens between humans, between humans and animals, and from and to the environment.

This funding application is a request for: 1) establishment or adaptation of a general IT infrastructure that facilitates storage, sharing and analysis of microbial sequence information linked to sensitive data; 2) setting up analytical pipelines that can be easily accessible, facilitating sharing of both genomic sequence data as well as corresponding metadata and tools; 3) setting up a team of experts (help desk) that can assist users in performing their analyses and developing databases; and 4) further building microbial bioinformatics expertise in Norway by establishing a network of bioinformaticians serving the different partners. NIMG is working in close collaboration with ELIXIR through BioMedData (funded by RCN) in the development of a structure allowing portability of the microbial data and accompanying metadata between the partners as well as exchange of expertise, especially in the metagenomics area. As an IT infrastructure, NIMG will permit storage, immediate sharing and analysis of data linked to microbial sequence information in a secure way and, as such, will be an essential tool to control and fight infectious diseases. Data will be easily discoverable, accessible, interoperable and reusable, in line with the FAIR principles for scientific data management. The availability of this large-scale microbial sequence information will contribute to the development of new diagnosis tools, to the control of AMR by helping to develop new drugs, provide insights into the host-microbe interactions, and offer translational opportunities of future linkage with host genome data to improve our understanding of infectious disease susceptibility, immunity and vaccination.

Prosjektnummer: 346926

INFRASTRUKTUR-arbeidstittel: NBBI – The Norwegian Brain Bank Initiative

Vertsinstitusjon: Haukeland University Hospital

Sammendrag:

Brain diseases such as Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis, multiple sclerosis, schizophrenia and mood disorders, are among the greatest health and socioeconomic challenges of our time. Collectively, these disorders are the leading cause of disability and the second leading cause of death, globally. For most of them there are no effective disease-modulating therapies and patients face a future of progressive disability, early institutionalization, and premature death. Since cell and animal models accurately reflecting human disease are lacking, direct access to brain tissue is pivotal for gaining insight into underlying disease mechanisms and for developing effective treatments. Despite this clear need, there is currently no national storage resource for human brain tissue in Norway and very few in the world. Moreover, the few existing brain banks (e.g., in the UK, the Netherlands and Barcelona) do not cover this urgent need because they: 1) have a relatively low number of samples compared to what current research needs to provide clear and definite answers, 2) contain little or no tissue from extra-neural organs, which play

an increasingly recognized role in brain diseases, and 3) lack tissue from a sufficient number of healthy control subjects.

We propose NBBi: The Norwegian Brain Bank Initiative. NBBi will store antemortem clinical information and postmortem brain, as well as tissue from other relevant organs, from individuals with brain diseases and healthy controls. NBBi will comprise: 1) A tissue repository with fresh-frozen and formalin-fixed tissue from all relevant brain regions and other organs. 2) Standardized pathological characterization and staging of all samples. 3) A digital pathology database containing scans of all sections. 4) Systematic clinical information. 5) Antemortem neuroimaging and blood samples. **NBBi will host and/or provide access to data and material for users from all fields of academic research and industry.**

Prosjektnummer: 346937

INFRASTRUKTUR-arbeidstittel: The Norwegian X-ray Diffraction and Scattering Resource Centre (RECX-II)

Vertsinstitusjon: UiO

Sammendrag:

Established in 2013, the RECX national infrastructure has been a center providing access to advanced and specialized X-ray instruments to academic groups, research institutes and industrial users. It has a solid strategic position in the Norwegian infrastructure landscape and is listed in the Norwegian roadmap for infrastructures. Over the past 10 years RECX infrastructure has been used by almost every project in materials chemistry delivering not only the data, but also building the community and developing new methods.

The modern experimental chemistry and biochemistry strongly depends on the advanced characterization techniques necessary to support the scientific hypothesis and/or performance in devices. The proposed RECX-II infrastructure is designed to significantly expand and improve the capabilities of the existing facilities and to take advantage of the recent development of the instrumentation and techniques in X-ray based characterization. It will provide an advanced and versatile platform within X-ray diffraction, scattering and spectroscopy for research not only for materials science and physical sciences, but also for biomedicine and life sciences. RECX-II will enable the precise structural and spectroscopic characterization from the micron scale (e.g. cracks) to the (sub-)nanoscale of chemical bonds.

Recent technological developments have opened up for new capabilities to characterize fast processes and small volumes, which are essential for e.g. operando studies of catalysts, sorbents, materials for energy storage, quantum computers and studies of precious biomolecules such as DNA and proteins only available in small amounts. These techniques are of paramount importance for the present research activities in Norway and will provide an essential upgrade for a broad range of disciplines ranging from materials science and energy research, catalysis and green chemistry to electronics, nanomedicine and biochemistry. In an international context, RECX-II is of utmost importance as home laboratory, where users can prepare to access and make optimal future use of large-scale X-ray (synchrotron) and neutron facilities such as ESRF, ESS and European XFEL. Furthermore, the proposed activities will greatly strengthen the international collaboration for the

participating research groups at UiO and NTNU as well as with the associate partners at UiT, UiB, NMBU, IFE and SINTEF. Within the host institutions, RECX-II also aims to expand the user community by offering tools applicable for characterization of chemical systems outside materials science.

Prosjektnummer: 346939

INFRASTRUKTUR-arbeidstittel: Norwegian facility for Scanning Electron Microscopy

Vertsinstitusjon: University of Bergen (Department of Earth Science)

Sammendrag:

Nanoscale data on the structure and the chemical, biological and physical properties of samples are in great demand in many scientific disciplines and the development of new technologies and methods offers outstanding new possibilities. NORSEM will provide the most advanced infrastructure for high resolution imaging and compositional analysis of a wide range of natural and synthetic materials. Having a dedicated interdisciplinary and synergistic agenda, the facility will offer outstanding resources for cutting-edge research in basic and applied fields in geosciences, biosciences, medical sciences, nanosciences, material science and many other areas. The capabilities of the facility will cover under one roof the full range of critical instrumentation and services from sample preparation to scanning electron microscopy (SEM) and focused ion beam (FIB)-SEM, the newest spectroscopic tools, image processing, and data analysis. Workflows for automated generation of 2D and 3D image data and seamless correlation with data obtained with other types of imaging devices will be deeply implemented in the facility. This will tightly connect NORSEM to other national and international facilities and turn NORSEM into an important building stone for the generation of content-rich data across scales of magnification. The unique capabilities of NORSEM will push the boundaries of currently available tools for high resolution imaging and thorough characterization of sample composition and properties and establish itself and Norway at the forefront of the international research community.

Prosjektnummer: 346941

INFRASTRUKTUR-arbeidstittel: Remotely Controlled and Autonomous Integrated Systems in Arctic Operations (RARctic)

Vertsinstitusjon: UiT The Arctic University of Norway,

Sammendrag:

Even though autonomous systems-related research under various navigation systems has been funded extensively in Norway and Europe, the required human capabilities to overcome possible safety-critical situations, i.e. possible failures of autonomous systems, have not been emphasized adequately by the research communities. It is a possibility that this issue may not be a critical condition for land-based navigation systems when it comes to maritime and aerial navigation systems that can create life-threatening moments, e.g. autonomous ships or aerial drones. Humans are expected to take control over autonomous maritime or aerial systems in such situations in future present and industrial applications e.g. remotely controlled centres for autonomous ships, even though the research activities on developing human competency to overcome such situations are

somewhat limited. On the other hand, evaluating human competence in remotely controlled situations of autonomous maritime and aerial navigation systems has not been evaluated extensively. Furthermore, the respective teaching and training activities on developing human competency in handling autonomous maritime or aerial systems in such situations are unavailable due to the same reasons. This is mainly due to the lack of reteaching and research infrastructure to create such simulated or realistic situations with remotely controlled maritime and aerial navigation systems and then to train humans to overcome possible safety-critical situations. Therefore, UiT The Arctic University of Norway (UiT), with Norce Norwegian Research Centre As (NORCE) and Akvaplan-niva (Akvaplan) are proposing this project to integrate their existing infrastructure, including surface vessels and aerial, surface, and underwater drones supported by realistic and virtual onshore operations centres to create an integrated maritime and aerial infrastructure that can be utilized towards creating novel knowledge and developing human competent to cope with possible failure situations of autonomous maritime and aerial navigation, while supporting human-friendly (ethical) technology development.

Prosjektnummer: 346946

INFRASTRUKTUR-arbeidstitel: National Cryptography Engineering Laboratory (NCEL)

Vertsinstitusjon: NTNU

Sammendrag:

This is a pre-project application outline as requested in the Research Council call.

We aim to establish a *National Cryptography Engineering Laboratory (NCEL ("nseil"))* for research, education, and industry cooperation at NTNU Trondheim. This application concerns support for a pre-project to include and make coordination among interested national parties and generate detailed plans for establishing and operating the proposed infrastructure.

Research and education in *applied cryptology* at NTNU started in 1985, and currently the Cryptology Group include 8 professors, many postdocs and PhD-students, and around 30 master students graduating in applied cryptography and information security annually. Long-standing inter-departmental cooperation have taken place with Math and Electronics departments at the IE Faculty. **NCEL** will enable us to put an emphasis on *cryptography engineering knowledge and skills* because education and research are now greatly demanded by networked digital services and national security.

Current practice shows that implementing cryptographic standards directly very likely produces security vulnerabilities with physical/electrical/logical side-channels. In particular, this concerns all post-quantum public-key schemes that are becoming standards internationally now.

Constructing, testing and validation of embedded systems with cryptographic functionalities require specific electronic instrumentation and proper facilities and skills. Already, the Cryptology Group at NTNU perform education and research activities specifically related to this, including a recent substantial acquisition of specialized instrumentation and plan for a new master-level course. Now we want to take this further to take a national role for this proposed infrastructure development in academic cryptology.

Prosjektnummer: 346949

INFRASTRUKTUR-arbeidstittel: ECCSEL-Enhancing the Norwegian Capabilities (ECCSEL-ENC)

Vertsinstitusjon: SINTEF Energi AS (SER)

Sammendrag:

ECCSEL-Enhancing Norwegian Capabilities (ECCSEL-ENC) is a coordinated effort towards developing a national research infrastructure to support the giga scale deployment of carbon capture and storage (CCS) nationally and internationally. The consortium of excellent, internationally leading research actors within CCS, including the ESFRI-landmark ECCSEL ERIC, demonstrates the broad national and international interest. The project will pave the way towards coordinated physical and digital solutions deployment to maintain Norway's position within CCS. ECCSEL-ENC will achieve its purpose by upgrading and establishing prioritised, highly reputed ECCSEL ERIC infrastructure laboratories. By doing so, ECCSEL-ENC will:

- Support the connection between CCS and the blue hydrogen economy.
- Enable the development of large-scale capture, transport, and storage infrastructure.
- Facilitate data sharing and remote access to infrastructures.

ECCSEL-ENC includes two physical nodes and one digital node. The physical nodes contain the construction of state-of-the-art laboratory infrastructure and much-needed upgrades to existing infrastructures. The digital node covers the need for a coordinated approach to data sharing and remote operation of selected infrastructures. All the infrastructures will be made available to the international research and industrial communities through ECCSEL ERIC.

Prosjektnummer: 346956

INFRASTRUKTUR-arbeidstittel: The Norwegian Emergency Primary Care Research Network

Vertsinstitusjon: National Centre for Emergency Primary Health Care, NORCE Norwegian Research Centre AS

Sammendrag:

In this project we are applying for an extension of the Norwegian Primary Care Research Network (PraksisNett) to emergency primary care clinics. The project will pilot the process of encompassing other parts of primary care into the existing PraksisNett. An extension to emergency primary care clinics will make it possible to perform advanced clinical research on emergency primary care and to investigate acute care trajectories. Above all, it will allow research on the overlapping services of GP offices and emergency primary care clinics, providing a more complete picture of the clinical activity in primary care.

In Norway, primary care provides health care for the population 24/7/365 and acts as gatekeepers to more specialized health care. Within a year, approximately 70% of the population are in contact with

primary care, and most of these patients are cared for only within primary care. Changes in quality of care, service provision and gatekeeping abilities of primary care have a huge impact on the whole health care system. Two thirds of all acute admissions to hospitals are referred from primary care, and even small changes in routines and clinical practice can result in large changes of the influx to specialist care. Primary care is provided by general practitioners working in GP offices and at emergency primary care clinics (Norwegian: legevakt). Despite that the largest part of medical treatment takes place in primary care, clinical research in this domain is still scarce.

PraksisNett is an established research infrastructure for general practice that has improved the possibilities for performing high quality research in primary care. The aim of this project is to extend the existing PraksisNett to the emergency primary care services and establish the research infrastructure PraksisNett legevakt. Some of the general approaches of PraksisNett can be transferred to emergency primary care, but the new structure also gives legal, practical, and collaborative challenges that need to be solved. Furthermore, the IT infrastructure developed in PraksisNett can be expanded to include emergency primary care clinics but will need adaptation to the new setting. There is an existing research network of emergency primary care clinics and corresponding local emergency communication centres, the Watchtower project, in which aggregated data has been collected for years. This existing network will be incorporated into PraksisNett legevakt and will constitute the core of the new research network. Additional emergency primary care clinics will be recruited to increase the strength and benefits of the network.

The IT part of PraksisNett legevakt will be a distributed network of emergency primary care clinics where research data can be extracted for research purposes. A centralized web portal will be used for communication, recruitment, and definition of research projects. The research servers and infrastructure will be identical to the servers in the existing PraksisNett, and sensitive data will be saved in a safe haven.

Prosjektnummer: 346958

INFRASTRUKTUR-arbeidstittel: Infrastructure for future integrated pest management (IPM FUTURE)

Vertsinstitusjon: Norwegian Institute of Bioeconomy Research (NIBIO)

Sammendrag:

In this infrastructure pre-project (IPM FUTURE), we aim at mapping which R&D infrastructure is needed to build sustainable plant protection alternatives to chemical pesticides and to build models and equipment to reduce chemical pesticide application. This is a response to the urgent and very pronounced demands for a significant cut in the use of chemical pesticides to 50% by 2030 suggested in EU's revision of the sustainable use of pesticide Directive to a regulation (EU 2021/2115). EU emphasize that this should be done by increasing the application and enforcement of integrated pest management (IPM) by; 1) Preventative strategies (e.g. crop rotation, phytosanitary measures, conservation of natural enemies). 2) Increasing the use of less hazardous and non-chemical alternatives (e.g. physical/mechanical/ thermal measures, light, signalling substances, nature-based substances and biological control). 3) Promoting the adoption of new technologies for sensor-based detection (e.g. vision, odour and sound), site- specific management of pests and weeds and precise

decision support systems (DSS). Good plant health is extremely important for our ability to produce enough food and feed. To be able to do this in Norway and the rest of Europe under the new IPM regulation regime, we need urgent progress in the development of strategies, methods and tools. The IPM FUTURE pre- project therefore aims to map, evaluate, and clarify the following to be able to write a full R&D infrastructure grant proposal: 1) Map existing IPM infrastructures among t partners and potential collaborating companies and farmers. 2) Evaluate which new IPM infrastructure is needed (location and partner). 3) Map existing E-infrastructures and evaluate what is needed to support new IPM infrastructure. 4) Map partners' and potential collaborators' competence to fully benefit from new IPM infrastructure. 5) Clarify with partners how the running and operation of the new infrastructure will be funded. 6) Map and visit potential collaborating international institutions that have a good IPM infrastructure. 7) Design a model for utilization and sustainable operation towards the infrastructure's users. 8) Collect requirements specifications and tentative price offers of suggested infrastructure.

Prosjektnummer: 346962

INFRASTRUKTUR-arbeidstittel: NEXT-STEP LAB

Vertsinstitusjon: Universitetet i Sør-Øst Norge

Sammendrag:

It is planned to build an infrastructure that can explore the scope for system integration of energy systems. The focus is on increased flexibility in system integration of the energy resources water, wind and solar power, and energy storage units' such as battery, hydrogen and ammonia. Over vision is to make the center an arena where technology suppliers, industrial users and researchers can collaborate to develop new solutions in the Green shift. A versatile infrastructure to enable utilization of state-of the art and new prototype equipment, brought in at the lowest possible cost (project-based, temporary, test-equipment from supplier, or other), in development of new energy solutions. The flexible and modern infrastructure (IT, electrical, assembly, logistics) is needed so that users can quickly, safely, and affordably establish the desired setup for various projects/development tasks. Partners will use the center for their growing need to test technologies, develop solutions, strengthen R&D and innovation initiatives, etc. within renewable energy solutions. All partners see a growing need for scaled-up testing of new technology but have no lab or (permanent) piloting facilities.

Prosjektnummer: 346963

INFRASTRUKTUR-arbeidstittel: Norwegian Centre for Next Generation Liquid Hydrogen Technologies (NCLH)

Vertsinstitusjon: IFE

Sammendrag:

This proposal describes an infrastructure for research and innovation on thermophysical properties and technology related to liquid hydrogen (LH2). Due to the high gravimetric energy density of LH2, there is presently much interest in its use as a green energy carrier for heavy-duty transport. Liquid

hydrogen can satisfy the overall requirements for long-haul routes where pressurized hydrogen gas and batteries will not provide the necessary capacity. However, there are challenges connected both with the cost of liquefaction as well as with storage and transport (material properties, losses, and safety issues), and industry is currently asking for national and European level laboratory facilities to perform experiments with LH2. Such facilities are necessary to obtain a detailed understanding on how materials are affected when in contact with LH2 (short and long-term effects), on liquid-gas behaviour in situations relevant to LH2 transfer and storage, and for benchmarking alternative technologies for hydrogen liquefaction. There are significant knowledge gaps in this area that need to be addressed in order to safely employ liquid hydrogen in different applications, to allow the implementation of knowledge-based regulations and procedures related to the handling of LH2, as well as to reduce CAPEX and OPEX in liquid hydrogen systems. However, due to the complexity of working in a laboratory setting with LH2 and the connected safety aspects, there is presently no such laboratory existing in Norway nor in the Nordic countries.

IFE has several years of practical experience with liquid hydrogen in connection with materials science at the former JEEP-II reactor. The present proposal concerns the implementation of a new infrastructure, dedicated to liquid hydrogen research, based on IFEs experience in this field and the strong competence of partner institution University of South-Eastern Norway (USN) in hydrogen safety and University of Oslo (UiO) in materials science. The infrastructure will provide capabilities of great value in many areas, ranging from national and international research projects of fundamental and applied character to pilot projects for industry, and provide a breeding ground for innovation and spin-off activities.

This initiative is well anchored in the strategic plans for the three participating institutions. At IFE, hydrogen is one of the main pillars in the recent R&D strategy with an emphasis on advanced laboratory setups. USN has hydrogen safety as a focus area and particular interest in experimental studies of explosive evaporation of LH2 to validate numerical models. Univ. of Oslo focuses on the implementation of hydrogen in material science which represents a growing topic, e.g. as complex hydrides for hydrogen storage materials or as proton (hydrogen-ion) conductors that perform well in solid-oxide fuel cells.

Prosjektnummer: 346965

INFRASTRUKTUR-arbeidstittel: Norwegian Research Centre for Hydropower
Technology Laboratories, Phase 2 (HydroCen Labs - 2)

Vertsinstitusjon: NTNU

Sammendrag:

HydroCen Labs is infrastructures linked to the hydropower industry in Norway and the research centre for renewable energy (FME), HydroCen, and it is located at NTNU's campus in Trondheim and USN's campus in Porsgrunn. Through its partners, HydroCen has a well-established network with users of HydroCen Labs. The infrastructure must be available for student assignments, applied and basic research based on challenges that the hydropower industry has today and what is foreseen for the future. Through the work in HydroCen, it has become apparent that the different laboratories have to be linked together in order to meet the cross-disciplinary challenges of the future. In the

coming years, the infrastructure will be largely used by research projects such as; Norwegian Research Counsel, Horizon Europe and the Clean Energy Transition Partnership.

The need for this infrastructure is linked to the changes in the energy system that are expected in the future. Introduction of a lot of wind and solar energy in the power grid will require that hydropower plants will be used as energy storage, power regulation, base load and as a backup when the wind or solar power plants are not in operation. If existing and new hydropower plants are to be used for this type of operation, significantly greater flexibility is required from hydropower plants than today, and this requires good research infrastructure available in Norway for the development and testing of new operating patterns. There is also a clear trend towards the strengthening of environmental requirements in hydropower, and in particular measures that ensure free migration routes for fish, and in Trondheim a unique collaboration between watercourse engineers, biologists and environmental scientists has been developed which has provided and will provide more environmental technological innovations related to hydropower and mitigation of environmental effects.

Prosjektnummer: 346967

INFRASTRUKTUR-arbeidstittel: Autonomous underwater vehicle for deep-sea research

Vertsinstitusjon: Universitetet i Bergen, Institutt for geovitenskap

Sammendrag:

The NORMAR-AUV project aims to acquire a new autonomous underwater vehicle (AUV) for marine research and development. The infrastructure will include an AUV capable of collecting data from coastal areas to deep ocean depths. It will be mobile and usable from Norwegian research vessels and land stations. The project involves acquiring an AUV with control systems, sensors, launching and retrieval devices, and financing for technical personnel. The new AUV will enhance marine research capabilities, contribute to marine mapping and monitoring programs, and facilitate the investigation of new ocean resources. The infrastructure will serve universities, research institutes, governmental institutions, and marine industries. The project is a replacement for the existing Hugin HUS AUV, which is no longer suitable for deep-sea missions. The University of Bergen is leading the acquisition in collaboration with FFI and IMR, building on the experiences gained from operating the Hugin HUS. The AUV infrastructure will be part of the distributed Norwegian marine research infrastructure, with data management handled by the Norwegian Marine Data Center. The project also plans to participate in international infrastructure cooperation, connecting to the European EUROLLEETS program.

Prosjektnummer: 346968

INFRASTRUKTUR-arbeidstittel: Upgrade of the Ægir 6000 ROV-system (NORMAR II - ROV)

Vertsinstitusjon: Universitetet i Bergen, Institutt for geovitenskap

Sammendrag:

The proposal aims to extend the operational lifespan of the Ægir 6000 ROV used for deep-sea research from Norwegian research vessels. The Norwegian Marine Robotics Facility (NORMAR) supports the maintenance and operation of the infrastructure and has provided ROV services to various research institutions nationally and internationally. The Ægir 6000 is a vital tool in marine research, spanning various disciplines and enabling exploration of deep-sea environments and resources. The proposal seeks funding for maintenance, upgrades, spare parts, and modifications to reduce costs and enhance the system's capabilities. While the Ægir 6000 is the sole national ROV system for deep-sea research, smaller ROV systems are available for shallower depths. The proposal also highlights the involvement of NORMAR and Ægir 6000 in the Eurofleets alliance for European marine research infrastructure.

Prosjektnummer: 346970

INFRASTRUKTUR-arbeidstittel: Bildediagnostisk utstyr til tredimensjonalt laboratorium ved Akershus Universitetssykehus

Vertsinstitusjon: Akershus Universitetssykehus (Ahus)

Sammendrag:

Tredimensjonalt laboratorium ved Akershus Universitetssykehus (Ahus) består av tre tredimensjonale (3D) printere, en kraftig computer og programvare til å sekvansere bilder. Laboratoriet benyttes i dag hovedsakelig til planlegging av kirurgi, forskning og innovasjon. De 3D-printede modellene bygges i dag fra bilder innhentet med computer tomografi (CT) eller magnetisk resonans (MR) tilrettelagt for klinisk virksomhet. Forsknings- og innovasjonsprosjekter må gjennom en dyr og tidkrevende prosess for å få tilgang til den kliniske infrastrukturen. Det har særlig vist seg utfordrende å modellere detaljerte beinstrukturer i hode- halsområdet da lavdose CT har lav oppløsning og høydose CT utsetter deltakere i forskningsprosjekter for en unødvendig stor stråledose. Det kirurgiske, ortopediske og radiologiske forskningsmiljøet ved sykehuset har derfor gått sammen for å søke om anskaffelse av en «Cone Beam (CB)-CT», en oral skanner og programvaren «Dolphin» for bearbeidelse av data fra oral skanning. Den bildediagnostiske utstyrspakken vil bidra til å øke prosjektporteføljen ved det etablerte 3D-laboratoriet ved sykehuset.

Prosjektnummer: 346974

INFRASTRUKTUR-arbeidstittel: National network for Advanced Proteomics
Infrastructure phase 2 (NAPI2)

Vertsinstitusjon: University of Oslo

Sammendrag:

The National Network in Advanced Proteomics phase 2 (NAPI2) is an extension to NAPI, which was funded by RCN in the INFRA2018 call (Project no 295910).

With the NAPI2 application, we aim to expand the current capabilities of NAPI by introducing emerging techniques and proteomics instruments that are currently not available to the Norwegian research community. The primary theme of NAPI2 will be clinical proteomics, which involves the use of proteomics technologies and informatics tools to identify proteins implicated in diseases. This will help to elucidate disease mechanisms and enable the detection and monitoring of specific disorders, ultimately leading to improved patient care. To achieve this goal, NAPI2 will incorporate emerging techniques such as mass spectrometry imaging, array-based proteomics, single cell proteomics, and automated sample handling and microfluidics. This application is of utmost importance and timeliness, and it will have major impact on all life science research in Norway.

Prosjektnummer: 346975

INFRASTRUKTUR-arbeidstittel: Norwegian Center for Neutron Research - NcNeutron

Vertsinstitusjon: Institute for Energy Technology (IFE)

Sammendrag:

Neutron tools are invaluable for a large number of research topics in contemporary science and technology, by contributing to scientific discoveries, creating new technology and addressing the greatest challenges of our society. The European Spallation Source (ESS ERIC) is under construction in Lund, Sweden, and when the facility will be in operation in 2026-27 it will be a world-leading neutron research facility and better than any other existing neutron sources. Norway is a key partner in the ESS, with a contribution of 2.5% to the ESS construction cost.

When the present research infrastructure Norwegian Center for Neutron Research, NcNeutron, was established it was planned to be a neutron science and technology exchange center associated with the JEEP II research reactor at IFE. However, with the permanent shutdown of JEEP II in Spring 2019, NcNeutron investments and activities were agreed to be transferred to the SINQ neutron source at PSI in Switzerland, NcNeutron@PSI. The agreement with PSI gives annually ca 50 days of neutron beamtime for Norwegian users, and with all instruments at SINQ available for a period of six years from May 2021.

This new research infrastructure proposal aims to continue the collaboration with PSI with NcNeutron@PSI, and thus to continue to have access to neutrons at PSI as a Norwegian "home lab" also during the final construction, and the initial and state-state operation phase of the ESS. A major goal is to strengthen the Norwegian neutron user community in order to be able to make good

future use of neutrons in general and in particular at the ESS. Neutrons are important tools in many areas, including physics, chemistry, life science, engineering, heritage science and materials science and technology.

Prosjektnummer: 346976

INFRASTRUKTUR-arbeidstittel: Norwegian network of biological mass spectrometry

Vertsinstitusjon: University of Oslo

Sammendrag:

Biological mass spectrometry (MS) is a central technique in modern life science research. It forms a key component in many OMICS sciences like proteomics, metabolomics, lipidomics and glycomics, and in addition it plays an important role in structural biology. Biological MS is also essential in targeted approaches as diagnostics and monitoring tool for precision prevention of diseases and treatment of patients. The instruments and techniques for biological MS are developing rapidly, allowing new applications to benefit top-level research.

At present, many core facilities and research groups in Norway utilise biological MS as an integral part of their services/research, but there is little integration among the different groups. The aim of this pre-proposal is to establish a Norwegian network of biological mass spectrometry (NorMS) to increase collaboration and coordination in this growing field.

Prosjektnummer: 346981

INFRASTRUKTUR-arbeidstittel: National research infrastructure for biopharmaceutical process development and production (BioPoD)

Vertsinstitusjon: SINTEF AS

Sammendrag:

Biopharmaceutical production includes the expression of both small compounds (e.g. antibiotics) and large proteins (e.g. antibodies) in microorganisms or mammalian cell culture systems. Large research efforts are today put into the discovery and development of new biopharmaceutical drugs to answer clinical needs and for better treatment of disease. However, for these drugs to reach the clinic, they must be produced for preclinical, regulatory approval and clinical studies. A key factor that is often overlooked, is the need for a well-described, scalable and efficient production process and product control early in product-development, and prior to translation to commercial manufacturing. And further, how the selected production process can also substantially affect the resulting product, particularly true regarding rapidly increasing and novel advanced therapy medicinal products (ATMPs). This is in part because process development requires specialized equipment and competences, which are not available for academia or SMEs in Norway. The national research infrastructure for biopharmaceutical process development and production (BioPoD) will provide facilities and expertise to enable researcher-driven bioprocess research and development across the whole range of biopharmaceutical products. The infrastructure will cover 1) product design, 2) cultivation and 3) processing, purification and formulation, and 4) analytical tools for process monitoring and product characterization. This will fill the gap between drug discovery and

development and commercial manufacturing, and providing an early-stage option for Norwegian academics and SMEs not dependent on commercial, international contract development and manufacturing organizations (CDMO). BioPoD will gather leading research environments for cultivation, fermentation and high-throughput screening for biopharmaceutical research and development and advanced ATMP product design and characterization, and build on current leading research infrastructure in the participating institutions. The complementarity of the existing infrastructure will enable continued collaboration with research environments, public sector, start-ups and established industry in Norway. BioPoD answers the governmental ambitions to build competence and infrastructure for national pharmaceutical production, contingency production of biopharmaceutical products in Norway, and is of high national importance for reaching the goals for growth within the national health innovation and industry.

Prosjektnummer: 346982

INFRASTRUKTUR-arbeidstittel: NOR-Openscreen II – The Norwegian node of EU-OPENSREEN ERIC

Vertsinstitusjon: University of Oslo

Sammendrag:

NOR-Openscreen started as a national RI with funding from the NFR in 2016. It consists of four facilities located in Oslo (UiO, NCMM), Bergen (UiB, BiSS), Trondheim (SINTEF) and Tromsø (UiT, Marbio), and represents the Norwegian node of the EU-OPENSREEN ERIC. The RI delivers services in the area of chemical biology, high throughput screening, cheminformatics and bioprospecting to both the public (academic research groups, hospitals) and the private sector, from SMEs to large life science and pharma companies. The different nodes are very specialized with regard to instrumentation, technologies and services that are made available to the users. UiO is hosting the project and the majority of the networks' chemical compound collection of ~70 000 molecules and the Norwegian copy of the European Compound Collection of 100 000 substances from EU-OPENSREEN ERIC and offers a broad variety of screening technologies. UiB is specialized on biophysical and structure-based approaches like fragment screening and differential scanning fluorimetry (DSF) and the cheminformatics and hosts the fragment library of EU-OPENSREEN. SINTEF has a strong background in mass spectrometry and metabolomics and UiT is the bioprospecting node, offering pipelines for purification, characterization, and screening of natural products mainly from marine sources.

In the present application the RI is applying for a phase II funding to implement novel emerging technologies to maintain its cutting-edge position.

Prosjektnummer: 346984

INFRASTRUKTUR-arbeidstittel: GeoHub Research Data Platform

Vertsinstitusjon: NGI

Sammendrag:

The field of Geotechnical engineering is fundamentally based on empirical data from field investigations and lab testing. Even though NGI has data stored in historical archives on paper and in digital format on file servers, the access to the data is cumbersome without a unified efficient data platform solution. With the evolvement of data driven science, there is an additional potential and growing interest for utilizing broader data sets for analyses and modelling. The geotechnical research community in Norway is currently suffering from the lack of well structure geotechnical data. The project proposed herein will turn the existing NGI data archives into a structured unified data platform, and organize and store new data in present and future research projects. In addition, future data from consultancy driven geotechnical site investigations and laboratory testing will be fed into the data platform. These data have a great interest for researchers as the data volume outstrip the volume from research projects. This will require integration towards existing industry solutions such as GeoSuite, NADAG and Holebase. An important part of the project will be to the legal considerations and categorisation of intellectual property rights of the data. This is required to ensure sharing and to utilize the potential value in the data by making it available for the research community.

The data platform should be accessible for the geotechnical community in Norway. Geotechnical data should be stored at made accessible for research purposes across Norway. The data will also be utilized to public and private infrastructure developers in order to provide early phase information, promote re-use of data and reduce risk and cost in general.

Prosjektnummer: 346985

INFRASTRUKTUR-arbeidstittel: DiSSCo Norway

Vertsinstitusjon: Universitetet i Oslo

Sammendrag:

Distributed System of Scientific Collections (DiSSCo, <http://dissco.eu>), is on the current ESFRI roadmap and presently includes 170 institutions in 23 countries. Norway participates in DiSSCo through the DiSSCo Norway consortium with UiO as beneficiary in DiSSCo Prepare. DiSSCo will create a virtual, digital research infrastructure uniting European Science Collections – thereby making approximately 1.5 billion objects accessible for everyone. DiSSCo Norway will join DiSSCo ERIC. University of Oslo (represented by the Natural History Museum) is main applicant, and NTNU (Vitenskapsmuseet), UiB (Universitetsmuseet i Bergen) and UiT (Norges arktiske universitetsmuseum) are co-applicants. The Natural History Museum holds Norway’s largest collection of biodiversity, and DiSSCo Norway unites all major collections and potential users of the infrastructure. The goal of DiSSCo Norway is to create a virtual national infrastructure mobilising Norwegian natural history collections (approximately) 10 million objects) and providing access to the collections stored by DiSSCo. Efficient and seamless access will help support UN’s Global Goals and

Targets in addition to the EU commissions and the Norwegian Government's policies on Open Science, climatic change and digitisation.

Prosjektnummer: 346987

INFRASTRUKTUR-arbeidstittel: Sustainable Processes Advancement from the Norwegian Research: an integral Bio-, Thermo-, Electro- chemical effort (SUPRANO)

Vertsinstitusjon: SINTEF Industy

Sammendrag:

The SUPRANO is a coordinated national effort regarding infrastructure that serves value chains for the production of sustainable fuels and chemicals from underutilized renewable carbon sources through chemical and biological complete valorisation of such streams. In SUPRANO key research groups within the area of sustainable fuel and chemical production in Norway are participating; SINTEF Industy, SINTEF Energy Research, Norwegian University of Science and Technology (NTNU), Norwegian Institute of Bioeconomy Research (NIBIO), Norwegian University of Life Sciences (NMBU) and RISE PFI. The current well-coordinated consortium forms a national pillar of competence with an established track record for cooperation both within the on-going FME Bio4Fuels and SFI for Industrial Biotechnology, NORBIOLAB infrastructure project, as well as an envisaged new FME on sustainable fuels and chemicals (Submitted Sketch SusFuels). The application is aligned with national and international recommendations towards (i) a rapid and efficient deployment of sustainable energy carriers for the transport sector & (ii) increased circularity in the (bio-) economy, as well as the current political focus on technology development towards locally produced fish and animal feed. The partners within the SUPRANO include both universities (NTNU and NMBU) and research institutes (SINTEF, RISE PFI and NIBIO), providing a vital blend that ensures competence building and industrial implementation as well as wider coverage of relevant biochemical, thermochemical, and emerging electrochemical technologies at various scales of R&D. There are several gaps identified in the national infrastructure for R&D on new routes for the production of sustainable fuels and chemicals which need attention especially with respect to higher TRL.

The SUPRANO will serve the needs of national stakeholders in obtaining knowledge and identifying bottlenecks during deployment of technologies, while serving as a tool for developing and testing new concepts, both nationally and together with European partners in multinational research initiatives. SUPRANO will have an immediate and drastic impact on bringing novel concepts and integration of different value chains established in the FME Bio4Fuels and the SFI for Industrial Biotechnology (SFI-IB) closer to industrial realisation. The SUPRANO will also foster activities on European level to bring the technologies faster to the market, such as in HORIZON projects Pulp&Fuel, REFOLUTION, PyroCO₂, VALUABLE, and aligns well with finalized projects such as BRISK2, Waste2Go, LIBERATE, 4Refinery and Waste2Road. The partners have strong international co-operations through numerous projects which give access to a number of facilities and results generated in existing European infrastructures, however vital equipment is needed to strengthen participation in future projects and maintain the positions, competence and research abilities that the partners have established.

Prosjektnummer: 346988

INFRASTRUKTUR-arbeidstittel: Offshore Renewables Foundations and Anchors test HUB (ORFA-HUB)

Vertsinstitusjon: Stiftelsen Norges Geotekniske Institutt (NGI)

Sammendrag:

Norway has set ambitious goals for the development of a strong offshore renewable industry, particularly offshore wind, to meet the carbon emission targets. Today, the production and installation of foundations and anchors for this industry constitute a significantly greater portion of the total investment cost, relative to that of the traditional petroleum sector, offering opportunities for design optimization and efficiency improvement. To overcome the entrenched conservatism and tackle emerging challenges, significant advances and technological innovations are required. The Offshore Renewables Foundations and Anchors test HUB (ORFA-HUB) aims to drive research and innovations in the behaviour and impact of foundations and anchors across the whole design life, focussing on three key areas: (1) site survey technology and complex geological conditions; (2) novel subsea structure technology; and (3) efficiency, scalability, and environmental impact. By providing the Norwegian research and industry communities with a distributed and integrated, state-of-the-art physical testing platform operating at multiple scales, ORFA-HUB will facilitate the development, testing, and validation of new ideas, technologies, and concepts under conditions equivalent to those encountered in the maritime environment. The multi-scale facilities will include advanced element scale laboratory testing and 1-g (gravity) to n-g (enhanced gravity) testing of foundations and equipment in model-scale test bins, geotechnical centrifuge, and pressure chamber. Furthermore, mobile facilities equipped with advanced load actuators and sensor technology will enable efficient simulation of complicated environmental loads, monitoring of soil-structure response in the field, and leverage the existing national infrastructure Norwegian Geo-Test Sites (NGTS). Provision of a common data acquisition and control system for the experimental nodes, and software for data dissemination and collaboration, are also key components of the ORFA-HUB. With this ambition, the new facilities will efficiently link the advanced understanding of seabed soil at element level to small-scale model test behaviour and field-scale experiments by sequential trials, and thus, cater the gap in the national infrastructure landscape. The infrastructure will be operated as an inclusive testing platform, open to all users. It will be coordinated by the Norwegian Geotechnical Institute (NGI) and hosted by NGI and Oslo Metropolitan University (OsloMet) in Oslo, and by the Norwegian University of Science and Technology (NTNU) in Trondheim, securing Norway's competence and world-leading position in the emerging market. ORFA-HUB will actively foster collaborations with academia, industry, national and international infrastructure and facilities, to address overarching challenges, elevate the global recognition of Norwegian research and accelerate the development of a strong green industry.

Prosjektnummer: 346995

INFRASTRUKTUR-arbeidstittel: MANULAB Phase 2; Norwegian Manufacturing Research Laboratory

Vertsinstitusjon: NTNU

Sammendrag:

Norwegian Manufacturing Research Laboratory (project #269898) MANULAB is a national infrastructure for manufacturing research. MANULAB implements an infrastructure capable of performing cutting edge research with state-of-the-art equipment, and to support the Norwegian manufacturing industry to increase their global competitiveness and sustainability. Partners are; Norwegian University of Science and Technology (NTNU), SINTEF Industry and SINTEF Manufacturing. NTNU is project coordinator and Professor Geir Ringen is the project manager. The running MANULAB project was funded by 78 MNOK from the Norwegian Research Council and is currently in the operational phase. This draft proposal is for the second phase of MANULAB, based on the original MANULAB proposal, although there are updates from the original proposal given changes in the needs and the research state-of-the art.

We claim this equipment is necessary to achieve the complete MANULAB concept as described in the original proposal, with upgrades with regards to technology development and demand. With three partners and four geographical nodes the current phase 1 might be under critical mass. The phase 2 equipment will complement the phase 1 equipment in the following laboratory nodes; The Wireless sensor systems lab, the Additive Manufacturing (AM) lab, the Industry 4.0 lab, NAPIC one-piece flow aluminium forming line, IDEALAB for product and process development, Laser robotic welding lab, , AMT SLM and The Gleeble thermomechanical testing machine. In addition, there will be five new laboratory nodes; The polymer lab, the Laser surface treatment lab, the Nano AM lab, the multi-material AM lab, the Nano CT lab and the ceramics AM laboratory. These four new sub-laboratories mean that MANULAB will widen the scope new material systems and multi-material manufacturing, where metals, polymers and ceramics are included. Furthermore, MANULAB phase 2 will introduce nanoscale manufacturing with the nano-AM laboratory and the nanoscale Computed Tomography X-ray laboratory (CT).

Prosjektnummer: 346996

INFRASTRUKTUR-arbeidstittel: CTNC OPM_MEG to study brain dynamics

Vertsinstitusjon: UiO

Sammendrag:

The Cognitive and Translational Neuroscience Core facility (CTNC) is a world-class infrastructure for the study of human brain dynamics. The facility, a core infrastructure acknowledged by the University of Oslo, combines different imaging methodologies, including functional magnetic resonance imaging (fMRI), intracranial EEG (iEEG), scalp EEG, transcranial magnetic stimulation (TMS), eye tracking/pupillometry, and other physiological measures of body functions (e.g., cardiac and respiratory). The core facility has extensive national and international collaboration with labs, hospitals, and project groups rooted in the humanities, social sciences, and medical and health

research. CTNC infrastructure is central to the activities at two centres of excellence (RITMO and NORMENT) and provides infrastructure to international and Norwegian research groups.

Funding is sought to fill in the gap between the present methodologies by including the new generation of functional neuroimaging - optically pumped magnetoencephalography (OPM-MEG). Due to a host of favourable features, including ease of use for clinical groups, no need for superconducted cooling and sampling of neural data with both excellent temporal resolution and precise spatial location outperforming combined EEG and fMRI, OPM-MEG is expected to facilitate a leap in our understanding of functional brain dynamics, and thus holds considerable promise across basic and clinical neuroscience.

There is a need to combine MEG data with precise measurements of brain anatomy. The 3T MRI scanner at the Intervention Centre at Oslo University Hospital requires an upgrade to meet future needs in MRI-based research. We therefore also apply for upgrade of our MRI scanner.

If funded, this investment will strengthen the University of Oslo as a world-leading institution for empirical neuroscience research and pave the way for even more interdisciplinary research nationally and internationally.

Prosjektnummer: **346997**

INFRASTRUKTUR-arbeidstittel: **Norwegian environmental monitoring infrastructure within eLTER RI**

Vertsinstitusjon: **Norwegian Institute for Water Research NIVA**

Sammendrag:

There is a lack of organisation in Norwegian environmental monitoring practices of air pollution, terrestrial and aquatic plants, and animals, as well as soil and water chemistry. These monitoring activities are carried out at different locations and involve various actors. The lack of co-location, key parameters, and coordinated data across different disciplines poses challenges for interdisciplinary research. Additionally, the tools for sharing and reuse of data are currently suboptimal, impeding our adherence to the FAIR principles. These deficiencies have adverse consequences for our ability to detect changes in biodiversity, comprehend the effects of climate change, and engaging in international cooperation.

The Integrated European long-term ecosystem, critical zone, and socio-ecological research infrastructure (eLTER) is a network of European environmental monitoring and research stations that will integrate disciplinary natural sciences and holistic socio-ecological research approaches, to better understand ecosystem functioning across Europe's environmental and socio-economic gradients. The network is included on the ESFRI Roadmap and aims at becoming a European research infrastructure consortium (ERIC) by 2026. The eLTER framework encompasses a data repository and a platform that provides modelling and analysis tools. NIVA is leading the Norwegian LTER consortium, which comprises over 40 distributed monitoring sites operated by seven partner institutions: NILU, NINA, NIBIO, UiO-NHM, NTNU-VM, UiT, and NPI.

To qualify as an eLTER RI site, a set of mandatory eLTER RI standard observations must be implemented. To meet these requirements, LTER Norway has arranged a sub-set of the Norwegian

LTER sites into 9 provisional site clusters. Each cluster consists of individual monitoring or research sites that are ecologically relevant to one another. Upgrading these clusters to meet eLTER RI standards (i.e., categories 1 and 2) involves the incorporation of physicochemical sensors (e.g., pH, colour, turbidity, oxygen in water), biological sensors (such as cameras and acoustics), and automated sampling equipment (e.g., water, eDNA and insects). The objective of this grant application is to upgrade the existing category 2 sites to category 1 and upgrade the category 3 sites to category 2, i.e., enabling Norway to attain full membership in eLTER RI.

Prosjektnummer: 347001

INFRASTRUKTUR-arbeidstittel: The FoodPilotPlant Campus Ås, Phase III

Vertsinstitusjon: Norwegian University of Life Sciences

Sammendrag:

FoodPilotPlant Norway (Matpiloten) is a research infrastructure for food processing located at NMBU and Nofima on Campus Ås. The infrastructure is built up through own efforts and infrastructure funding from the Research Council of Norway (project no. 208674 and 296083). FoodPilotPlant Norway consists of pilot-scale equipment for processing food and residual raw materials located in 8 dedicated processing pilot plants. The grants contributed to the renewal and upgrading of existing pilot plants and the establishment of new pilot plants for the utilisation of the rest raw materials and made it possible to apply for and receive funding for new and innovative research projects. Rapid developments in technology, biotechnology and circular economy and demands for more sustainable production require new food processing and production solutions. The food industry faces a number of challenges that will require increased research efforts: 1) They are adopting new technology, which provides opportunities to develop new products, but also presents new challenges; 2) They have an increased focus on full resource utilisation ("use the whole milk litre/carcass/grain"); 3) New regulatory requirements (EU) for increased recycling of packaging materials and reduced use of packaging; 4) A public debate on ultra-processing, which may have consequences for consumer behaviour and which goods are in demand; 5) New technology and new packaging solutions can lead to increased food waste. FoodPilotPlant Norway must keep pace with developments and have state-of-the-art equipment to contribute to socially responsible research and teaching and meet the industry's needs. We must be one step ahead of developments in the industry and help to create alternative solutions. Food processing takes place in production lines that start with the raw material and end with the finished packaged product, and parts of today's production lines need upgrading. Phase III of FoodPilotPlant Norway will thus: 1) Support existing pilot plants and contribute to a significant upgrade of the food pilot plants that need upgrading; 2) Contribute to the purchase of process equipment that provides new technological opportunities, e.g., by integrating biotechnological processes and biorefinery; 3) Develop a new pilot lab, PP9, on non-destructive process analysis and establish a LivingLab and a FoodLab to include consumers and student innovation. FoodPilotPlant Norway will have a broad area of application and the infrastructure will be used in international and national research projects, in teaching and testing processes and to produce test products for the food industry.

Prosjektnummer: 347002

INFRASTRUKTUR-arbeidstittel: NORA.LLM - infrastructure for national large language models

Vertsinstitusjon: UiO

Sammendrag:

We are now witnessing the initial stages of the deployment of artificial intelligence, a technology that will likely transform society, much like previous industrial revolutions. Large language models (LLMs) such as ChatGPT have already demonstrated tremendous power. They possess the ability to translate between languages, generate essays, create computer code, successfully pass various professional exams, and perform many other tasks. However, these algorithms also come with evident drawbacks. They exhibit biases, harbour cultural preferences, and may impact political discourse and decision-making. Furthermore, the companies controlling this technology are often lacking transparency, there may be privacy concerns, and the companies are driven by an advertisement-driven financial model. The current concentration of power within this domain poses a challenge to regional digital sovereignty.

To address these issues and foster transparency, digital sovereignty, and competition on multiple fronts, several nations recognize the need to develop their own national language models. The UK, for example, has announced the Foundation Models Taskforce, which aims to build BritGPT. Similar initiatives are underway in Germany, France and China, and other countries are expected to follow.

It is of national importance that Norway pursues a similar path. In this project, we will develop a Norwegian language model rooted in Norwegian languages and culture, based on democratic principles. While ChatGPT/GPT4 is highly versatile, the model weights are not openly accessible, and the method is not documented or evaluated scientifically. Although we do not know the details of its training data, it is most likely trained predominantly on American texts, thus reflecting American culture.

We will establish an infrastructure that comprises national, open models as an alternative to the closed models owned by the world's largest companies. The developed models will be accessible for research purposes and deployment by academic institutions, the public sector, Norwegian businesses and startups, and the general public. The infrastructure will also develop and make accessible benchmarking tools specifically aimed at evaluation of generative capabilities and language understanding for a new generation of Norwegian language models.

The infrastructure will further facilitate domain-specific development (“fine-tuning”), for example within the fields of medicine and education. The development of a national LLM will ensure that user data and the data required for domain-specific training can remain within a secure system on Norwegian servers, ensuring that the models can be deployed and fine-tuned by the Norwegian public sector.

Prosjektnummer: 347003

INFRASTRUKTUR-arbeidstittel: NMDC - OceanData for You (NMDC-OceanData4Y)

Vertsinstitusjon: Havforskningsinstituttet

Sammendrag:

“Seamless access to marine data” is the vision of the established distributed national research infrastructure Norwegian Marine Data Centre (NMDC). This proposal is an upgrade of NMDC further developing access to multidisciplinary data collected from the marine area. Partners from Norwegian institutions collaborate in NMDC to generate a single open data access system able to import, store, and process large sets of physical, geological, chemical, and biological marine data.

To deal with the identified challenges the NMDC-OceanData4Y will add to the NMDC infrastructure:

- DATA4U “data for you” is a data rescue module for data that are in danger of being lost
- NEAR4U “near real time data for you” is a module to handle data on a shorter timescale
- SAVEUD “save your data” is a service to make it easy for a researcher to deposit data
- TRUD “transform your data” is a module that ensures interoperability
- VIZUD “Visualize your data” is a module to present data to user to ensure easy access
- TRAINUS “Training yourself” is an outreach module educate users in data management

Key goals are facilitating interoperability between distributed data centres, offering human and machine friendly interfaces for data processing and documentation, access and archiving. The infrastructure simplifies the technical obstacles scientists encounter when finding and using data from various sources. To provide a cost-effective solution for data providers NMDC is ensuring proper long-term stewardship for data, bridging the extensive knowledge of marine data managers with the research community through the European Open Science Cloud EOSC.

Prosjektnummer: 347004

INFRASTRUKTUR-arbeidstittel: Grensen Lab – National laboratory for sustainable transformation of traditional building structures (PRE-PROJECT)

Vertsinstitusjon: NTNU Faculty of Architecture and Design (AD)

Sammendrag:

The aim of this pre-project is to prepare the ground for developing the historic neighborhood Grensen in Trondheim into a national interdisciplinary living laboratory. The project group wants to use the area for testing new solutions for energy upgrading and restoration/transformation of old log- and half-timbered houses, but also experiment and test the sociocultural and emotional effect historic buildings and environments, and different types of usage and management of them, have on their users and the wider public. Hundreds of thousands of wooden homes have been deserted and stands empty in Scandinavia, and there are significant climate and social benefits in renovating and

reusing houses instead of building new ones. Through developing Grensen Lab we want to build the strongest research environment in the Nordic countries on reuse of existing wooden buildings. The Grensen neighborhood will be a hub for research, education, and dissemination within this field. The location of Grensen, on NTNU's campus at Gløshaugen, is ideal for these purposes.

As a national research infrastructure, Grensen Lab will be available for research on: (1) Development of circular, energy- and cost-efficient solutions for upgrading and management of traditional wooden houses; (2) Design, architecture and art as instruments for the green transition; (3) The role of users for sustainable transformation of the built environment and (4) Transformation of existing buildings that safeguards universal design, social sustainability and equity. It will thus serve as a lab for interdisciplinary research within technology, natural science and energy research as well social sciences and humanities.

The pre-project will be based on the feasibility study that NTNU Eiendom carries out in 2023 (including the architectural competition [EUROPAN](#)). It will develop plans for testing and experiments that can take place in a 10-15-year perspective and build an interdisciplinary national consortium that will use the infrastructure. Grensen Lab will complement established centers, laboratories, and projects within sustainable architecture on a national level. It will be linked to established research infrastructures, such as [ZEB Living Lab](#) and [ZEB Lab](#), which NTNU is currently hosting together with SINTEF.

Prosjektnummer: **347005**

INFRASTRUKTUR-arbeidstittel: **Norwegian Infrastructure for Molecular Biodiversity Research (NIMB)**

Vertsinstitusjon: **NTNU**

Sammendrag:

Norwegian Infrastructure for Molecular Biodiversity Research (NIMB) will provide infrastructure that Norway needs to be at the forefront in biodiversity genomics research. By combining the efforts, knowledge and facilities of the four major university museums in Norway, NIMB will establish a research infrastructure that meets present and future challenges of accurate and high-quality biodiversity research. NIMB is a significant expansion of current infrastructure at Norwegian natural history collections and aims to document, conserve and mobilise quality-assured genetic resources for national and international scientific research. The infrastructure has three pillars: Biodiversity biobanking, Challenging taxa and tissues, and Reference barcodes and genomes. Past and current initiatives and current developments emphasize the need for biodiversity research under the FAIR principles (findable, accessible, interoperable, reusable) at a national and international level. High-quality digital sequence information is needed to meet demands for current and future research, while adherence to FAIR principles necessitates bringing biodiversity biobanking and sequencing to those institutions that are nationally mandated to maintain these collections for posterity. A special emphasis will be placed on challenging taxa or tissues where we currently have poor solutions for obtaining reliable data. The new protocols developed and the facilities we establish, will enable us to provide users with the best possible opportunities to generate and analyse biodiversity data using molecular tools. NIMB will be a secure repository of genetic resources that supports biodiversity

research under the FAIR principles and will be a collaborative, distributed infrastructure that offers high throughput, high quality DNA isolation and consolidation of specimens for direct storage in natural history collections. Our quality assurance protocols include the generation of reference DNA barcodes from 50 000 species and 100 full reference genomes.

Prosjektnummer: 347006

INFRASTRUKTUR-arbeidstittel: **Goldschmidt Laboratory 2 – The national infrastructure for the advanced characterization of Earth materials**

Vertsinstitusjon: **University of Oslo**

Sammendrag:

The present application, Goldschmidt 2, aims to upgrade the “Goldschmidt Laboratory” (NFR# 295894) to become the national infrastructure for the advanced characterization of Earth materials. The Goldschmidt Laboratory will be a world-leading infrastructure hosting state-of-the-art analytical facilities to support cutting-edge academic research in Solid Earth and Climate Science, and to stimulate industrial innovations in the field of critical raw materials and advanced materials for energy transition.

Earth and Environmental Sciences at the University of Oslo, UiO, was recently ranked #3 in Europe outside UK in the 2022 Nature Index Tables. A world-leading national research infrastructure for the advanced characterization of Earth materials is imperative to continue to compete at international level and keep Norway at the forefront of Earth and Environmental Sciences research. In our vision, the Goldschmidt Laboratory will integrate Goldschmidt 1 and 2 and be able to determine the 1) **absolute age** of rocks and the **timing** of geological processes using U/Pb and Ar/Ar dating (existing ID-TIMS at UiO, new CO₂ and diode lasers for the existing Ar/Ar geochronology lab at NGU, new UV excimer laser for the ICP-MS laboratories at NGU, new LA-Q-ICPMS at UiO); 2) the **exact temperature** of formation of rocks and ancient ocean waters using clumped isotopes and mineral chemistry (new Ultra HR-IRMS at IFE in Kjeller, new EMPA at UiO); and 3) the micro and nano-scale **properties of materials** using electron microscopy (new FIB-SEM at SINTEF and UiO in Oslo, and existing FEG-SEM at UiO). These three variables are often determined based on poorly constrained assumptions and low-precision measurements, despite being fundamental parameters that control the evolution of the Earth, as well as the composition and properties of Earth and geo-inspired materials.

Goldschmidt 2 will be coordinated by the Department of Geosciences at UiO, with internal collaborations at UiO with the Centre for Materials Science and Nanotechnology and the Faculty of Odontology, and with partners at SINTEF with its institute SINTEF-Industry, the Geological Survey of Norway (NGU), and IFE with its Isotope Geochemistry Laboratory. With the proposed upgrade, the Goldschmidt Laboratory will continue the century-old tradition established by Victor Goldschmidt of promoting excellence in Norwegian research and is essential for the further development of concepts and models in Solid Earth Dynamics and Climate Sciences in Norway. In addition, the infrastructure will be crucial to boost industrial innovation in geosciences in Norway, to elevate the quality of education and national competences in the advanced characterization of natural and manmade materials, and to attract outstanding international research partners.

Prosjektnummer: 347009

INFRASTRUKTUR-arbeidstittel: Hydrogen energy systems laboratory

Vertsinstitusjon: SINTEF AS

Sammendrag:

The use of hydrogen and hydrogen technologies are gaining momentum both nationally and internationally, as a pillar to decarbonize industry, transportation, and the energy system towards 2050. Norway has world leading industry and research institutions with vast potential for value creation from development and future export of hydrogen as well as hydrogen technologies such as electrolyzers, hydrogen storage tanks and fuel cell systems.

This proposal outlines a hydrogen energy systems laboratory in Trondheim. The proposed infrastructure will facilitate for development, testing and validation of fuel cell stacks and electrolyser modules in a 100 – 1 000 kW power range, thereby complement existing infrastructure and providing a missing link towards full scale implementation of these technologies. The power range and Technology Readiness Level (TRL) of the activities are carefully selected in dialogue with Sustainable Energy Catapult Centre and potential Norwegian and International industrial customers to ensure the relevance and future utilization of the facilities.

Currently, there is no such hydrogen energy system infrastructure available, neither in Norway nor in Scandinavia. Even in the European domain such infrastructure is scarce and fragmented. While the relevant individual technologies are maturing, larger scale dynamic operation, validation and optimisation are crucial aspects to focus on, thereby providing for market implementation. As an integral part of the proposed Hydrogen energy systems laboratory, education of Master and PhD candidates, primarily linked to NTNU, is foreseen. Through open access, the infrastructure will be pivotal for generating innovation projects, increasing competence levels, and boosting the Norwegian and European industry's competitiveness.

Prosjektnummer: 347010

INFRASTRUKTUR-arbeidstittel: Norwegian participation in the ESFRI project European Solar Telescope (EST)

Vertsinstitusjon: Universitetet i Oslo

Sammendrag:

The purpose of the proposal is to secure the Norwegian participation in the ESFRI-project European Solar Telescope.

European solar physicists unanimously share the view that a large aperture new generation solar telescope is needed as a revolutionary step to unveil the fundamental processes in the Sun. To this aim, the European Solar Telescope (EST) was proposed in 2008 as a 4-meter class solar telescope to be located in the Canary Islands. The project was ranked as the highest priority, ground based, medium size (cost less than 500 MEUR) project in all of European Astronomy in the ASTRONET Infrastructure Roadmap for European Astronomy for 2010- 2030. It formally entered the active

project list of the ESFRI roadmap in March 2016 as the flagship project for the European Solar Physics community.

The preparatory phase (supported by EC project PRE-EST) just finished (2016-2022) with a budget of 15 MEUR. The construction phase is planned for 2024-2031 with a total cost of 185 MEUR and a Norwegian contribution of 10 MEUR.

For solar physics in Norway to stay at the absolute international research front, it is essential to keep access to cutting-edge infrastructure. EST is this infrastructure for European solar physics.

The participation in EST is of the highest priority for the Institute of Theoretical Astrophysics, as evidenced by the institute having covered the Norwegian contribution to the preparatory phase (355 kEUR).

Prosjektnummer: 347011

INFRASTRUKTUR-arbeidstittel: Upgrade and Expansion of the Environmental Pollutant Laboratory

Vertsinstitusjon: University Hospital North Norway HF

Sammendrag:

The Environmental Pollutant Laboratory is a specialized laboratory for analysis of environmental pollutants in human matrices and a collaboration between the University Hospital of North Norway (UNN), UiT The Arctic University of Norway and the Northern Norway Regional Health Authority. It is situated at UNN in Tromsø and was established and developed over the last decade to a high-performance laboratory considering the users' demands and customizing analysis according to the needs of the individual projects. Users are local, national and international researchers collaborating with the Environmental Pollution Laboratory within joint research projects and mainly on exposure to environmental pollutants and health effects in humans. The existing infrastructure consists of a liquid handling work station for automated sample preparation, complementary chromatographic systems coupled to mass-spectrometers for targeted analysis of organic environmental pollutants, and an inductively coupled plasma mass-spectrometer (ICP-MS) for analysis of inorganic pollutants and trace elements in liquid human samples. Through scientific conversation and discussions with our users the need for an expansion and upgrade of the instrument park has become imminent. To implement new methods faster and not being that vulnerable of a force majeure, we intend to expand with a second liquid handling work station. To perform specific analysis of compounds not covered yet, we intend to upgrade our existing ICP-MS system with a liquid chromatography system for speciation analysis. To perform analysis of inorganic environmental pollutants and trace elements in solid human samples, we intend to expand with devices for sample preparation and safe cleaning of reusable equipment. Having a permanent storage location for interim storage of samples related to the research projects is urgent, and we apply for covering the costs for modification of rooms according the needs for placing our existing freezers.

Prosjektnummer: 347013
INFRASTRUKTUR-arbeidstittel: Norwegian Rheology Laboratories
Vertsinstitusjon: The University of Stavanger

Sammendrag:

Rheology is the science of deformation and flow of materials, ranging from liquid to solid materials such as drilling fluids, polymers, concrete, rocks, ceramic-based materials, gas hydrates, etc. Rheology is a fundamental subject for understanding behaviour of fluid systems.

The main objectives of the proposed infrastructure are: a) to develop cutting-edge techniques for rheological analysis and characterization combined with advanced data processing and image processing methods; b) modelling rheological behaviour for processing and design; c) facilitate the discovery and development of new functional materials and fluids for use in industries and in society; d) improve process control in advanced production by generating in-depth understanding of the rheological properties of materials (from feedstock to intermediate and final products). This infrastructure will mainly address field of rheology with focus on Petroleum and GeoEnergy theme.

This infrastructure project will bring together leading Norwegian academic and research environments within the field of rheology. The partners in Norwegian Rheology Laboratory (NRL) have a wide range of active research activities related to rheology, such as development and characterization of drilling fluids (UIS), research on movement of cancer cells (UIS), sustainable technologies such as carbon capture and storage, hydrogen-based technologies, multiphase flow systems, oil-water dispersions (IFE and SINTEF Industry) and process-related technologies (SINTEF Industry and IFE) including oil & gas and energy. The infrastructure project will also strengthen multi-disciplinary collaboration related to rheology in Norway and with leading international environments, and result in common project applications, exchange of fellows, students, and experience, and sharing equipment. The collaboration will also help strengthen smaller research environments within rheology in Norway. The NRL will also support industrial research and collaboration, helping SMEs and industries in developing/ optimizing their services.

We plan the infrastructure to be fully operational within 3 years. NRL will provide services and leading research infrastructure to academia, research organizations and industries, and will make Norway a leading country within rheological innovation, science and technology.

Prosjektnummer: 347015
INFRASTRUKTUR-arbeidstittel: Strategic Hub for the Analysis of Transport data with Novel Technologies Yielding insights (SHANTY)
Vertsinstitusjon: Institute of Transport Economics (TØI)

Sammendrag:

Today, many transport suppliers publish their real time data on APIs. These data can generate great benefits for the public sector and private companies, if stored and curated. Otherwise, these flashes of information might perish in the digital nirvana and be lost forever. Storing these data for later use,

be it for market analytics, reactions on disruptive events or monitoring changes in level of service and travel behavior, will be greatly beneficial for all stakeholders. Potentially, the establishment of extensive and well-curated data series will safeguard our ability to monitor and analyze changes over time.

While stakeholders like EU, the Norwegian Public Road Administration, Entur and others are making strides in open data accessibility, their scope is limited by privacy and competition concerns. The vast diversity of data in the transport sector demands more extensive efforts and advanced curation systems to tap into all potential sources. Additional efforts are necessary to address these gaps, enhance data usefulness, and fully exploit the sector's data potential:

- The proposed new infrastructure project will focus on data storage, curation, and value creation through advanced analytics and machine learning applications.
- The project involves mapping and expanding existing computation clusters, with a focus on suitability for large scale machine learning applications.
- The pre-project phase involves mapping existing (open and proprietary) data sources, improving interconnectivity and accessibility, and exploring sustainable business models for infrastructure maintenance and usage.

Prosjektnummer: **347017**

INFRASTRUKTUR-arbeidstittel: **NorMet – Norwegian Infrastructure for Metabolomics**

Vertsinstitusjon: **NTNU Norwegian University of Science and Technology**

Sammendrag:

NorMet – Norwegian Infrastructure for Metabolomics – is an initiative for joining resources and competence on detection, identification and quantification of small molecular components (<1500 Da, i.e. metabolites) of living organisms. NorMet will provide Norwegian universities, research institutions and industry with a broad selection of methods for analysis of metabolites (Metabolomics), metabolic fluxes (turnover of metabolites; Fluxomics) and lipids (Lipidomics). The infrastructure will focus on chromatography and mass spectrometry-based technologies but will collaborate closely with other technology platforms and e-infrastructures to provide the most comprehensive and complete service for the users.

The study of metabolites (their concentrations and fluxes) provides a picture of the state of the cell/organism at a specific time point and are generally more precise phenotypic descriptors than RNA or proteins. Still, whereas genomics, transcriptomics, proteomics have developed into mature technologies with extensive service infrastructures established for Norwegian scientists, Metabolomics is less established on the technology side and completely underdeveloped at the service side in Norway. Metabolomics has emerged as a highly topical field that has led to major discoveries in biological model systems; however, there are still non-resolved challenges throughout the whole Metabolomics workflow from study design, sampling and sample processing, analyzing and post-analytical processing incl. interpretation (data analysis tools, metabolite libraries and databases are also required). It is therefore correct timing for Norwegian universities and research institutions to join forces, like other comparable countries have already done the last 5-10 years, to put Norwegian scientists at pace with the international community and further advance the field of

Metabolomics. The NorMet infrastructure project will provide a broad specter of expert services within metabolite analysis, both on quantitative targeted and untargeted/ global analyses within health, environmental, industrial and marine applications, that should cover most needs within the Norwegian life science public and private communities. This will be possible through investment in advanced LC-/ GC-/IC-/SFC-MS instrumentation in strong research groups with experience in MS based Metabolomics that are committed to build and operate the research infrastructure. Service will be open for external universities, research institutions, industry and other relevant public agencies.

Prosjektnummer: 347022

INFRASTRUKTUR-arbeidstittel: Center for advanced microscopy (CAM)

Vertsinstitusjon: NTNU/NV/IFY

Sammendrag:

The vision of the Center for advanced microscopy (CAM) is to make advanced optical imaging techniques easily available for all interested users nationally and enable the best science possible. This is achieved by maintaining state-of-the-art equipment that is continuously updated, as well as the high-quality support and training necessary to generate high-impact results. A range of instruments are provided from conventional fluorescence microscopes to nationally unique instrumentation, particularly within non-linear optics and multiphoton microscopy.

In this proposal we seek funding to upgrade the main multiphoton microscopy at CAM with improved features for live-cell imaging, as well as a whole slide imager that we will extend our capabilities for high-throughput imaging.

Prosjektnummer: 347024

INFRASTRUKTUR-arbeidstittel: Sámi Place Name Archive

Vertsinstitusjon: Sámi allaskuvla | Sámi University of Applied Sciences

Sammendrag:

Sámi University of Applied Sciences as project leader applies, in conjunction with Sámi Parliament in Norway, for funding for the establishment of a Sámi Place Name Archive, which is planned both as a new innovative digital archive as well as to appropriately organize physical place name collections for the use of researchers and other users.

Both Norwegian language and Kven language place names have name archives in Norway, while there exists no corresponding archive for Sámi place names. The Norwegian Place Name Archive was established in 1921, and celebrated its centenary in 2021. The archive is today part of the Language Collections at the University Library in Bergen. The Norwegian Place Name Archive is responsible for the collection and cataloguing of Norwegian place names, whereas the collection, cataloguing and digitizing of Sámi place names has not been similarly defined as a national responsibility, and this task has therefore not been systematically organized in Norway. With regard to Kven language place names, a place name database was set up through The Language Council of Norway.

The establishment of a Sámi Place Name Archive as new infrastructure in co-operation of the Sámi institutions in The Science Building in Kautokeino, will ensure specialized place name and Sámi language expertise. This will facilitate the task of collecting and processing the name material according to required disciplinary and methodological standards, as well as the cataloguing and digitalization of the Sámi language name material for use in research and for administration of The Place Name Act. Building up a name archive constitutes a central part of both the Sámi University's as well as the Sámi Parliament's work during the United Nations' International Decade of Indigenous Languages (IDIL) 2022–2032.

Prosjektnummer: **347025**

INFRASTRUKTUR-arbeidstittel: **A Norwegian Argo Infrastructure – a contribution to the European and global Argo infrastructure (NorArgo3)**

Vertsinstitusjon: **Havforskningsinstituttet (IMR)**

Sammendrag:

NorArgo3 is a sustainable observation system for the Arctic that provides continuous measurements over large areas that are fundamental in climate research and monitoring. NorArgo3 consists of an array with oceanographic autonomous vertical profiling floats, Argo floats, including advanced physical and biogeochemical sensors. It will extend the existing infrastructure NorArgo2, which is on the Norwegian infrastructure roadmap, including new generation of Argo floats and novel biogeochemical sensors. The profiling float will be equipped with more sensors as required. The Norwegian Argo floats are part of the international Argo program and the roadmap of Euro-Argo ERIC, that Norway has been a member of since 2018. The Argo floats are mainly located in the deep water drifting with the currents there. With 5-10 day intervals, they rise from their maximum profile depth, 2000-4000 m, to the surface while taking measurements during the ascent. The floats are equipped with sensors for measuring pressure, temperature, salinity, oxygen concentration and other biogeochemical parameters that are important for the description of the ocean ecosystems. At the surface, the data are transmitted to land via satellite. Afterwards, the float descends to the deep ocean again until it ascends again after 5-10 days. Each Argo float can do approximately 150-200 cycles over 3-5 years. Data from the floats will be available in near-real time to all users via the Internet. All collected data will additionally be manually quality controlled to ensure that the data are of high scientific quality. NorArgo3 will operate minimum 30 operative Argo floats, simultaneously drifting in the Nordic Seas, the Barents Sea and the Arctic Ocean. The aim is to monitor changes in the ocean's climate and the properties of the water masses and biological diversity throughout the water column and the deep currents in the ocean.

Prosjektnummer: 347027
INFRASTRUKTUR-arbeidstittel: E-INFRA 2023
Vertsinstitusjon: Sigma2 AS

Sammendrag:

Sigma2 AS has strategic responsibility for and manages the national e-infrastructure for large-scale data- and computational science in Norway. In addition, Sigma2 coordinates Norway's participation in international collaborations on e-infrastructure. While Sigma2 AS owns the e-infrastructure, operations and user support are provided by NRIS (Norwegian Research Infrastructure Services), which is a collaboration between Sigma2 AS and the four universities UiO, NTNU, UiB and UiT.

Sigma2 is mandated to provide high-performance computing services and data storage services to individuals and groups involved in research and education at all Norwegian universities, colleges, and other publicly funded organizations and projects.

The Sigma2 activities are jointly financed by the Research Council of Norway (RCN) and the Sigma2 consortium partners, UiO, NTNU, UiB and UiT.

While historically (and still currently), the operations of Sigma2 have been funded jointly by the universities and the Research Council of Norway (base funding), the budget for *investment* in e-infrastructure has primarily been financed by the Norwegian Research Councils INFRASTRUKTUR program.

The base funding for Sigma2 is under revision. It is currently too early to determine the outcome of this process. However, the base funding will likely be reduced significantly. Hence, Sigma2 will apply, through the application described in this outline, for funding for investment in e-infrastructure for 2025-2027 on the assumption that the base funding will be reduced significantly.

Prosjektnummer: 347028
INFRASTRUKTUR-arbeidstittel: Norwegian Platform for Municipal Unstructured Data - NORMUD
Vertsinstitusjon: OsloMet

Sammendrag:

Norway has been often cited as one of the leading countries in digitizing public services. Application and registration, processing and delivery of services are highly digitized in Norway, allowing for a more efficient administration of different services. One important effect of this process is the enormous volume of data generated every day by different services. While a small part of this data can be easily structured in a data set, the vast majority is considered *unstructured* data – information that is not organized in a pre-defined manner. Emails, comments sent through webpages, sms are some examples of unstructured data produced everyday by public services. Alone, each one of these elements is a very poor point of information. However, put together and organized in a meaningful way, we have rich data sets for research and produce valuable insights about the performance of public services.

In the Norwegian context, municipalities are the main responsible for delivering public services. Consequently, they are the owners of vast amounts of unstructured data produced every day by digitized systems. Currently, these data have in practice no use or purpose, being mostly stored without any clear plan for use or to make them available for others. Simultaneously, most of these data is public and should be made available to the public. Therefore, there is a growing interest from researchers and stakeholders in exploring the potential of these data sources. The rapid development of data science methods makes it increasingly easier to structure different types of unstructured data to, for instance, generate valuable descriptive statistics and contribute to test more complex causal hypothesis.

The purpose of this preliminary project (*forprosjekt*) is to map the viability of implementing a system for storing and sharing unstructured data (*data lakes*) from public services administered by Norwegian municipalities and make them accessible for researchers interested in processing them for further analyses. This project aims to map 1) the existing available infrastructure for such a system; 2) municipal and national partners interested in collaborating for its implementation; 3) definition of most feasible types of data to be shared considering privacy and technical issues; 4) establishing a prototype for the architecture of the system to be scalable; 5) assessment of possible business models for the system to secure its long-term viability and expansion.

Prosjektnummer: 347029

INFRASTRUKTUR-arbeidstittel: PLANKTONLAB – Mobile Benthos Platform

Vertsinstitusjon: SINTEF Ocean AS

Sammendrag:

The RI "Norwegian Center for Plankton Technology - PLANKTONLAB" (245937/F50) was granted financing by the Research Council of Norway (RCN) in 2016. The overarching goal of the centre is to strengthen research and technological development on cultivation and use of planktonic organisms from lower trophic levels, to increase marine biomass production, address climate change mitigations and conduct environmental research.

The research activities include various disciplines such as aquaculture, nutrition, physiology, ecotoxicology, biotechnology, ecology and marine biology. The RI encompasses both production and harvesting methods for marine biomass from lower trophic levels which serve as high-value food for the marine larviculture sector and feed ingredients for aquafeeds.

With the present RI proposal, the PLANKTONLAB will be upgraded and expanded with a Mobile Benthos Platform (MBP) encompassing research on benthic epi- and in-faunal organisms and meroplankton in circular biobased blue-green value chains. The MBP combined with the existing RI – PLANKTONLAB will complete the infrastructure to encompass R&D-activities on both planktonic and benthic, low-trophic organisms and therein address the targeted, national community missions launched in 2022 by the Government in their long-term policy for research and higher education on "sustainable feed" stating that "*The Government has set the objective of ensuring that all feed for farmed fish and livestock shall come from renewable sources, thus reducing greenhouse gas emissions from food systems*". This RI will support Norway in taking the necessary first steps towards reaching this goal and support development of new biomarine industries. The complete RI will be

established at SINTEF and NTNU at Sealab. The MBP will be made mobile, which will ensure possibilities for conducting experiments outside the physical location of SINTEF/NTNU Sealab.

Prosjektnummer: 347030

INFRASTRUKTUR-arbeidstittel: FAITH: Firmware for AI tasks handling

Vertsinstitusjon: Smart Innovation Norway

Sammendrag:

This pre-project targets the establishment of research infrastructure at Smart Innovation Norway (SIN) to carry up a planning phase and submit an application for a later call. The proposal outlines a comprehensive upgrade to SIN's existing artificial intelligence (AI) infrastructure, featuring the implementation of a cutting-edge deep learning server to meet the burgeoning computational requirements of AI research and digital twin simulations. This pre-project's aspiration is to strengthen both national and international collaborations on sustainable energy projects, providing access to top-tier computational resources. This investment will amplify research in key domains such as AI-enabled smart grid management, energy consumption prediction, renewable energy forecasting, and optimization of energy flexibility. Additionally, this enhancement allows us to leverage large AI models, such as GPT-4, for energy research in groundbreaking ways, democratizing these large models and the hardware they run on beyond mere cloud APIs connected to servers in privately owned international datacenters. This initiative is perfectly aligned with national strategies and industrial priorities and signifies an important step towards fortifying Norway's research capabilities and sustainable energy transition.

Prosjektnummer: 347031

INFRASTRUKTUR-arbeidstittel: SciCult- National Infrastructure for Scientific Research on Cultural Heritage

Vertsinstitusjon: Museum of Cultural History - University of Oslo

Sammendrag:

SciCult aims to be a distributed national infrastructure for Heritage Science (HS). The infrastructure will connect both new and already existing equipment, research teams and specialists in HS and aims to deliver access to expertise, data and technologies across Norway. The mission of the consortium, which involves the main Norwegian Cultural Heritage (CH) research institutions is to create the basis for new avenues of research in Norway which are open to all actors within CH, including smaller institutions with limited resources. SciCult will thus contribute to increase competence, awareness and knowledge of material culture.

To achieve this objective and to become a participant at the international level in the study of CH objects and structures, SciCult intends to create two platforms, Fixed and Mobile facilities, following the model of ERIHS- the European Research Infrastructure on Heritage Science (<https://www.e-rihs.eu/>), which SciCult intends to join in the future.

Consequently, the acquisition of new portable (Mobile facilities) and benchtop (Fixed facilities) instruments, accompanied by a reinforcement of management and scientific staff with specific technical skills and knowledge, will allow the examination of a diversity of materials and objects (including built heritage structures). Such investments will develop SciCult into a complete research entity in the field of Cultural Heritage. It will generate new and deeper knowledge on historical materials themselves as well as on the degradative/alteration processes affecting them, thus enabling the development of alternative and innovative conservation materials and treatments, and documentation methods.

SciCult will offer the community i) Facilitated access to distributed infrastructure; ii) Data Management facilities and e-Infrastructure services; iii) Training activities; iv) Science outreach to smaller CH institutions; v) Increased awareness about research facilities, expertise and research output in the HS sector; vi) Policy development.

Prosjektnummer: 347032

INFRASTRUKTUR-arbeidstittel: Faecal biobank Norway - FaBio

Vertsinstitusjon: Cancer Registry of Norway

Sammendrag:

Components in faeces are utilized in the research of gastrointestinal diseases, diabetes, obesity, immunological and mental health conditions, as well as environmental research. With novel techniques, faeces can be used to analyze composition and diversity of gut microbiome, bacterial metabolic potential, small stable RNA molecules regulating gene expression, epigenetic regulation, genotypes and metabolites, providing information on e.g., the genetic predisposition and bacterial and metabolic status of an individual. With complementary information on diet, lifestyle and high-quality registry data, the faecal samples will form a rich source of exposure information for long-term follow-up studies with a number of outcomes. A challenge for advancing these fields is the lack of gut samples, and it is crucial to establish a biobank of samples collected prior to the onset of disease from well-characterized populations with long-term longitudinal follow-up.

We therefore propose establishing a national faeces biobank for general use. The national screening program for colorectal cancer (CRC) introduces a unique opportunity to systematically collect faecal samples of entire age cohorts in Norway. The screening program will invite all residents aged 55 years to take a sample at home and send it to immunochemical faecal occult blood testing (iFOBT). Up to five repeated faecal samples every second year will be collected from each invitee. The proposed faeces biobank will store the residual volume of collected samples after the screening test. Analyses of the iFOBT samples show that the leftover buffer contain a diverse microbiome,1 virome, small RNAs, including miRNA and metabolites.

We will take the advantage of the ongoing national CRC screening program and the established collaboration with national biobank infrastructures to: 1) develop a new infrastructure for digital consent, 2) biobanking of the faeces samples, 3) assess information on diet and lifestyle prior to the sampling, as well as 4) establish a faeces biobank health registry.

Prosjektnummer: 347034

INFRASTRUKTUR-arbeidstittel: NorSeq II - norsk konsortium for DNA sekvensering

Vertsinstitusjon: Oslo Universitetssykehus

Sammendrag:

NorSeq (www.norseq.org) er en etablert NFR-delfinansiert nasjonal forskningsinfrastruktur for DNA- og RNA-sekvensering med svært stor aktivitet. Infrastrukturen betjener over 500 prosjekter for >250 unike forskere årlig, for alle typer prosjekter, fra grunnleggende biologi til avanserte translasjonsprosjekter. Vi tilbyr også bioinformatiske analyser for brukerne. Det er for tiden en rivende utvikling innen DNA-sekvenseringsteknologi og annen genomisk teknologi, og NorSeq har behov for nyinvesteringer for å videreutvikle tilbudet til norske forskere og sikre at vi fortsatt kan levere state-of-the-art tjenester og kompetanse.

Prosjektnummer: 347036

INFRASTRUKTUR-arbeidstittel: "Preparedness platform for health crises research and management (PrepHealth platform)"

Vertsinstitusjon: Pandemic Centre, University of Bergen

Sammendrag:

The outbreak of the coronavirus underscored the need for enhancing preparedness in addressing health crises through a comprehensive, sustainable, and interdisciplinary research and management system. It is imperative to not only develop our capacity to generate knowledge but also to strengthen the connections between research disciplines and to clarify the roles of different institutions and agents during a crisis. An infrastructure that facilitates efficient data collection, availability, and coordination across various domains is essential for prompt and effective response when a crisis occurs, as well as for maintaining research preparedness during non-crisis periods. Additionally, improved preparedness regarding collaboration among stakeholders, including academic institutions, is crucial when confronting a new crisis in society. By integrating these two dimensions of preparedness, research and management, timely and relevant evidence can be generated for informed decision-making in critical situations. To fill this gap, our proposed research infrastructure, named the "Preparedness platform for health crises research and management (PrepHealth platform)," will enhance data research management capabilities and establish a unified national framework for crisis management roles and preparedness plans that involve diverse institutions.

The PrepHealth platform will develop established collaborations and structures into a unique new research infrastructure that address the need that has emerged over the last three years: a prospective, proactive, sustainable collaboration among research fields and across agents, with clear role definitions. The Pandemic Centre, at the University of Bergen (UiB), including members of the Faculties of Medicine, Mathematics, Law, Psychology, Arts, Social Sciences and Humanities, in close collaboration with the National Public Health Institute (FHI), the Centre for Influenza (UiB) and Elixir will through this two years period explore the best ways to cooperate to build synergies internally and with other institutions, including Directorate of preparedness, WHO, etc. The PrepHealth

platform will be able to fill a unique and needed position in Norway and Europe. Our infrastructure is intended to serve researchers, the industry, policy makers and society at large. In the longer turn, some of the deliverables might be converted into products available for the market.

Prosjektnummer: 347037

INFRASTRUKTUR-arbeidstittel: Norwegian Plasma Lab for ice, ocean, and climate research (PlasmaLab)

Vertsinstitusjon: Department of Geosciences, UiT the Arctic University of Norway

Sammendrag:

The PlasmaLab for ice, ocean, and climate research is a proposed nationally unique, state-of-the-art laboratory facility focussed upon tracing the biogeochemical cycling of elements throughout the Earth system and the consequent impact on human lives and livelihoods against a landscape of accelerating 21st century climate and environmental change. It will employ a streamlined analysis of elemental concentrations, speciation, and isotopic ratios as a diagnostic tool to detect changes in Earth's biogeochemical cycles in the past and present, thus providing critical knowledge required to track anthropogenic influences and support future sustainable human development. It will also open up new geological and archaeological archives for chemical and isotopic analysis, indicating how oceans, landscape, life and climate evolved, with important implications for quantifying future changes in Earth's climate and ecosystems. This united capability across multiple elements, isotope systems and application areas is underdeveloped in Norway, and the PlasmaLab presents a unique opportunity to catapult Norwegian research to excellence across many spheres, including polar oceans, climate, biodiversity, agriculture, food, health and environment. It fulfils needs articulated by the Norway infrastructure roadmap, the UiT 2030 strategy and will contribute strongly to a new Centre of Excellence, the Centre for ice, Cryosphere, Carbon and Climate hosted by UiT (2023-2033), and several other ongoing projects at UiT and the partner institutions.

PlasmaLab will be a nationally and internationally coordinated initiative, with a suite of state-of-the-art mass spectrometers at its core. These will also interface with a unique laser ablation system to allow elemental and isotopic mapping of solids, including ice, alongside coupled ion and gas chromatography systems for e.g., elemental and ionic speciation analysis. The proposed facility is founded upon a long track record of biogeochemical and paleoclimate laboratory-based research by the PIs, supported by a complementary team of internationally-leading scientists at UiT and its partners.

PlasmaLab will provide an analytical hub in Norway for geoscientists, oceanographers, biologists, and archaeologists, who will utilize its cutting-edge capabilities to tackle global-scale environmental and societal issues, contributing to a more sustainable future. Further, utilizing recently established novel 'low temperature' biogeochemical and microbiological labs at UiT, the PlasmaLab will take an internationally leading role in improving the applicability of emerging trace element and isotope methods in studying polar environments and resources. It will strongly strengthen the collaboration between the national partners including accessing and sharing equipment and competences. The diverse array of PlasmaLab applications and user environments will also be pertinent to interactive

public engagement activities, designing new cross-disciplinary student courses in biogeochemistry and sustainability, and training next generations of Earth and environmental scientists and entrepreneurs.

Prosjektnummer: 347038

INFRASTRUKTUR-arbeidstittel: Nordic center for thermal processing of food (NORTEP)

Vertsinstitusjon: Nofima

Sammendrag:

Our vision is to expand the Nofima pilot plant and physical properties lab into a Nordic center for thermal processing of foods. This is a center requested by the pasteurised ready meals producers, canneries, dried foods producers and producers of pasteurised or sterilised pumpable foods.

We propose to upgrade the existing infrastructure on processing of solid foods to include continuous processing of liquid foods. With the proposed infrastructure it will be possible to contribute to the research front of thermal processing and drying of foods and to accommodate the needs of producers of heat treated foods. All of the equipment is planned to be in pilot plant size and capacity, enabling research and trials in the TRL range 4 to 7.

Prosjektnummer: 347039

INFRASTRUKTUR-arbeidstittel: IbsenSpace

Vertsinstitusjon: University of Oslo

Sammendrag:

Henrik Ibsen is one of Norway's most important cultural exports, and, as a leading figure in world literary studies and performance culture, his impact is truly global. The national and international importance of his legacy calls for an innovative state-of-the-art digital approach in time for the 200th anniversary of Ibsen's birth in 2028. The proposed project, IbsenSpace, will establish an interoperable research e-infrastructure that encompasses all the significant datasets associated with Henrik Ibsen, spanning his life and literary works. By consolidating these diverse datasets into a unified platform, IbsenSpace will facilitate open access and interoperability, enabling seamless exploration and analysis across different disciplines. This endeavor aims to preserve and safeguard the digital Ibsen legacy, ensuring its accessibility and relevance for future generations.

IbsenSpace will be created by the Centre for Ibsen Studies (CIS), which holds significant digital multimedia corpora after 30 years of documentation and research on Ibsen, as well as extensive expertise in data management and building advanced infrastructures at such a scale. The infrastructure will expand beyond the internal CIS holdings and include Ibsen-related datasets and relevant services from our partner institutions. By transcending disciplinary boundaries, connecting previously isolated datasets, and enabling new ways of interpreting and exploring the data, IbsenSpace will offer a research and multimedia exploration platform serving numerous user groups and provide a dynamic resource hub for scholars, high-level researchers, theatre practitioners and the general public.

More broadly, IbsenSpace will respond to the urgent need for sustainable research infrastructures in the Digital Humanities as well as to the challenges of maintaining digital resources. Several of the infrastructures have become difficult to maintain and are partly inaccessible because of the rapidly changing digital environment. These include the digital edition Henrik Ibsens skrifter (HISe) and the lost platform from the last Ibsen jubilee in 2006, Ibsen.net.

Prosjektnummer: **347040**

INFRASTRUKTUR-arbeidstittel: **Electrification and Digitalization Laboratory (ELDIgLAB)**

Vertsinstitusjon: **NTNU**

Sammendrag:

The vision of a zero-emission society is materializing in national and international policies and initiatives such as the EU Green Deal. Strategy documents such as Energi21 and Digital21 outline the power system as a key component for the Norwegian transition towards such a society. A robust power system is critical to progress in the electrification of Norway. The future power system will also need to evolve according to present development trends often summarized through the 4 D's (Decarbonization, Digitalization, Decentralization and Democratization). In order to meet the ambitious goal of a zero-emission society, it is essential to research and develop technologies for operating the future energy infrastructure considering faster dynamics, tighter market interaction, a larger degree of automation, higher variability in both production and consumption patterns and a fundamentally increase in the level of digitalization in every part of the power system. The Electrification and Digitalization Laboratory (ELDIgLAB) will provide a research infrastructure to research, develop, test, and demonstrate solutions for the future operation of the power system. The infrastructure will encompass the present needs for research, development and educational purposes, covering technology readiness levels from prototyping to full-scale testing. The ELDIgLAB is a collaboration between NTNU and SINTEF. The new infrastructure will partly build on existing laboratories, mainly the National Smartgrid Laboratory, and partly develop new research facilities. The infrastructure project is organized in 3 infrastructure groups spanning from grid emulations and market simulators to Human-Machine-Interaction facilities, all interacting to make one integrated laboratory environment. A national infrastructure covering these focus groups is identified to be needed to enable the development that makes the operation of the future power system robust and efficient.

Prosjektnummer: **347044**

INFRASTRUKTUR-arbeidstittel: **Norwegian Research Laboratory Cluster for Additive Manufacturing (AddiNor Labs)**

Vertsinstitusjon: **NTNU**

Sammendrag:

Additive Manufacturing (AM) allows production of complex products and shapes layer-by-layer with high precision and with minimal material waste. AM therefore plays a very important role in the technological green shift in which the world currently is immersed. With the worldwide growing

interest in this technology, further development and deployment of AM technologies and recent national investments, AddiNor Labs will pave the way for enabling Norway to conduct advanced research and development on the whole value chain of AM. AddiNor Labs will provide the necessary research infrastructure to generate knowledge and technology as a fundament for Norwegian companies to use AM as a competitive edge in the global marketplace. This will also contribute to creating new application areas, products and solutions given the innovative nature of the activities that can be performed with the proposed infrastructure.

AddiNor Labs is an initiative that aims to bridge the AM value chain all the way from development and manufacturing of feedstock materials (powder), technology and process development, to the final verification and validation of the properties and performance of the final product. This approach will allow for optimizing quality, functionality, and value as well as minimizing energy and material consumption through process control of the entire AM value chain. This novel research approach requires a step-change in research infrastructure. AddiNor is of large national interest since it will build upon existing, though limited, AM infrastructure, i.e., MANULAB, FutureMaterials, MTNC, and ongoing projects such as HydroCen, SFI PhysMet, SFI Manufacturing, etc. However, the existing infrastructure suffers from the lack of integrative capabilities necessary to cover the entire value chain necessary to grow the use and application of AM for increased value creation.

AM-related research at MTP-NTNU cover more than half of the scientific publications on this topic in Norway. In addition, MTP-NTNU is an active member of the Norwegian AM cluster and therefore actively contributes to the development of AM at national level. AddiNor Labs will foster collaboration and knowledge-sharing among academia, industry, and government, accelerating the adoption of additive manufacturing across various sectors. Furthermore, it will help Norway achieve its sustainability goals by promoting a more efficient and eco-friendly manufacturing processes, more sustainable products, and extended lifetime of existing products in the marketplace. In summary, establishing this AM-oriented research infrastructure in Norway is essential for the country to gain a leadership in technology and innovation, promote sustainability, and create new economic opportunities. AddiNor Labs will cover four main fields in the AM value chain, namely powder production technology, metal, ceramic and cermet AM, high performance polymer AM, and remanufacturing as explained in the following section. AddiNor Labs will be localised at the NTNU campus in Trondheim, which will allow for easy and quick access to other advanced research infrastructure necessary to achieve its goals.

Prosjektnummer: **347045**

INFRASTRUKTUR-arbeidstittel: **COASTWATCH – integrated coastal observatory and digital twin infrastructure**

Vertsinstitusjon: **Institute of Marine Research**

Sammendrag:

Accurate descriptions of the coastal ocean and physical biogeochemical state is key to inform management of marine ecosystems and industries. Political ambitions for developing industries in support of the green transition, food and energy demands, under rapid global climate change and human impacts, require cross disciplinary research to close knowledge gaps. Such research depends

on a substantial improvement in our capabilities to monitor and model the coastal ocean. COASTWATCH aims to complement existing observation and modeling capacities in line with national needs and international recommendations. The infrastructure will represent a hub for easy integration and dissemination of existing and new scientific and user data. This will equip researchers, management and industries with a source of historic and near real-time information of the physical, chemical and biological state of coastal ecosystems enabling blue growth under a green transition in compliance with the sustainability goals (SDGs), EU taxonomy (ESGs) and the High-level Panel recommendations.

Prosjektnummer: 347046

INFRASTRUKTUR-arbeidstittel: EISCAT Norway 2025

Vertsinstitusjon: UiT, The Arctic University of Norway

Sammendrag:

This sketch includes the Norwegian participation in the International EISCAT Scientific Association (EISCAT) and contribution to the first implementation stage of EISCAT_3D. EISCAT_3D is included as a Landmark on the ESFRI Roadmap to research infrastructures and is owned and operated by EISCAT. EISCAT_3D is a multi-static phased-array radar facility using incoherent scatter radars for novel type of observations to study the upper atmosphere and near-Earth space. EISCAT_3D radar stage 1 consists of a transmitter and receiver site located near Skibotn, and two receiver sites located in Sweden and Finland. All three radar sites are under construction and first operation is expected in the end of 2023. The Ministry of Education and Research through the Norwegian Research Council invested 228 MNOK into EISCAT_3D Stage 1. The Norwegian EISCAT consortium was granted EISCAT_3D phase 1 investment funding and 60 MNOK operating funding for EISCAT through the RCN project 245683. That project is coming to an end.

This sketch includes a 5-year extension of the EISCAT membership to secure Norwegian participation through the early implementation phase of EISCAT_3D, thereby ensuring that Norway benefits from its investments. EISCAT will in future operate EISCAT_3D and the EISCAT Svalbard radar (ESR) near Longyearbyen. This sketch also includes a pre-study to ensure the future energy-efficient ESR operation.

Prosjektnummer: 347047

INFRASTRUKTUR-arbeidstittel: DataverseNO 2030

Vertsinstitusjon: UiT The Arctic University of Norway

Sammendrag:

There is an increased expectation and demand from funders, publishers, and other stakeholders that research data should be managed following the FAIR principles in being findable, accessible, interoperable, and reusable. Whereas some disciplines have developed suitable domain-specific repositories, DataverseNO is a national, generalist, FAIR-aligned repository for archiving and sharing research data which are not catered for by domain-specific, more appropriate services. The DataverseNO 2030 project proposal is about upgrading, expanding, and integrating the DataverseNO

repository with other research support services at the partner institutions with the following main goals:

- Increasing the FAIRness of research data
- Making the FAIRification of research data more feasible and awarding for researchers, and more efficient for support staff
- Enhancing the transparency and reproducibility of published research results

To achieve these goals, DataverseNO 2030 will

- develop enhanced methods, workflows, and tools to improve the effective depositing, curation, and reuse of research data published in the DataverseNO repository;
- integrate these resources with other research support services at DataverseNO partner institutions (e.g., Electronic Lab Notebooks, DMP tools, and OA publishing services) to establish trusted and awarding models and routines for data verification and publication; and
- improve the informed reuse of these data in research, teaching, and training.

The outcomes of the DataverseNO 2030 project will benefit the Norwegian research communities as well as the larger global community of Dataverse repositories and other research support services by further enabling FAIR research data management. The outcomes are expected to contribute considerably to propel the cultural changes in research that are required for Open Science to become the new default in the Norwegian research landscape and beyond.

Prosjektnummer: 347048

INFRASTRUKTUR-arbeidstittel: Svalbard SuperDARN – a digital upgrade

Vertsinstitusjon: The University Centre in Svalbard (UNIS)

Sammendrag:

In this infrastructure call, we propose an upgrade to the existing Svalbard SuperDARN radar (<https://www.unis.no/project/superdarn-radar/>) – an upper/middle atmosphere research infrastructure facility located close to Longyearbyen, Svalbard, and owned and operated by the University Centre in Svalbard (UNIS).

Having upgraded parts of the radar system in the period 2021-2023 (masts, antennas, feed cables, reflective fence), there is a need to upgrade the radar electronics to future-proof the radar. The Svalbard SuperDARN radar is now running a conventional system that has legacy hardware and radar operating software (ROS), with components that are hard to get, and with limitations on software updates, as well as limitations on radar and data techniques. We propose to upgrade the radar using software-defined radios (SDRs), that will improve the capabilities, flexibility, and security of the radar system. Such a new digital system will, in addition to using modern, off-the-shelf components, also enable more complex experiments – such as imaging capabilities, higher time-resolution and simultaneous multi-frequency operations. In addition, an upgraded system will have the ability to monitor and diagnose technical issues remotely.

Prosjektnummer: 347049

INFRASTRUKTUR-arbeidstittel: Norwegian Centre for Minimally Invasive Image Guided Therapy and Medical Technologies, Phase 2 (NorMIT2)

Vertsinstitusjon: St. Olavs hospital HF, Trondheim (SOH)

Sammendrag:

NorMIT phase 2 (NorMIT2) national infrastructure addresses the needs for national collaboration on R&D infrastructure for less invasive patient treatment, including artificial intelligence (AI) analysis and automation in patient diagnostics, treatment and monitoring. In the operation theatres of the future, AI will be used clinically to automate medical imaging interpretation and planning, clinical decision support, and real time monitoring to optimize patient-specific treatment. For the patients, less invasive treatments means less pain and stress, lower risk of infection, less side effects, and a shorter recovery time. For healthcare providers, less invasive treatments and automated decision support leads to less time-consuming and less expensive medical procedures, reducing the overall cost of healthcare. These type of procedures also have a lower risk for complications, which will reduce the workload of healthcare professionals and improve patient outcomes. In addition, for society as a whole, less invasive treatments has the potential to increase access to healthcare, as they are often less expensive and can be performed in outpatient settings.

The main clinical goal of NorMIT2, is to improve patient care through a national implementation of medical technology towards non-invasive treatment using the therapeutic potential of ultrasound, and making this treatment available for the whole country. MR-guided focused ultrasound (MRgFUS) is an early-stage, non-invasive therapeutic technology with the potential to improve the lives of millions of patients with a variety of serious medical disorders. It offers a disruptive, game-changing alternative and complement to surgery, radiation therapy, drug delivery, and cancer immunotherapy. The technology has the potential to increase the quality and longevity of life and decrease the cost of care by transforming the treatment of a range of indications.

Prosjektnummer: 347050

INFRASTRUKTUR-arbeidstittel: Hospital-based infrastructure for the exchange of EHR, medical images and advanced algorithms – NOR-X-CHANGE

Vertsinstitusjon: Helse Bergen RHF

Sammendrag:

NOR-X-CHANGE aims to establish distributed hospital-based infrastructures across Norway to enable efficient and secure exchange of sensitive human subject data. The exchange of electronic health records (EHR), medical images, algorithms, and tools is crucial for research projects, quality registries, and distributed clinical and research studies. To ensure compliance and patient safety, data transfers between hospitals are backed by legal agreements, and secure pseudonymization techniques. Traditional file-based transfers are inadequate for such complex health data, necessitating the need for models for improved data provenance and checks. Notable progress has been made by local

initiatives in two of the four Norwegian health regions. This grant proposal seeks to expand these efforts across all health regions, providing shared legal documents, system designs, data protection assessments, and expertise in secure data capture and transfers. The project also aims to foster connectivity and integration of hospital-based infrastructures nationally, creating a seamless network for data and algorithm sharing in cross-institutional research studies, registries, clinical studies, and operational support projects. Additionally, the project intends to enable hospital-initiated data and algorithm exports to high-performance computing (HPC) environments suitable for processing sensitive data such as Safe, TSD, HUNT, and Sigma2. By supporting the distribution of proven infrastructure models, this project aims to simplify research with hospital data and provide an interface to other infrastructure projects such as COMPatNor, ELIXIR4 and NorTRE.

Prosjektnummer: **347051**

INFRASTRUKTUR-arbeidstittel: **Nordic Seas Regional Facility of the European Multidisciplinary Seafloor and Water Column Observatory (NorEMSO)**

Vertsinstitusjon: **Geofysisk Institutt (GFI), UiB**

Sammendrag:

NorEMSO represents the Nordic Seas facility of the European Multidisciplinary Seafloor and Water Column Observatory (EMSO) ERIC (European Research Infrastructure Consortium), currently being established. This proposal seeks support to consolidate and enhance the Nordic Seas facility. The objectives of NorEMSO are to improve our understanding of the drivers behind temporal and spatial changes in water mass transformations, ocean circulation, ocean acidification, and thermo-chemical exchanges at the seafloor in the Nordic Seas. By providing high-quality, open-access, and consistent long-term observations of essential ocean physical and chemical variables, NorEMSO aims to contribute significantly to the development of knowledge of the carbon system, water mass transformations, and the marine ecosystem. The current components of NorEMSO's infrastructure include an underwater glider program spanning the Nordic Seas and moored observatories strategically positioned along the perimeter of the Norwegian Sea, at the Arctic gateway in Fram Strait, and on a hydrothermal vent located on the Mohn Ridge between the Greenland and Norwegian Seas. We propose advancing the research infrastructure for the Nordic Seas facility by equipping all sites with biogeochemical sensors and introducing deep-reaching gliders capable of collecting data at full depth. Investments will also be made to foster collaborations, enhance research capabilities, and drive innovation in oceanographic technology. Collaborations with marine infrastructures like SIOS, Euro-Argo ERIC, and ICOS ERIC are facilitating integrated research approaches. Aligned with Norway's research infrastructure roadmap, which calls for improved autonomous and mobile ocean observation systems and for increased sharing of observational data, NorEMSO contributes to national development, knowledge generation, and sustainability goals. By utilizing advanced technologies and promoting a lower carbon footprint and sustainable data collection, NorEMSO is actively instigating transformative changes in the field of marine research.

Prosjektnummer: 347052

INFRASTRUKTUR-arbeidstittel: **Coordinated Online Panels for Research on Democracy and Governance in Norway / Koordinerte online-paneler for forskning på demokrati og styresett i Norge – KODEM**

Vertsinstitusjon: **Universitetet i Bergen**

Sammendrag:

Being at the international forefront of collecting and analyzing survey data has benefited both Norway's social scientists and its democratic governance structures. Remaining in front in the future will require imagining, creating, investing in, and maintaining new sustainable survey research infrastructures adapted to the needs and constraints of the digital age. We propose to do so by establishing fully digital national Coordinated Online Panels for Research on Democracy and Governance in Norway, KODEM. The online panels cover citizens, elected representatives, public administrators, and journalists and have transformative potential along four main dimensions. By establishing KODEM, we will: (a) Better meet the need for data on social and cultural behavior and interaction in multi-disciplinary and social science research addressing complex societal challenges, such as, climate change, energy transformation, environmental sustainability, how to manage migration and complex risks relating to health and security. (b) Elevate a larger share of Norwegian research in these areas to a top international level through facilitating use of experimental methods, longitudinal studies, and coordinated data collection in groups with different functions in society and government. (c) Influence the future development of the social science research system in Norway by requiring more frequent and denser collaboration among research communities, disciplines, and universities not least on data protection, a crucial issue in the current geo-political situation. (d) Make the system for collecting social science survey data more sustainable and resilient by, e.g., safe-guarding study quality, optimizing the use of respondents' time, and setting standards for best-practice on research ethics, archiving and dissemination.

Prosjektnummer: 347053

INFRASTRUKTUR-arbeidstittel: **Wave Energy Research Center in Northern Norway (WENor)**

Vertsinstitusjon: **UiT The Arctic University of Norway**

Sammendrag:

The ocean is full of renewable energy that can be used as a power source to support many cities and onshore and offshore industries. The ocean's renewable energy is in the form of mechanical and chemical energy. Such mechanical energy, as renewable energy, can be harvested by wave, tidal, and wind energy-capturing and converting devices and technologies. In general, power generation from mechanical to electrical energy through fluids has a higher efficiency due to its simplified power transformation, e.g. wind, wave, and hydropower energy. Therefore, wind and wave energy can be considered renewable energy source that has a higher power density due to their distribution of the air and sea surface conditions and that are available adequately. Offshore wind energy technology

has not been adequately developed in northern Norway, even though there are several areas have been allocated for renewable energy, mainly due to possibly non-profitable and harsh operational and maintenance conditions. Hence, integrating wave energy devices with offshore wind turbines can increase the profitability of the renewable industry, specifically where solar energy is not available, e.g. northern Norway. By introducing wave energy harvesting devices around offshore wind platforms can further reduce undesirable motions of the same, as a damping device, while harvesting additional renewable energy. Therefore, the system reliability of offshore wind turbines can further be improved in both design and operational stages, where the respective operational and maintenance costs can further be reduced. This project proposes to establish wave energy harvesting infrastructure in northern Norway to create knowledge and competence on the same field, where existing technology can be evaluated under harsh environmental conditions. The project consortium consists of UiT The Arctic University of Norway, Akvaplan-niva, NORCE, SINTEF and Energi i Nord will share their knowledge and competence in the same field. Therefore, northern Norway can be a center of such a renewable industrial cluster, where such integrated technological innovations can be demonstrated. The increase in renewable energy production can reduce carbon-intensive power production in onshore and offshore cities and industries, where considerable environmental carbon footprints can be reduced.

Prosjektnummer: 347054

INFRASTRUKTUR-arbeidstittel: Kjeller Quantum Infrastructure Program (KQIP)

Vertsinstitusjon: Forsvarets forskningsinstitutt (FFI)

Sammendrag:

Quantum technology (QT) represents a transformative leap in our understanding of the physical world around us and our ability to exploit its advantages. The KQIP project aims to establish a state-of-the-art research infrastructure on quantum technologies. This collaborative endeavour will bring together public, higher education, and research sector entities responsible for metrology, sensor development, communication, and simulation to create a shared infrastructure platform. The project's primary objective is to establish an integrated hardware platform for fundamental experimental research exploring multiple aspects of quantum technologies: quantum computing, - metrology, - sensing and - communication. KQIP will help advance the next generation of metrological measurement capabilities, to be utilized for superconducting (transmon, topological, fluxonium), spin, and photonic quantum computation research and development. Furthermore, the project aims to establish secure quantum communication protocols and networks, promote active collaborations with multiple user groups, and cultivate a skilled workforce in quantum technologies.

The KQIP infrastructure will install a state-of-the-art low temperature dilution refrigerator cluster for quantum metrology & computation research and development, and house a superconducting qubit development pilot-line where a quantum computer node will be maintained. A room temperature photonic node for optical computation and communication will also be maintained. A secure optical network will be developed and deployed, supporting quantum sensing, metrology, as well as optical services for secure communication, precise time dissemination, and distribution of ultra-stable reference frequencies. The outcome of the KQIP will nurture future Norwegian and EU collaborations

regarding software, design and implementation of qubit chips, and provide secure quantum communication infrastructures.

Prosjektnummer: 347055

INFRASTRUKTUR-arbeidstittel: **SAMLA 2.0. National Infrastructure for Tradition Archives in the age of AI**

Vertsinstitusjon: **Universitetet i Bergen, Institutt for arkeologi, historie, kultur- og religionsvitenskap**

Sammendrag:

SAMLA 2.0 is a continuation and further development of SAMLA, NFR No 295964, a national infrastructure for tradition archives that has been established in the period 2020 to 2024. As in SAMLA, the main purpose will be to make archived documentation of vernacular cultural expressions and practices accessible through a national digital infrastructure, and make the source material accessible for the public, for innovative research and for business development. The infrastructure will consist of long-term storage solutions, a database and a searchable trans-institutional web archive, in accordance with the FAIR principles. The online archive will be made accessible on samla.no.

SAMLA 2.0 will include collections that will strengthen the cultural diversity of the SAMLA corpus by including children's folklore, Sami traditions, Kven traditions, queer life stories and seamen's, workers' and crofters' memories. As a result, SAMLA will contain vernacular beliefs, songs, stories, vernacular knowledge and cultural practices of unsurpassed richness, making it a unique online resource for exploring Norwegian cultural history.

SAMLA 2.0 will also focus on machine trained components, such as using handwritten text recognition technology to generate transcripts in combination with crowdsourcing to train the language models, as well as translation models as an underlining technology to enable searches across languages.

In addition to an online archive of the Norwegian folklore and cultural history, SAMLA 2.0 will construct a search engine for Nordic folklore (NordFolk), that will harvest SAMLA and online collections in other Nordic countries. This search engine will enable transnational macroscopic analyses of cultural historical sources and unveil cultural patterns in the sources from the Norwegian archives that go beyond national and linguistic borders.

Prosjektnummer: 347057

INFRASTRUKTUR-arbeidstittel: **Norwegian National Cryo-EM Infrastructure (CryoNOR)**

Vertsinstitusjon: **University of Bergen**

Sammendrag:

Cryogenic electron microscopy (cryo-EM) gives unprecedented 3-dimensional views into the molecular mechanisms of life and disease and enables high-resolution studies on the structure, dynamics, and interactions of biological molecules and large complexes. It allows us to visualize tiny

molecular machines in their native state and to understand how they function in biological processes. Therefore, in the last decade, cryo-EM has become an indispensable, widely used tool in life sciences, including biochemistry, biophysics, biomedicine, and pharmacology.

Despite rapidly increasing interest in and use of cryo-EM internationally and across Norway, Norway does not have any facilities for biological cryo-EM. To fill this void and to boost Norwegian science, we propose to establish a Norwegian cryo-EM infrastructure (CryoNOR), with the main node at UiB and auxiliary nodes at UiT and UiS. The main node will host a full cryo-EM setup to enable sample preparation, testing, and data collection with high-resolution single-particle imaging as well as micro electron diffraction, tomography, and in situ capabilities. The UiT and UiS sites will have auxiliary facilities for high-quality sample preparation. With CryoNOR, cryo-EM will become an integrated part of Norwegian science from structural biology to cell biology, marine biology, nanoscience, molecular evolution, and the medical sciences. Such a facility is critically needed by our scientific community, and the proposal is supported by leading scientists from all major universities in Norway.

Prosjektnummer: 347058

INFRASTRUKTUR-arbeidstittel: EPOS-Norway-Geohazards

Vertsinstitusjon: University of Bergen

Sammendrag:

EPOS-Norway-Geohazards (EPOS-NG) aims to build on and complement existing Norwegian, Nordic and European EPOS efforts to promote research on Norwegian geohazards through improved observational capacity and easy access to data, models and visualization tools for researchers and practitioners working on geohazards and other solid earth science topics. The EPOS-Norway project (2016-2020) has developed and integrated data that map the physical conditions of the Earth's crust and made them available under a unified umbrella, the EPOS-N data portal. In this new phase of EPOS-Norway, research infrastructure will be developed and upgraded allowing us to address new, specific research questions while assuring that the infrastructure will benefit the wider geoscience community and society. We focus on urgent research questions related to assessment of marine, terrestrial and cryosphere-related multi-hazards in a changing climate. EPOS-NG will be composed by three main components: i) instrument pools to support real-time and long-term monitoring of geohazards; ii) datasets, databases and e-infrastructure services relevant for geohazards research and iii) the national EPOS-N portal for data visualization and download. EPOS-NG will develop the infrastructure needed to substantially improve our understanding of the natural hazards affecting Norway and how they might evolve due to climate change, and to facilitate multi-hazard assessment in Norway for hazards such as landslides, earthquakes, and tsunamis. The infrastructure will serve public and industry stakeholders and decision makers, and will have a high societal relevance in making data and services easily accessible to e.g. governmental and local authorities, and risk managers. At the same time, the infrastructure will be highly relevant and accessible to researchers working on other topics in the solid earth sciences and to industry. The infrastructure will integrate and hence maintain its close links to the Nordic and European EPOS communities, to catalyze more international collaboration in particular with European scientists.

Prosjektnummer: 347059

INFRASTRUKTUR-arbeidstittel: NORMOLIM-2 (Norwegian Molecular Imaging Infrastructure – 2)

Vertsinstitusjon: NTNU

Sammendrag:

NORMOLIM-2 is the continuation of NORMOLIM (Norwegian Molecular Imaging Infrastructure) which since 2017/2018 is a national research infrastructure on the RCN National Research Infrastructure Roadmap.

NORMOLIM is also trans-national node in the ESFRI infrastructure Euro-BioImaging ERIC.

These citations from the RCN roadmap describes NORMOLIM in an excellent way:

- *“Imaging technology is a core discipline in tomorrow's biology and medicine. The technology is crucial for gaining new knowledge in biotechnology, molecular biology and physiology and for understanding disease mechanisms and developing new forms of treatment in medicine.”*
- *“The infrastructure will be an important tool for Norwegian biomedical translational research, i.e. research that builds a bridge from basic research to practical application in patient treatment. In this way, the equipment has great social significance. It will also be important for the further development of Norwegian industry within biomedicine”.*

A NORMOLIM-2 application to RCN is of high importance to maintain the state-of-the-art level of the present NORMOLIM and enable investment in new innovative imaging technologies relevant for the infrastructure.

NORMOLIM-2 will:

- continue offering the imaging technologies and methods most popular by the users.
- further develop special methods and applications where NORMOLIM can show unique competence and experience.
- expand geographic coverage by including UiT as a fourth site, in addition to the existing three sites (NTNU, OUS, UiB).
- fully exploit the multimodal imaging possibilities of simultaneous PET/MR Imaging
- contribute actively to translation of PET/MR Imaging into clinical research and patient care.
- keep a strong focus on imaging technologies of importance for biotechnology users.
- develop and apply Artificial Intelligence (AI) tools adapted to extract as much new knowledge as possible from the large collection of image-based data generated in each user project.

Prosjektnummer: 347060

INFRASTRUKTUR-arbeidstittel: Intravital mikroskopi av immunsystemet

Vertsinstitusjon: Institutt for klinisk medisin, UiO

Sammendrag:

In the past two decades, real-time intravital imaging of immune cells has emerged as an invaluable method for studying the dynamics of the immune system within living organisms. Going forward this technique will allow scientists to assess the systems behavior of immune cells in unprecedented detail. Recent advancements in imaging technology, machine learning for data processing, and transgene techniques have further propelled intravital microscopy of the immune system to the forefront of biomedical innovation. By leveraging the recent advancements mentioned above, in close collaboration with international partners and The Norwegian Transgene Center (NTS) we will create a comprehensive core facility. The facility will offer unique opportunities to researchers interested in fundamental immunological studies as well as researchers interested in translational studies, providing profound insights into the underlying behavioral immune landscapes associated with specific phenomena.

Our methodology will involve tracking the behavior of multiple fluorescently labeled immune cells in various anatomical sites, including lymph nodes, thymus, bone marrow, and the gut. These observations can be made over short periods or longitudinally through the use of implantable windows. This approach enables detailed investigations of immune interactions and responses to pathogens, incorporating signaling reporters, cytokine reporters, calcium sensors, proliferation sensors, and cell death sensors. The significance of our core facility extends beyond basic research. The wide range of techniques we offer will be invaluable for studying drug delivery and nanobiological processes in real time, particularly in the context of tumor therapy and personalized immunotherapy. Specifically, our imaging techniques will facilitate the examination of xenografted tumors and the tumor microenvironment in response to therapy using dorsal windows. Furthermore, we will closely collaborate with the NTS to evaluate individual immunotherapy using cutting-edge technology for generating murine mouse models. Combining state-of-the-art imaging technology with a diverse array of techniques and close collaboration with the NTS, our core facility will provide a truly unparalleled resource for scientists. It will enable researchers to gain deep insights into immune system responses to vaccines, pathogens, tumors, and personalized medicine.

Prosjektnummer: 347061

INFRASTRUKTUR-arbeidstittel: Norwegian diachronic corpus 200–1814/Norsk diakront korpus 200–1814 (Norchron)

Vertsinstitusjon: University of Oslo

Sammendrag:

The overarching goal is to build Norchron, a new, national, comprehensive database of texts across historic stages of the Norwegian language (200–1814). It is anticipated that Norchron, with its open CC BY-SA 4.0 licence, will be widely used by researchers in linguistics, philology and history, but also by students and teachers in the education system and even members of the public.

The main tasks across all text types and historical stages are:

- new transcriptions of some texts and improvements of others
- development of a common XML structure for metadata
- fill in metadata (source, geolocation etc.) for each text
- annotation of lexemes and word classes for all texts, and morphosyntactic features and syntactic structure of a selection of texts
- translation at word-level (glossing) for all words
- selection and identification of images of source material
- programming of technical tools and the Glossa search system, including linking to other resources, such as maps and dictionaries.

The text material from the various historical periods is extremely varied both with respect to the number of words and the proportion of material previous annotated. The whole runic material contains 6000 words, with no previous annotation, Old Norwegian non-legal manuscripts contain as much as 700 000 words, of which 600 000 have already been annotated with some grammatical information. There are 10 000 diplomas in Old and Middle Norwegian, of which only a small part, 35 000 words out of 2 mill. words, have already been annotated. The texts from the newest period (Early Modern Norwegian) consist of 120 000 words, and have not been transcribed or annotated. The Norchron corpus will consist of 1.6 million words when ready.

Prosjektnummer: 347062

INFRASTRUKTUR-arbeidstittel: HumanLab

Vertsinstitusjon: Universitetet i Oslo

Sammendrag:

The planned HumanLab research infrastructure will be a world-leading, national facility for non-clinical studies of human behavior, perception, and action. It combines the topical expertise of two Norwegian Centers of Excellence, focused on multilingualism (MultiLing) and rhythm and music studies (RITMO), and their lab facilities and methodological know-how. The new HumanLab infrastructure builds on existing labs with state-of-the-art equipment for audio and video recording, motion capture, eye tracking, muscle sensing, respiration, heart rate, and brain activity measurements (EEG). The aim is to join forces and create a large lab facility that can serve as a national powerhouse for research on complex human behavior in both in-lab and out-of-lab settings. The infrastructure will consist of (1) a co-located physical lab accessible to students and researchers, (2) a mobile lab consisting of numerous sensor kits and technologies that can be used in real-world settings, (3) a virtual lab with technological and human resources for handling complex human-centered data capture, storage, analysis, and archiving, (4) a set of related educational components that can be combined to teach everything from short introductory courses to full MA programs. Funding is sought for setting up the co-located lab space, purchasing equipment necessary to ensure integration and synchronization between existing systems, and human resources to develop the virtual lab. Together, HumanLab will capitalize on the legacy of two successful Centers of Excellence, and make state-of-the-art data-capturing technologies available to students and researchers interested in non-clinical human research.

Prosjektnummer: 347064

INFRASTRUKTUR-arbeidstittel: Inland Health Study (IHS)

Vertsinstitusjon: Inland Norway University of Applied Sciences

Sammendrag:

Inland County is experiencing demographic changes at a faster rate compared to the rest of the country, including an aging population, declining birth rates, and low immigration. These factors have significant implications for population growth and the future maintenance of the region's economic conditions, living standards, and population health. To effectively assess future health conditions and living standards, it is crucial to employ region-specific forecasts, models, and research methods.

The One Health Research Group plan a project called Inland Health Study (IHS). IHS plan to collect data on health status and disease patterns in Inland County examining disease incidence, mortality rates, risk factors, and other health-related indicators with the goal to strengthen public health. Additionally, IHS will analyse long-term trends and patterns, including changes in specific diseases, shifts in risk factors, and the emergence of new health challenges. Changes in population as age distribution, lifestyle factors, access to healthcare services, and environmental conditions can all influence future health outcomes. It is important to identify and analyse the potential effects of these influences on the population's health.

Including the whole population of Inland County, a randomization of the population into operational research groups of sex and ethnicity for the whole range of age groups is acquired. Based on sex and ethnicity, the population will be divided into age-strata, where each stratum should represent a distinct combination of these two variables. The age groups are then to be divided into preferred sample size for each stratum based on research objectives, statistical power considerations, and practical feasibility.

Using a multifaceted approach and diverse methodologies will enhance understanding of health status in Inland County. Demographic variables (age, sex, ethnicity, socioeconomic status, and education level) will identify disparities and variations in health outcomes across population subgroups. Health variables (mortality rates, morbidity rates, medical risk factors, quality of life measures, and mental health indicators) will be emphasized. Common risk factors include smoking, alcohol consumption, nutrition, physical inactivity, environmental hazards exposure, and genetic predispositions.

By emphasizing these key variables, IHS may capture a holistic understanding of the population in Inland County health status and deliver policy briefs for politicians to make valid health decisions for future public health. Such comprehensive assessments provide valuable insights for designing evidence-based interventions and policies aimed at improving population health and reducing health disparities.

Prosjektnummer: 347067

INFRASTRUKTUR-arbeidstittel: Norwegian Hub for non-thermal food processing (FoodProHUB)

Vertsinstitusjon: NTNU, Fakultetet for naturvitenskap, Institutt for bioteknologi og matvitenskap

Sammendrag:

NTNU – The Norwegian University of Science and Technology is, together with SINTEF AS Norway’s knowledge Hub within research, innovation, and education in technology and natural sciences. The Trøndelag region is one of Norway’s most important food-producing areas, having small, medium, and large-scale enterprises pushing knowledge-based innovations in the food sector. In contrast to other regions in Norway, the region’s economy is largely based on food production. Moreover, Trondheim and the Trøndelag region were in 2022 awarded the European Region of Gastronomy, highlighting the food interest in the area. Therefore, NTNU and SINTEF must aim to be the food sectors’ knowledge hub supporting regional and national enterprises in developing sustainable food processing technologies, meeting consumer demands nationally and internationally. Further, NTNU, as a university, must be in front of technology development to succeed in being an attractive educator to the next generation of employees in the sector. The Department of Biotechnology and Food Science (IBT) and the Department of Energy and Processing (EPT) host several relevant study programs meeting the food sectors knowledge needs and, together with SINTEF, have a large network of industry and research collaborators that will benefit from the proposed investments.

Recent years have shown a tremendous increase in consumer demands for healthy, natural, high-quality convenience foods, especially within the fish and seafood sector. Traditional processing technologies such as drying or extensive heating can cause deterioration of nutrients and sensory quality uncompatible with these demands. Moreover, novel technologies are needed in the food sector to reduce energy use and the water- and carbon footprint to meet the United Nations’ sustainability goals. This has led to the development of many novel processing technologies, including several mild technologies.

With this sketch, we aim to develop a hub consisting of infrastructure focusing on non-thermal food processing of marine- and agricultural raw materials. Already existing infrastructure at the different departments will be upgraded and organized to optimize access and collaboration between the units and stakeholders nationally.

Prosjektnummer: 347068

INFRASTRUKTUR-arbeidstittel: Microalgae Technology Nodes of Norway (AlgaeNodes)

Vertsinstitusjon: Norwegian Institute for Bioeconomy Research (NIBIO)

Sammendrag:

Building upon the Research Council of Norway (RCN) funded researcher project (A2F, SUSFEED, EXCELL) green platform projects (AlgScaleUp/AlgOpti), Collaborative (ALGECO) and other internationally funded projects (HORIZON: LOCALITY, ALGAE4IBD; EEA: Algacycle), the members of

this consortium intend to seize the opportunity to unite Norwegian research institutions into a joint initiative, the AlgaeNodes project, to spur innovation and learning to help Norway establish a bio-industry based on microalgae. By establishing integrated infrastructure for cultivation of microalgae throughout Norway, the nodes will be able to significantly contribute to commercialisation of microalgae products, including those for the food/feed sector. This joint effort will contribute towards establishing a national infrastructure grid that will have substantial impact on the future development of the Norwegian microalgae-related industry. Norway is in dire need to increase its competence and research facilities, both at lab-and pilot scales, to ensure that research is innovative and that results are reliable and reproducible, to facilitate knowledge sharing and creating common goods that contribute to the blue bioeconomy-oriented industrial applications. By establishing a national research infrastructure network, AlgaeNodes can establish a viable cooperation and dialogue between academic and laboratory resources and practical industrial projects, based on shared research infrastructure and services. A ten-year plan for microalgae infrastructure establishment and operationalisation will be proposed. The project will build and maintain an open access digital portal for sharing of data, instruments and protocols with industry and other key stakeholders that will become a central national cohesive source of support and stability for microalgae technology-related developments. This web-based service will include a direct link to all project partners separately and their microalgae infrastructure and service offerings. This warrants for an adequate integration of decision makers, commercial interests and other stakeholders engaged in exploring microalgae co-innovation and development, thus, expanding, amalgamating, and standardising Norway's research and innovation capacity for microalgae and related green industries that could contribute to circular blue bioeconomy.

Prosjektnummer: 347069

INFRASTRUKTUR-arbeidstittel: Infrastructure for Norwegian Earth System modelling phase 2

Vertsinstitusjon: NORCE Norwegian Research Centre AS (NORCE)

Sammendrag:

We live in a world that is increasingly becoming tested by changing climate conditions. This trend has ramifications for all levels of society, and it is urgent that we develop and implement efficient mitigation and adaptation strategies. Our collective ability to do so hinges on access to advanced tools and methods that can provide testbeds and critical information about the complex climate system and how it will evolve from the current state and respond to forcing in the near and far future.

The Norwegian Earth System Model (NorESM) integrates sophisticated components of the climate system, enabling the simulation of past and present climate, including seasonal-to-decadal climate predictions and projections of future climate over centuries. An upgraded NorESM infrastructure is required to advance the capabilities of the model in the face of the expanding and complex set of questions asked of climate science, and to successfully deliver the Norwegian contribution to the Climate Model Intercomparison Project 7 (CMIP7), pivotal for climate change assessments such as the Intergovernmental Panel on Climate Change (IPCC). The Infrastructure for Norwegian Earth System modelling phase 2 project (INES2) will enable a cutting-edge and verified NorESM required to

address identified science goals of the national climate research community. It will advance knowledge, including that needed for climate services, on future climate change and impacts, with a special focus on high latitudes, Norway and adjacent regions.

INES2 aims to provide an infrastructure for efficient model simulations, storage, analysis, validation, documentation and training available for the national climate science community and collaborating international groups, and connect to national and international data grids which ensure that model data is efficiently shared and complies with established high standards of the climate community. Climate modelling in Norway is highly dependent on High Performance Computer (HPC) and storage systems provided by Sigma2. INES2 will ensure continued and efficient utilization of these systems.

INES2 will provide a strong and necessary boost to the national climate research community, ensuring also in the future high involvement of NorESM in projects (currently in 12 EU, 31 RCN, 7 internal institutional, 3 other national funding, and 1 Nordic). The project partnership constitutes seven established Norwegian climate research institutions, which are also partners of the NorESM Climate modelling Consortium (NCC).

Prosjektnummer: 347070

INFRASTRUKTUR-arbeidstittel: National Platform for NanoSafety

Vertsinstitusjon: Department for Clinical Dentistry, Faculty of Medicine, University of Bergen

Sammendrag:

The National Platform for NanoSafety (Nano4S) builds upon the SafeNano Norway Network and successful collaboration of the partners in previous and current national and European projects focused on the safety assessment of nanomaterials (NMs) and nanomedicines (NMDs). The ever-increasing number of NMs and nano-enabled products has led to an increase in the potential exposure of workers, users, consumers, and the environment. The most recent example is the use of NMDs in the lipid nanoparticle-based Covid-19 vaccines; as of March 2023, more than 14 million doses have been administered in Norway. A sound scientific basis is needed to assess the human and environmental impacts and risks, in order to inform regulatory decision-making bodies and ensure a responsible development of nanotechnology. **The aim** is to provide stakeholders, e.g., industry, academia, research centres, institutions, and consumers, with **easy access to the expertise, state-of-the-art instrumentation, infrastructure, and methods to assess the exposure, hazards and risks associated with NMs and NMDs**. It will provide a national hub to **support the safer-and sustainable-by-design development (SSbD)** of NMs and NMDs and facilitate the application of nanosafety principles to products and industrial processes. Nano4S will assess the physico-chemical characteristics and biological effects of various types of NMs, including NMDs and vaccines, polymer-based 'nanoplastic', and complex composite nanostructures. We will especially address the urgent need for advanced biological models and NM-interference-free methods that mimic real-life exposure to NMs and provide reliable results, with emphasis on high-throughput testing. Nano4S is **strategically anchored** in prioritized research areas of the host institutions. The consortium (UiB, SINTEF Industry, SINTEF Ocean, STAMI, NILU, NMBU) is transdisciplinary, comprising expertise in regulatory risk assessment, (eco)toxicology, biology, genetics, medicine, dentistry, chemistry,

physics, biophysics, electronics, automation, and is **ideally placed for the HEU framework program**, as demonstrated by partners' participation and coordination of ongoing H2020 and HEU projects. The service, state-of-the-art knowledge and innovative strategies developed within Nano4S will benefit **nanotechnology companies, regulatory authorities and the research community**.

Prosjektnummer: 347071

INFRASTRUKTUR-arbeidstittel: Norwegian Ocean Tracking System

Vertsinstitusjon: NORCE

Sammendrag:

The oceans are increasingly accessible due to the availability of new technologies that facilitate marine biological and oceanographic monitoring. Telemetry is a tool for animal monitoring that has greatly enhanced the capacity to observe processes within the ocean and understand drivers of change. Higher resolution data on the distribution, behaviour, physiology, and demography of marine animal communities contributes to better marine spatial planning including siting of aquaculture, fisheries policy, and marine industry operations. Because global positioning systems cannot penetrate through water, most aquatic telemetry uses acoustics, in which a tag emits a sound detected by a receiver, providing an indication of the tagged individual's position. The quality of data returned by acoustic telemetry is therefore highly dependent upon the distribution of the receiver array; an animal cannot be detected where there are no receivers. Large-scale telemetry networks have emerged in Canada, Australia, the United States, South Africa, Denmark, Belgium, Great Britain and other countries with coordinated marine tracking efforts. Norway is home to many economically important and vulnerable species that are tracked using acoustic telemetry, including salmon, trout, cod, eel, tuna, various sharks, and more. A coordinated effort to maximize the potential information can greatly enhance the information yielded by acoustic telemetry. Norwegian Ocean Tracking System headquartered in western Norway and built up from the existing infrastructure around Bergen is proposed, and will comprise fixed infrastructure available to aquatic researchers in Norway to investigate the patterns and drivers of animal movement and potential disturbances that they encounter from human activities (e.g. offshore wind, shipping, aquaculture, energy platforms, fisheries). This proposal details an ambitious plan to combine the capacity of NORCE Norwegian Research Centre with the Ocean Tracking Network to deliver an infrastructure project that will have long-term benefits to industry, policy, science, and society in Norway.

Prosjektnummer: 347072

INFRASTRUKTUR-arbeidstittel: The UiT IoT to (extreme) Edge testbed

Vertsinstitusjon: UiT The Arctic university of Norway

Sammendrag:

Systems composing the Edge to IoT continuum, an end-to-end approach of computing systems surrounding us, are becoming widely adopted. It includes Cloud, IoT, Fog and Edge systems. However, these systems and their combination started out being relatively simple, but soon became

too complicated to understand and improve without powerful tools allowing to explore and experiment with their behaviour. Such systems have been and are being researched and developed both by academia and industry. As a nation, it is dangerous to be only users of such systems. We need to better understand and have control over our infrastructures to deal with, for example, intended or not intended failures, we must be builders. This can only happen over time by a focused effort to build such systems. We propose to build a testbed for the Edge to IoT continuum, an infrastructure proposing the necessary tools to tinker with and explore these systems. Among the needed computing systems to be studied Edge to IoT systems are recognized to have key challenges, by ICT experts around Europe¹. A new paradigm comes with new challenges with regards to scaling and granularity of existing areas of concern including energy efficiency, ecological impact, security, privacy, reliability, maintenance, and reusability. To properly contribute, a scientist answering computer system challenges needs to design, build, test, experiment with, and validate prototypes. However, it is always necessary for such researchers to build their own experimental prototypes. The time, cost and effort to do this typically leads to short-cuts, resulting in missing functionalities and bugs. Such prototypes may never be used again.

At UiT, our answer is to create a testbed providing an extensible and remotely configurable experimental platform for IoT to Edge systems, where a user of the system can log-in, reserve nodes for exclusive use for a given amount of time (bounded by rules and regulations), deploy a software system (from OS to services), and conduct experiments. We want users to have full control over their experiment parameters. Users of such systems can include teachers, researchers and students (from undergraduate to PhD). A specificity of our testbed is that it focuses on the very edge of what is today called the “computing continuum”.

Prosjektnummer: 347073

INFRASTRUKTUR-arbeidstittel: Norwegian centre for railway sound & vibration

Vertsinstitusjon: SINTEF AS

Sammendrag:

As part of the green transition an increase in railway use for the transport of goods and people is mandatory and expected. However, railway traffic generates noise and vibrations, which can lead to annoyance of people, negatively impact animals and ecosystems, and can lead to damage of tracks, trains, and surroundings. Bybanen in Bergen, for example, receives around 10 complaints annually from neighbours, while Sporveien receives around 260 complaints from residents in Oslo. Today, 2-7 % of the budget when building new tracks are used for noise and vibration reduction and mitigation. These mitigation measures are often not optimized, and thus more expensive than they need to be. This is largely because of high uncertainties regarding the source excitation, the sound and vibration propagation, the effect of the mitigation measures, and the perception and effect on health of people.

While sound and vibration are of annoyance, they also carry information that can be used systematically to monitor railway traffic and the condition of the rail structure, the rolling stock, related infrastructure (e.g., tunnels, bridges), and the surrounding environment (built and natural). Making use of the information carried by sound and vibration signals to improve maintenance and safety is equally important as trying to reduce them.

Through the creation of the **Norwegian Centre for railway sound & vibration** we follow a holistic approach enabling investigations into positive and negative effects of railway generated sound and vibration. Building state-of-the-art infrastructure to study railway generated sound and vibration will allow Nordic researchers and industry actors to develop better tools for railway track planning, better measures for sound and vibration mitigation and damping, novel condition monitoring techniques and improved condition-based maintenance. The infrastructure will consist of a range of acoustic and vibration sensors (microphones, accelerometers, geophones, distributed acoustic sensing) in combination with control sensors (strain gages, inclinometer, camera, RFID readers), and equipment to reproduce sounds (audio-video equipment, minitraction machine). Thus, we will build a platform to carry out research projects to gain a better understanding of sound and vibration generation, propagation, and perception, which can lead to improvements and new inventions of analyses and modelling tools, integration into digital twin solutions and, thus, cost reduction and increased railway safety.

Prosjektnummer: **347074**

INFRASTRUKTUR-arbeidstittel: **ECOSYNERGY: Pre-project towards multisensor automated biodiversity monitoring infrastructure**

Vertsinstitusjon: **Norwegian Institute for Nature Research**

Sammendrag:

The loss of biodiversity is one of the main threats to humanity's survival. But only if we know what is there, can we make an effort to preserve it. Monitoring is crucial for tracking the state and change of biodiversity with respect to the EU Biodiversity Strategy for 2030, the UN Decade of Restoration, and the Convention on Biological Diversity. Monitoring of biodiversity and ecosystem change requires a holistic approach. While existing methods provide high quality data for some aspects of biodiversity, gaps exist both on temporal (e.g. phenology), spatial (e.g. large-scale spatial coverage) and taxonomic (e.g. insects) scales. For this reason, we urgently need new instruments and modernisation, in the form of automation and digitalisation, for monitoring biodiversity. The ECOSYNERGY project aims to create a blueprint for an automated, nationally distributed biodiversity monitoring observatory in Norway. This blueprint will identify (i) stakeholder (scientific, management, industry) interests and needs, (i) the structure of an automated biodiversity observatory based on nationally distributed biodiversity monitoring stations, (ii) the most appropriate combination of sensors and methods to be incorporated in each monitoring station, (iii) mobility (stationary or drone-based), connectivity and power solutions and (iv) data management and automated data extraction and analysis. This will yield the blueprint of a biodiversity monitoring station, much akin to present day weather stations, nationally distributed as a national biodiversity monitoring observatory providing data for monitoring and predicting the state and change of Norway's biodiversity.

Technological advancement of novel detection and identification methods is opening up new avenues for tracking species populations and assemblages¹. These technologies, which include automated image- and sound recognition, molecular identification, and remote sensing by means of radar, lidar and earth observations, have the potential for unprecedented improvements in taxonomic, temporal and/or spatial resolution and coverage, as well as our ability to understand and

extrapolate these changes¹. However, each of the available technologies has strengths and weaknesses regarding their taxonomic or functional scope, the essential biodiversity variables² they can provide observations for, and the spatial extent over which biodiversity can be assessed. For example, molecular methods provide high taxonomic detail on local samples, whereas radar provides data covering a large area, but only with a low taxonomic resolution. These limitations may be overcome by the simultaneous deployment of multiple technologies, which can also provide the ground-truthing data needed to enable extrapolations of biodiversity state and -change using remote sensing.

The main aim of ECOSYNERGY is to develop a blueprint of a holistic nationally distributed biodiversity monitoring observatory in Norway. Through this Infrastructure pre-project we will achieve ECOSYNERGY's aim via combination of literature review, workshops and meetings, and networking internationally. International networking will focus on connecting with countries that have already taken the leap into developing large-scale automated biodiversity monitoring such as The Netherlands ARISE project (<https://www.arise-biodiversity.nl/>), the German AMMOD project (<https://ammod.de/>).

Prosjektnummer: 347075

INFRASTRUKTUR-arbeidstittel: Microdata.no Cross-FAIR. FAIR access to microdata across sectors and disciplines.

Vertsinstitusjon: Sikt – Norwegian Agency for Shared Services in Education and Research/Sikt – Kunnskapssektorens tjenesteleverandør (Sikt)

Sammendrag:

Microdata.no was launched in 2018 and is an established national data infrastructure for FAIR, quick and safe access to large quantities of register data from Statistics Norway (SSB). It is owned, developed and operated by Sikt and SSB. The proposed extension makes register data from established national health registers equally available on the infrastructure, linkable with socio-economic and demographic data from SSB. The extension will improve functionality for statistical methods including longitudinal methods and methods relevant for health research, through collaboration with user communities across different domains, disciplines and sectors. New functionality will be matched with the development of statistical disclosure control techniques to ensure continued safe statistical outputs for all analyses.

Simpler and more user-friendly tools will be developed as part of the public variable catalog to further fulfill the “as open as possible” ambition and allow researchers and analysts in a data discovery phase fast and safe access to statistical outputs from register data on the platform.

Microdata.no can serve many needs regarding access to register data, but it is also a part of a larger ecosystem of data and services that combined can serve a broader range of needs. The extension will align and integrate microdata.no with tools and processes in Helsedataservice and SSB's section for microdata for handling data applications and the subsequent release of data onto secure platforms. An important goal is to simplify and shorten the process of accessing register data, regardless of access mode. This includes supporting the many research projects that require data across sectors

and register owners. Sikt and SSB will continue ongoing collaborations with KUDAF, other national registers and Nordic statistical agencies with interest in using microdata.no for data sharing. The consortium will follow other data ecosystems such as EHDS closely to be positioned to collaborate and interact there.

Prosjektnummer: 347076

INFRASTRUKTUR-arbeidstittel: Norwegian Plant Phenotyping Platform (PheNo)

Vertsinstitusjon: Norwegian University of Life Sciences (NMBU)

Sammendrag:

Advances in plant research and industrial innovations will be crucial for increasing food production and adapting to climate change. Recent years have seen big advancements in molecular genetics and genomics while the quantitative analysis of plant phenotypes is still a major bottleneck. While many European countries have established national phenotyping platforms, Norway has no such national infrastructure despite a great demand from national and international users. *PheNo* will provide the Norwegian research community with the needed plant phenotyping facilities to address these societal challenges and enable high quality research at the international forefront across the scale from basic plant biology research to applied plant breeding. State-of-the-art facilities for phenotyping of plants under controlled climate conditions in growth chambers and daylight phytotrons will be provided at localized facilities with specialized competences and unique growth conditions operated by the Norwegian University of Life Sciences (NMBU), the University of Oslo (UiO), the Arctic University of Norway (UiT) and the Norwegian Institute of Bioeconomy Research (NIBIO). To serve plant breeding and precision agriculture research on crop plants, high-throughput field phenotyping facilities will be established at NMBU and NIBIO with use of UAVs and field robots. IoT-based networks of environmental monitoring sensors will couple the phenotype data to soil and air parameters, and phenotyping installations in polytunnels will enable semi-controlled field conditions and root studies. The Norwegian University of Science and Technology (NTNU) will contribute expertise on image analysis, IoT and deep learning. Affordable high-quality phenotyping will be provided to users by use of flexible platforms that can be tailored to user needs, and at the same time adhering to user community standards. By filling gaps in the European plant phenotyping landscape, *PheNo* will become a Norwegian node in the ESFRI roadmap project EMPHASIS. This will make the infrastructure available to research groups across Europe and importantly, at the same time facilitate access for Norwegian researchers to the other available European research infrastructures.

Prosjektnummer: 347077

INFRASTRUKTUR-arbeidstittel: BRIS1717 – Building research infrastructure for partnerships for sustainability-driven co-creation

Vertsinstitusjon: Det Utdanningsvitenskapelige Fakultet (UV)

Sammendrag:

BRIS1717 is a new category of digital and place-based infrastructure for multistakeholder partnerships for sustainable research & development with a strong focus on building and sharing experiences, resources, and strategies for co-creation, social innovation, and research approaches for co-creation/collaborative governance.

Co-creation is a relational approach highlighting long-term and equitable collaboration between different actors, such as public, private, and voluntary organizations, to define common problems and design and implement new, better, and feasible public solutions. The University of Oslo (UiO), and the partners of this initiative play a central role here and aspires to strengthen dialogue with the outside world and strive for societal innovation and promoting knowledge in use.

Until now, research on co-creation as an emerging cross-disciplinary field has not been supported by its own research infrastructure in the HUMSAM field, and BRIS1717 implies pioneering work in this area. Co-creation is particularly relevant for understanding and tackling 'wicked' problems that confronts society. In this application, particular emphasis is placed on a broad spectre of sustainability issues that presupposes a collaborative research and development approach; climate and energy transition, public health, social justice, democratic renewal, and education for sustainable development. These are all topics that span very widely and may be illustrative of how co-creation can support pathways towards sustainable transformation, and thus provide valuable and varied insights into how such infrastructure should be designed.

Prosjektnummer: 347078

INFRASTRUKTUR-arbeidstittel: GENESS: A Living Lab for Next-Generation Thermal Energy Storage

Vertsinstitusjon: University of Stavanger

Sammendrag:

GENESS aims to establish an innovative platform and living laboratory for the use and storing thermal energy in underground boreholes. The research team chose the geological setting of Norway as an opportunity and aims to address the growing demand for sustainable energy solutions by exploring the potential of borehole thermal energy storage (BTES) systems, where excess thermal energy, e.g., waste heat from industrial processes or solar energy, can be stored in the ground during periods of low demand. The living laboratory serves as a practical testing ground to assess the performance, efficiency, and scalability of different integrated BTES technologies.

Norway has both national and international prominence in the field of thermal energy storage and has successfully implemented several large-scale BTES projects in Asko Vestby, Drammen and

Kaldnes, which serve as valuable demonstration sites for other countries. With the next generation of BTES, GENESS will contribute to i) district heating where BTES offers a reliable and environmentally friendly heating option that reduces electricity consumption and greenhouse gas emissions; ii) renewable energy integration, where BTES utilises the stable temperature of the surface (solar energy) or subsurface (ground heat), providing a sustainable and efficient heating solution for residential, commercial, and industrial buildings; iii) waste heat management, where BTES enables the management and storage of excess heat from data centres, incineration plants and other industrial processes, and iv) climate change monitoring, where BTES enables the continuous monitoring of temperature changes at shallow intervals over different time periods. The GENESS living laboratory also acts as a research vessel and observatory to study and monitor the Earth's climate. It can be part of a climate monitoring network and serve as a centre for Earth observation. GENESS is therefore, expected to inspire and promote national and international collaborations for better and efficient integration of thermal energy storage systems as a pathway to energy transition and decarbonisation of the heating and cooling system.

Prosjektnummer: 347079

INFRASTRUKTUR-arbeidstittel: Hydrogen Accelerator Lab at Technology Park Risavika (H2ACCLab)

Vertsinstitusjon: NORCE

Sammendrag:

Hydrogen Accelerator Lab at Technology Park Risavika - **H2ACCLab** - is a new research infrastructure which will fill the gap between novel lab scale H₂ production technologies and industrial scale technology validation. H2ACCLab is planned with necessary components of industrial relevance in order to accelerate technology development of novel technologies from scientific research , innovation start-up, SMBs as well as technology developers from larger organisations to prepare for investment decisions.

Technology Park Risavika (**TPR**) is owned and operated by NORCE. The site was originally built as a gas technology centre in 2016 by Shell and Equinor (Statoil) to develop clean gas technologies. **TPR** is well prepared with sufficient natural gas supply through pipelines (both high capacity pipeline from Kårstø, and low capacity pipeline for gas supply in the region), electrical / heat (4 MW/8 MW) to support the proposed H₂ technology accelerator. It is one of the main research facilities for ongoing large scale pilot and demonstration in biotechnology and H₂ production technology with funding from EU, RCN and private investors.

H2ACCLab will also be co-located with the existing national infrastructure **NBioC** currently being used for demonstration of a number of biological based fermentation processes to produce high-value feed and chemicals using CO₂ and other sustainable carbon feedstocks. Jointly, these will form a unique accelerator for developing hydrogen and carbon-based value chains. In addition, its geographical location, surrounded by the LNG plant, Risavika harbour, O&G supply base, logistic and transport companies as the neighbourhood of **TPR**.

Prosjektnummer: 347081

INFRASTRUKTUR-arbeidstittel: Norwegian National cryo-EM infrastructure (NOR-Cryo)

Vertsinstitusjon: University of Oslo

Sammendrag:

Cryo-electron Microscopy (cryo-EM) has become one of the most important techniques in the Life Sciences. It allows structure determination of biomolecules to atomic resolution, which plays an important role in many disciplines spanning all natural and medical sciences. Tomographic variants of this technique can be used to determine high-resolution structures *in situ*, in the context of the cell. Unlike other high-resolution techniques, cryo-EM is particularly well suited to study large dynamic biomolecular complexes, allowing structural insights into many important drug targets. Accordingly, cryo-EM proved indispensable in the recent Covid 19 pandemic, when the structures of many viral proteins were determined and used to develop new drugs as the virus was evolving.

The technique requires the use of cryo-electron microscopes that are not currently available in Norway. In contrast, other Nordic countries (Sweden, Denmark, and Finland) all have national cryo-EM facilities with several microscopes in each network. To address this deficiency, we propose to create a national cryo-EM network (NOR-Cryo). We see UiO as a leading centre, especially in view of the new Life Science Building (LSB), Norway's largest natural science building, currently under construction in Oslo. Here, a custom-built facility to house cryo-electron microscopes is already planned to become an integral part of core facilities ranging from structural biology, electron and super-resolution microscopy to proteomics and chemical screening facilities, providing a central location for cutting-edge life science research.

In addition to UiO, other centres in the country are in urgent need of national cryo-EM infrastructure, especially UiB, where a rich scientific community has already developed strong expertise in cryo-EM. Therefore, we propose a Norwegian national cryo-EM network that spans the entire country and includes two main centres (UiO and UiB).

Prosjektnummer: 347082

INFRASTRUKTUR-arbeidstittel: UWANE – UnderWater Acoustic Network Emulator

Vertsinstitusjon: UiB

Sammendrag:

Efficient development of innovative solutions for ocean monitoring is essential to bring new technologies to the market rapidly. Reduced need for field-trials and research cruises for testing and verification of new functionality and performance will boost the research and development process significantly. Wireless underwater communications reduce the need for cabling and is also simplifying the deployment and associated cost for marine observations. On the other hand, water is a complex and demanding media for wireless communications using acoustic transmission. Use of reliable and comprehensive emulator tools for testing and verification is therefore very important as an efficient tool for researchers and developers.

This pre-project aims to identify existing modules and the need for new developments for the integration of the required functionality of an Underwater Acoustic Network Emulator (UWANE) and lay out a plan for the implementation of such an infrastructure. The activities in SFI Smart Ocean show that this would be a very valuable asset for more efficient innovation and implementation of underwater communications. Both the partners of the SFI and other oceans industries and research institutions could benefit largely from the use of such a tool in their research and development work.

Prosjektnummer: 347083

INFRASTRUKTUR-arbeidstittel: Establishment of a Norwegian Theranostic Cancer Center

Vertsinstitusjon: St. Olavs hospital

Sammendrag:

“Theranostics” combines therapeutics and diagnostics in one package to treat cancer. Paired radioactive agents (radiotracers) are used, one for diagnosis, and another chemically similar for treatment. Theranostics has gained importance in the era of personalized medicine, since it allows for customized management for diseases, refines patient selection, better predicting treatment responses and estimating prognosis.

Theranostics uses molecular imaging, most often PET, combined with anatomical imaging (CT or MRI) to see if specific tumor receptors are present on tumor cells. If the diagnostic scan is positive for these tumor receptors, a radiotracer that selectively targets these receptors is injected into the patient. The radiotracer then accumulates in the tumors and deliver cytotoxic radiation to the cells over time.

The most common isotopes used for treatment in Norway are Iodine-131 ($^{131}\text{I-Nal}$) for thyroid cancer, Radium-223 ($^{223}\text{RaCl}_2$) for patients with metastatic bone lesions and Lutetium-177 ($^{177}\text{Lu-DOTATATE}$) for patients with neuroendocrine tumors. A national decision to also introduce ^{177}Lu -treatment ($^{177}\text{Lu-PSMA}$) for patients with metastatic castration-resistant prostate cancer is expected during 2023, and since this is a large patient group, implementation of this treatment will put high demands on the hospitals. New research also suggests treatment benefits for patients with brain tumors, like glioma and meningioma, using ^{177}Lu -labelled agents, and St. Olavs hospital/NTNU have now started one of the first theranostic studies in the world for patients with high-grade gliomas (2023). With the advances of new therapeutic radiotracers, like $^{177}\text{Lu-FAPI}$, there is also an increasing demand for more theranostic research to provide radionuclide treatment for other patient groups, including patients with pancreatic-, gastro-intestinal-, breast- and gynaecological cancer.

The field of theranostics has proved its effectiveness and is rapidly evolving worldwide. There is a growing national interest to provide such treatment options for patients in Norway, but the access is still highly limited due to the lack of infrastructure and dependence on external purchase of therapeutic radiotracers. An establishment of a theranostic cancer center would be a cornerstone for first-class cancer treatment, opening a new page in the development and implementation of personalized, state-of-the art, precision medicine.

Prosjektnummer: 347084

INFRASTRUKTUR-arbeidstittel: SIOS DT: Digital twin for the extended water cycle in Svalbard

Vertsinstitusjon: NORCE Norwegian Research Centre AS

Sammendrag:

The Svalbard Integrated Arctic Earth Observing System (SIOS) coordinates most of the science infrastructure in Svalbard. The suggested new infrastructure will provide data input to Earth System Science on long and short timescales under the SIOS umbrella. Current infrastructure gaps are defined in the context of SIOS Core Data and highlighted in annual State of Environmental Science in Svalbard (SESS) reports. One major shortcoming identified in the SESS reports is a lack of a holistic observation (in situ and remote sensing) and modelling system to study the extended water cycle in Svalbard. Key observations of water cycle are absent, which hinders an efficient synergistic use of observations and models. We aim to address this by extending the observational network and developing a Digital Twin for the water cycle. The application covers major infrastructure needs of Norwegian SIOS members closely coordinated with international SIOS partners. The suggested infrastructure will have near real-time data transfer where possible to enhance data availability in operational forecasting models for all relevant earth system components. Thematically the application covers:

- Measurement and data infrastructure to expand the knowledge and understanding of the water cycle and its current changes due to climate change, since the water cycle strongly influences the environment and society.
- Earth system model runs stored as FAIR data in SIOS data store for all major components of the water cycle (terrestrial snow, glaciers, permafrost, hydrology, atmosphere and coastal water including sea ice).
- A novel digital twin framework for the extended water cycle based on the infrastructure, models and open data and state-of-the art machine learning algorithms. This will foster evolvement of holistic science, where interactions and interrelations between earth system components can be studied effectively using modern AI technology.

Emphasis is made to make essential data FAIR and to facilitate operational use of data, which will have local and regional benefits (SIOS Data Management System, NorDataNet). Relevant system components will incorporate remote sensing, for validation and extension of the spatial coverage and to reduce the environmental footprint. The proposed infrastructure will, establish Svalbard as a leading Cal/Val reference site for high Arctic Earth observation. The extended availability of ground truthing instrumentation on Svalbard in specifically around Longyearbyen and Ny Ålesund is essential. The SIOS observation network will serve as a reference site and laboratory for observing and understanding the larger trends in the Arctic changing climate, as well as regional and local impacts on Svalbard. Through SIOS the infrastructure will be closely linked to the activities in Hornsund. We will work closely with local authorities and institutions ensuring essential societal use of the SIOS observations, thus directly impacting societal ability to handle the changing climate. **SIOS DT** is a continuation to the InfraNOR programme, complementing and contributing to integrating

SIOS towards a holistic observing system. The total cost of the infrastructure is indicated to be 150 million NOK (100 million NOK from RCN) over the 5-year period.

Prosjektnummer: 347085

INFRASTRUKTUR-arbeidstittel: Norwegian Scientific Data Network (NorDataNet) – an extension

Vertsinstitusjon: Norwegian Meteorological Institute (MET Norway)

Sammendrag:

The Norwegian Scientific Data Network (NorDataNet) is a distributed interdisciplinary data management infrastructure providing the scientific community with integrated, cost-efficient and sustainable e-services for data management and data publishing. This is achieved by integrating established national data centres and extending their services through the integration effort. The concept of FAIR data and FAIR principles are the core values for the development of the infrastructure and its services, as well as for the integration of the data centres providing assets to the project and engaging in the implementation of de facto international standards for data documentation, long-term preservation, discovery and reuse.

Such efforts are targeting several aspects of data sharing, from data publication to data findability and data reuse. The infrastructure and the provided services are supporting data providers in the different steps of the publication process, providing tools that can ease the preparation of data. This includes making it compliant to the appropriate standards, providing guidance and software/services/tools for proper data documentation, including licensing and citation as well as defining dataset granularity.

Moreover, NorDataNet is aiding publication, distribution and long-term preservation of data through the participating data repositories. By exposing the data records and giving easy online access to the published data, the infrastructure is supporting dissemination and reuse through the data portal and machine-readable interfaces available for the community. Supporting users implies improving interfaces which allow data discovery and access and providing standardised, robust and reliable services that can enable multidisciplinary research. Services provided by NorDataNet, include visualisation, validation and transformation toolboxes, data upload and integration services towards NIRD/Sigma2 data services and service platform. These services will be evaluated, improved and tuned to meet new needs in the community. NorDataNet has a strong commitment towards knowledge sharing and education through focused user interaction and outreach, e.g. by offering FAIR data management courses and webinars to Norwegian scientists. Furthermore, NorDataNet emphasises the linkages with international frameworks and activities, preparing the infrastructure for integration with European services as developed through the European Open Science Cloud (EOSC).

Prosjektnummer: 347086
INFRASTRUKTUR-arbeidstittel: Norwegian EXposome plaTform - NEXT
Vertsinstitusjon: NIPH

Sammendrag:

The Norwegian EXposome plaTform (NEXT) will offer the tools to measure the totality of environmental exposures (the exposome) experienced by an individual over its lifetime, associated biological responses and how these exposures relate to health effects. NEXT will aid to identify ways to reduce the impact, assessing the efficacy of measures and facilitating outreach and knowledge transfer to stakeholders and the general public to both Norwegian and international research communities. Exposure to hazardous chemicals is considered as one of the main ongoing and future health threats and a significant factor in the development of non-communicable diseases (pollution was estimated to lead to 9 million early deaths in 2015 (*J Landrigan et.al., 2017, The Lancet Commission on pollution and health*)). NEXT will leverage the European ESFRI project EIRENE to establish a state-of-the-art infrastructure for groundbreaking research on the human exposome. It will include advanced mass spectrometry platforms, 3D tissue models and other advanced in vitro systems, wearable pollution sensors, advanced urban/built and natural environmental sampling tools, big data modeling and the permanent establishment of the Norwegian Environmental Biobank (Miljøbiobanken) for human samples at NIPH. NEXT partners are leading institutes in human biomonitoring, environmental monitoring, hazard and risk assessment and participate in a large variety of exposome projects. National funding is crucial for Norway's participation in EIRENE. NEXT's primary focus is to fill knowledge gaps of national and international importance, as identified in the ESFRI roadmap. It will offer infrastructure to facilitate the characterization of the internal and external exposome using innovative mass spectrometry platforms including mass cytometry and imaging techniques. An infrastructure for translating data from new approach methodologies to humans, via toxicological testing will be established. To facilitate future exposome research in Norway of broad national and international relevance, Miljøbiobanken will be interlinked with the Environmental Specimen Bank (ESB Norway) and the two new modules of e-infrastructure established within NEXT: Digital Sample DataBanks for monitoring (also retrospective) human and environmental pollution. Considering the impact of climate change, biodiversity loss, and food safety on human health, all interlinked with the exposome, NEXT offers a holistic approach to address these complex and critical challenges and will assist in knowledge transfer by the use of high dimensional analysis tools, data processing, validation and access.

Prosjektnummer: 347087
INFRASTRUKTUR-arbeidstittel: Digital Infrastructure for Research in Teacher Education
Vertsinstitusjon: Oslo Metropolitan University, Department of Primary and Secondary Teacher Education

Sammendrag:

Recent societal level challenges like the global pandemic, security situation and the rapid emergence of artificial intelligence have had perhaps no greater impact than on practices of teachers, students,

and schools. We need research infrastructure to systematically and rapidly understand these and future challenges. Large investments have been made in developing and implementing comprehensive five-year integrated teacher education programs for primary schools (2017-2022). It is vital that these investments are followed up with a commitment to research for developing resilient schooling and teacher education programs that address the needs of children and young people in terms of their upbringing and education. To achieve high-quality research in this field, teacher education institutions need quality assurance for FAIR (Findable, Accessible, Interoperable and Reusable) research infrastructures to systematically collect, access, analyse and manage data. Research-based teacher education programs may thus increase the public's confidence in the resilience of the teaching profession. The purpose of this INFRA project is to develop a digital teaching and learning lab, a statistical database on teacher education, and a multimodal data analysis archive adapted teacher educators' research responsibilities, and finally, a forum for such research infrastructures, for a) the betterment of integrated teacher education programs and the teaching profession, b) to reveal potential for joint research across teacher education academic environments and c) to strengthen the research partnership with the field of practice. This contribution will lead to new knowledge and innovation in teacher education and schools. Collaboration across institutions on research infrastructure will strengthen Norwegian research on teacher education programs and for schooling in both a national and international perspective. There are realistic opportunities to position Norwegian research in teacher education at the international research front in several ways. These include strengthening our abilities to conduct teaching innovative experiments and the role of digitalisation in teaching and learning; systematising our wealth of existing, yet piecemeal multimodal teaching and learning data; taking advantage of the pre-service teachers as research partners; and developing new forums for advancing research ethics and collaboration in teacher education research.

Prosjektnummer: 347088

INFRASTRUKTUR-arbeidstittel: NorCRIN 3: Elevation of the Norwegian Clinical Research Infrastructure Network, NorCRIN

Vertsinstitusjon: Haukeland University Hospital - Helse Bergen HF (org.nr. 983974724)

Sammendrag:

NorCRIN was established in 2012 and has, in this timeframe, become the Norwegian node of the European Clinical Research Infrastructure Network (ECRIN) and developed a strong collaboration between the 6 university hospitals in Norway. NorCRIN offers researchers involved in clinical studies extensive local, national, and European research support in an evolving landscape. NorCRIN provides essential training in line with national and international regulations and standardized operative procedures (SOP's) implemented as best practice by all regional health authorities. Through continuous upgrading within NorCRIN 1, (supported by NRC 2015-2020), challenges such as requirements for early-phase Clinical Trial Units and advanced clinical trial methodology, data capture and management, monitoring, as well as collaboration with health care industry have been addressed. The main deliverables have been 1) continuous updating of SOPs, recommendations, and guidelines in accordance with user needs; 2) the production of templates for contracts with external

parties, and 3) high-quality teaching courses for clinical trial conduct. Pragmatic trials, patient public involvement and facilitating multi-centre/multi-country trials such as European platform studies through ECRIN have been enhanced in NorCRIN 2 (RCN 295652, 2020-2025). Through EU-AMRI comprising the three European Research Infrastructure Consortia: ECRIN (clinical research), BBMRI (biobanking) and EATRIS (translational research), NorCRIN can offer complimentary services in international biomedical research. Important focus areas for NorCRIN 3 will include health economy in clinical trials, pandemic preparedness, and fortification of patient and public involvement in clinical research. In line with the Norwegian action plan for clinical studies, NorCRIN will initiate a broader national collaboration on computer technology solutions in clinical research (including national digital consents) and establish a closer collaboration across health services, universities, and research networks (adult and paediatric) to decentralize and democratize clinical trial participation. NorCRIN 3 will contribute to resolving barriers in the national and global clinical trial ecosystems through work force training aligned with international standards, supporting conduct of research on research, and facilitating internationally funded multi-centre studies, emphasizing a stronger Nordic collaboration.

Prosjektnummer: 347089

INFRASTRUKTUR-arbeidstittel: Mobile Sealab 4.0 – Redesign and upgrade of SINTEF Ocean's mobile facility for processing of bioresources

Vertsinstitusjon: SINTEF Ocean

Sammendrag:

Mobile Sealab is a small but complete and flexible processing facility, where any kind of (rest) raw material can be processed into oil and protein concentrate. Customers are mainly businesses from the seafood industry, who wish to better utilise and profit from their rest raw material. Other research projects can also be run to test parameters or interesting finds from ground research in smaller scale labs, and to optimize processes in near-industrial scale. After more than a decade of being sent out in the field to perform large scale processing tests, the infrastructure needs upgrading.

The new Mobile Sealab 4.0 envisioned in this application will have more instrumentation and sensors to yield increased amounts of research data and give sufficient input to enable the creation of a digital twin. This will give the seafood industry the opportunity to perform research and projects that cannot be handled by stationary infrastructures.

- Description: Mobile Sealab – a mobile processing plant for the fish industry.
- Services: Processing of (rest) raw material into oil, protein concentrate and sludge, or further into fish meal or more specialized products. The plant can be operated by SINTEF Ocean's personnel in research projects or, for longer rental periods, by local industry operators.
- User groups: Commercial companies or research organizations with a need to perform large scale tests, optimize processes and/or produce larger amounts of product samples.
- Mobile: Mobile Sealab is stationed in Trondheim, where we can also run tests, but it is usually sent to the customer's location where fresh material can be fed directly into the process.

Prosjektnummer: 347090

INFRASTRUKTUR-arbeidstittel: Research Laboratory for pharmaceutical production and characterisation

Vertsinstitusjon: University of Oslo, Dept. of Pharmacy

Sammendrag:

Development of pharmaceutical preparations is as important as development of new active ingredients (API). To strengthen this research, there is the need for a national cooperation between academic environments and pharmaceutical industry. This proposal suggests the establishment of a *Research laboratory for pharmaceutical production and characterization*. The infrastructure will include three laboratories directed towards radiopharmaceutical preparations, solid formulations and cytotoxic formulations, respectively.

- *Lab facility for research on radiopharmaceutical preparations.*

Radiopharmacy in Norway includes a wide range of therapeutic principles in addition to PET and other imaging technologies. The research is primarily commercially driven, while academic research and teaching is scarce. There is therefore a great need for a radiopharmaceutical facility for academic research and teaching. The lab facility will supplement and cooperate closely with the newly established Nuclear Research Centre.

- *National facility for research and production of solid pharmaceutical products.*

Infrastructure of this type and to such an extent is no longer available in Norway, as the pharmaceutical industry over a long period has downsized and moved this type of research and production out of the country. The facility will include equipment for processing of solid formulations, but also equipment for "real time" process control. The facility will be useful for research groups from pharmacy, biology and chemistry in addition to start-up companies who need to formulate an API.

- *Lab facility for research and production of cytotoxic formulations.*

The main focus of this lab will be on nano- and microparticulate formulations of hazardous materials. Development of this kind of formulations requires a lab that is specific for this use. However, this kind of facilities are scarce within academic research due to the high costs. The lab will include equipment for the production of nano- and microspheres with encapsulated cytostatic drugs or hazardous API, as well as instruments for characterization.

Prosjektnummer: 347092

INFRASTRUKTUR-arbeidstittel: Norwegian Extreme Cryo- and Climate Chamber Network - NECCCN

Vertsinstitusjon: University of Bergen, Geophysical Institute

Sammendrag:

All processes in this world are driven by physical laws. Being able to understand how to scale from the physical laws governing on a molecular level to the macroscopic world that we live in is paramount for our ability to make projections. However, understanding the physics of Earth system processes, biological systems, or material science requires the possibility of both stabilizing and varying the environmental conditions that a physical system is placed under. Carrying out observations in the environment outside our laboratories will always be subjected to an underlying transient condition preventing a complete understanding of the studied physical processes, in addition to increased complexity due to the influence of confounding variables. Experimental approaches provide a critical tool to interpret and understand the mechanisms that influence natural variations, especially under conditions not observed at present (e.g. the effects of higher or lower CO₂ on Earth system processes). However, thorough experimental designs require large experimental spaces and specialized infrastructure to manipulate environmental conditions under different contexts. No single solution exists to meet all requirements for cryo- and climate chamber controls that are needed by the different scientific disciplines or industry. In addition, scientific or industrial experiments often need significant running time, which means that the use of cryo- and climate chambers becomes more feasible when located physically close to investigators. To meet these demands, it is necessary to establish a network of cryo- and climate chamber hubs across Norway. Furthermore, the development of custom solutions to achieve maximum flexibility to accommodate a suite of both planned and to-be-developed experiments is needed.

Prosjektnummer: 347093

INFRASTRUKTUR-arbeidstittel: Membrane Centre for sustainable water – MemCentre

Vertsinstitusjon: Norwegian University of Life Sciences (NMBU)

Sammendrag:

Norway has been a water-affluent nation for centuries. However, water quality and quantity challenges have recently become increasingly widespread. The frequency of boil-water warnings and outdoor water-use restrictions has increased nationwide. One out of four rivers and lakes in Norway were below good environmental conditions in 2022. The Oslo Fjord is another stark example of a long way to reaching the environmental targets. Environmental toxins, persistent pollutants, and agricultural and sewage emissions affect fish and plants and pose risks to human health.

The Norwegian Environment Agency has outlined eight objectives in alignment with SDG 6 "*Ensure availability and sustainable management of water and sanitation for all*". These objectives focus on ensuring equal access to safe drinking water, managing water resources in an integrated manner, and maintaining water quality. By 2030, Norway must reduce water pollution, limit emissions, and halve the proportion of untreated wastewater. All eyes are now on water treatment technologies

supporting the transition to a zero-emissions society and adaptation to climate change, cleaning rivers, lakes, and oceans.

MemCentre will establish a national research infrastructure on membrane technology tackling global water challenges. The overarching goal of *MemCentre* is to pave the way for a sustainable water future by minimising waste, reducing emissions, and ensuring the reuse of water and accompanying resources. *MemCentre* will foster the science of advanced artificial membranes and membrane separation processes to conserve natural water and protect public health, mitigating and reversing adverse effects of human activity and climate change. *MemCentre* will position Norway at the forefront of high-quality membrane research by strengthening collaboration among water-oriented institutions at the national level and supporting cooperation with membrane centres worldwide. The major impacts of *MemCentre* are expected within strategic areas Oceans, Health, and Green Transition, with a particular emphasis on environment and climate.

Prosjektnummer: 347094

INFRASTRUKTUR-arbeidstittel: Norwegian Wind Power Laboratory

Vertsinstitusjon: SINTEF Energy Research AS

Sammendrag:

The Norwegian Wind Power Laboratory (NWPL) is a large wind power plant, recreated at laboratory scale. The facility fills a critical R&D gap between wind tunnels, or simulations, and full (multi-MW) scale wind plants. The key motivations are:

- there are a sufficient number of turbines to create the atmospheric boundary layer effect, over and beyond a simple superposition of the individual turbine wakes
- the laboratory can be used to test and demonstrate advanced (low-TRL) ideas in wind plant design, operation, and control, which could never be implemented in a commercial plant due to insurance, warranty, and financial reasons
- the facility will be accessible to students, researchers, and industry, and will be a sought-after infrastructure for national and EU projects on wind energy and renewables-dominated electrical grids

The NWPL is unique in the world; there is no existing site of this sort, with a sufficient number of turbines to reproduce real large-scale wind plant layouts.

Prosjektnummer: 347095

INFRASTRUKTUR-arbeidstittel: National research infrastructure for small satellites (NARISS)

Vertsinstitusjon: NTNU

Sammendrag:

Space-based infrastructure is essential for communication, earth observation, navigation and timing services, and is therefore acknowledged as critically important for the efficiency, security, and sustainability of society. Norway has national interests and responsibilities for the polar regions, and

in particular observation, research, and monitoring of the oceans, as well as security. The government has therefore stated a political goal for a complete industrial value chain for space infrastructure and satellite services. For the Norwegian space industry's high ambitions for being competitive, there is a need to invest in research, development, and education.

The need for a national research infrastructure for small satellite missions was identified by a working group at NTNU, FFI, and Andøya Space. This INFRA proposal builds on this initiative and the main objective is to provide unique research data based on innovative instruments and concepts:

- Hyperspectral imaging in the visual and near infrared (VNIR) spectrum with very high spatial resolution, for research on applications such as water quality and marine biology in freshwater and coastal areas, forestry, vegetation, agriculture, and maritime security.
- GNSS-Reflectometry for ocean surface monitoring (meteorology, sea state, sea ice, oil spills, microplastics) as well as anomaly detection with application to real-time maritime surveillance, ice navigation, and GNSS interference monitoring, including jamming and spoofing.
- L-band interference monitoring and ocean salinity measurement (CENSSS at UiO).

The research infrastructure includes the needed microsattellites, ground segment, facilities for operations and data management necessary to strengthen Norwegian education, research, and industry.

The secondary objective of the infrastructure is to bring forth the full pipeline needed to develop payloads and satellites for national utility. Also, it should strengthen the national ability to build, assembly, integrate, test, launch and operate microsattellites. The proposed new infrastructure emphasize integration with existing research infrastructure and to utilize synergies with existing and planned infrastructures.

Prosjektnummer: 347096

INFRASTRUKTUR-arbeidstittel: Norwegian Marine and Lacustrine Core Repository (NORCOR)

Vertsinstitusjon: Department of Earth Science, University of Bergen

Sammendrag:

Norway is a leading nation in climate, polar, and marine geoscience research and has for decades used many millions annually on field campaigns with advanced infrastructures (e.g. icebreakers, advanced Research Vessels, lake coring rigs) to recover geologic and environmental archives. These activities are foundational to our geoscience, paleo-environmental, polar, and climate research and form the basis for the work carried out in multiple centres of excellence and related educational programs. As a result of these long-term investments a number of Norwegian institutions have accumulated extensive and completely unique sample archives that are extremely expensive, or even logistically or politically impossible (e.g. Russian territory) to replace. While other nations and coordinated international programs (e.g. IODP, ICDP etc.) have long recognized the need for core material and data to be archived in accord with FAIR principles, in Norway the archiving remains uncoordinated and ad hoc for academic work. Each institute has developed its own partial solution

such that cores and fundamental data are often unfindable, unavailable, or non-interoperable (not searchable through international databases/nodes). Thus, much of the activity in our internationally leading research environments, and valuable geologic and environmental data, remain invisible to, and unusable by, the national and international community.

To realize the full value of our large research investments, we propose a Norwegian Marine and Lacustrine Core Repository (NORCOR). We will establish a common approach and facilities for archiving marine and lacustrine cores and making related core data FAIR as well as compatible with, and linked to, international repository databases and search engines. The facility will build upon local nodes already at partner institutes who have intense activity collecting and analyzing new cores (UiB, UiT, NGU, NORCE) so that each node will have working access to new cores while also being able to supply standardized data to a central harmonized database. In addition, we will establish a central facility for permanent archiving of core material where scientists can access, analyze, and sample cores. Stewardship of the accumulated material and data will cost only a fraction of the annual investment in field capabilities and, thus, will save enormous resources while stimulating a steady stream of new collaborations and new science from our prior investments.

Here we aim for a pre-project to coordinate between partners and design the joint physical facilities and database to be interoperable and comply with international standards.

Prosjektnummer: **347097**

INFRASTRUKTUR-arbeidstittel: **ZEB Living Lab 2.0**

Vertsinstitusjon: **NTNU**

Sammendrag:

The application concerns the further development and upgrading of a living laboratory research infrastructure called ZEB Living Laboratory. The infrastructure, located at NTNU, is a research facility designed as a single-family house to conduct experimental investigations on building technologies, energy efficiency, and user interactions. As one of the first living laboratories in Norway, it is a real-world environment where research and innovation take place. Living laboratories facilitate collaborative spaces for scientists, researchers, practitioners, and stakeholders to test and evaluate new ideas and solutions. The ZEB Living Laboratory was built about ten years ago and has been jointly operated by NTNU and SINTEF Community. It was designed with state-of-the-art technologies for energy conservation and solar energy exploitation, aiming to create a demonstration of low-carbon Norwegian dwellings. The laboratory focuses on building technologies and user-centric design, aiming to demonstrate CO₂-neutral construction in Norway. New developments in information technology, automation, and building technologies have emerged since the building of the infrastructure. Upgrades are needed to lead the facility to the new dimensions of research and development enabled by pervasive and transformative digital technologies. The planned upgrades include, in addition to improved heating and ventilation equipment, electrical energy storage, EV-to-Grid installation, a significant upscaling of the IT infrastructure to enable a digital twin of the laboratory. The digital twin will facilitate advanced control possibilities, user interaction, and feedback.

The upgraded ZEB Living Laboratory aims to promote cross-disciplinary collaborations in energy-efficient and healthy built environments. Various disciplines such as building technology, control engineering, power engineering, social sciences, health sciences, and digital technologies can benefit from this shared research infrastructure.

Prosjektnummer: 347098

INFRASTRUKTUR-arbeidstittel: Norwegian laboratory for resolved interfacial flows at multi-scales (INTERFACE)

Vertsinstitusjon: NTNU

Sammendrag:

We propose to establish a new national laboratory for interfacial fluid flow (INTERFACE) that gathers together national facilities and internationally recognized research groups in experimental fluid dynamics. Complementary experimental facilities at UiO and NTNU will be expanded and developed as a collaborative national infrastructure. The infrastructure will enable Norwegian researchers and industry to target groundbreaking scientific discoveries that provide a bridge between basic research and next generation innovations across a wide range of industries. The infrastructure will comprise of unique set of multi-scale flow facilities equipped with novel experimental capabilities tailored to provide resolved measurements of interfacial flows that can address a number of key scientific questions in environmental, industrial, and biological fluid flows. In addition, the infrastructure will bring together a critical mass of Norwegian researchers, three of whom are recipients of ERC grants, working in complementary but distinct branches of fluid mechanics, unified by their expertise in conducting world leading research in the areas of flow stability, wave motion, turbulence, multiphase flows, heat and mass transfer and biological flows.

INTERFACE will consist of two physical nodes. Node 1 at UiO in the Department of Mathematics and Node 2 at NTNU in the Department of Energy and Process Engineering. Each node consists of two research infrastructures (RI's) that will be able to facilitate resolved measurements of:

- Laboratory-scale interfacial flows. Well controlled experiments of scaled systems at the laboratory scale that can provide realistic proxies for air-sea interactions, dispersion of particles and pollutants, and turbulent mixing.
- Small-scale interfacial flows. Well controlled experiments to reveal the nature and behaviour of smallscale flows that form the building blocks of real systems in nature is crucial to our ability to control and use them for small energy sources, heat transfer, bioengineering and medicine.

Prosjektnummer: 347099
INFRASTRUKTUR-arbeidstittel: Bymiljølab/ Urban Environment Lab
Vertsinstitusjon: SINTEF Community

Sammendrag:

More than 82 % of Norwegians live in communities and especially the large cities continue to grow in the next decades. The guiding principle for this progressing urbanisation is densification which aims at maximising the land-use of already developed areas. Consequently, many intra-urban green spaces are lost, and population density increases significantly. Previous research strongly associated dense urban spaces with high levels of noise and air pollution and overheating during summerly heatwaves. All three effects are known to be greatly harmful to the health of city dwellers, cause thousands of premature deaths and cost society billions of NOK every year in Norway alone.

Detailed monitoring of environmental factors and understanding their relation to land use, urban morphology, traffic, etc. are key to create liveable, healthy and safe cities for city dwellers and particularly vulnerable population groups. While in the past, some attempts have been made to monitor different health-related environment factors like noise, air quality, air temperature and local wind conditions, they largely are of very low spatial and/or temporal resolution.

The research community in SINTEF aims to establish an Urban Environment Lab in cooperating municipalities – a dense and area-covering sensor network that captures all health-related environmental factors. The aim is to provide a cutting-edge research infrastructure and excellent data basis for future research on the urban environment at international top level. Associated with it is an e-infrastructure to accommodate for data storage, analysis, visualisation, retrieval and linking the data to geographical information systems (GIS). This provides a basis for mapping and analysis that is used in science and almost every industry. Thus, researchers across numerous fields are addressed, e.g., engineering, city planning, health and medicine, social sciences, biology, climatology and many more. Research building upon the Urban Environment Lab is expected to deliver invaluable knowledge for authorities and the government to ensure the transformation to a sustainable, intergenerationally just, resilient, liveable, and smart city of the future.

Prosjektnummer: 347100
INFRASTRUKTUR-arbeidstittel: Norwegian open infrastructure for high-throughput experimentation and scale-up (NorHTE)
Vertsinstitusjon: Kjemisk institutt, Universitetet i Bergen

Sammendrag:

This application seeks to establish a new national infrastructure platform (NorHTE) that will furnish Norway's research communities in chemistry, materials science, biotechnology, pharmaceuticals, and chemical and energy process engineering with state-of-the-art instrumentation for high-throughput experimentation (HTE) and advanced materials manufacturing. By offering a fast, automated, and quality-assured alternative to errorprone manual methods, NorHTE will accelerate the discovery of

new molecules and materials for multiple application areas, including electronics, catalysis, renewable feedstocks, therapeutics, diagnostics and energy generation and conversion.

The proposed infrastructure – the first of its kind in Norway – will comprise four integrated platforms, dedicated to (i) batch high-throughput experimentation (batch-HTE), (ii) continuous-flow HTE (flow-HTE), (iii) scale-up technology, and (iv) algorithms and software for AI-controlled operation and data analysis. By combining automation, state-of-the-art robotics, chemometrics and machine learning, NorHTE will allow Norwegian scientists to carry out large-scale chemical experiments of far wider scope than is currently feasible, leading to accelerated and otherwise inaccessible insight, superior products and/or more efficient synthesis routes. The main batch-HTE platform will be located at UiB, with a complementary flow-HTE platform located at NTNU. The UiB node will consist of two robotic systems for aerobic and anaerobic synthesis, respectively, a system for automated purification, and analytical instrumentation for reaction monitoring and quality control. The NTNU node will comprise a suite of flow modules for in-line reaction, analysis, purification and scale-up. Both nodes will be furnished with extensive instrumentation for reaction monitoring, allowing for automated feedback-driven searches in which the most promising conditions for testing are decided on the basis of previously acquired data. The resulting “self-optimising” reactors will massively enhance the efficacy of HTE chemistry, bringing Norway to the international forefront of automated chemical discovery.

NorHTE will be welcoming academic and industry researchers across Norway, based on an hourly rate model for fees. The distinguishing feature of NorHTE – which sets it apart from other HTE facilities worldwide – is the inclusion of infrastructure for intermediate-scale chemical synthesis up to the 1-kg/day-level, providing users with a complete solution that encompasses both chemical discovery and chemical manufacturing.

Prosjektnummer: **347101**

INFRASTRUKTUR-arbeidstittel: **Center for Crisis Management Training (CCMT)**

Vertsinstitusjon: **Inland Norway University of Applied Sciences, Inland School of Business and Social Sciences**

Sammendrag:

Training and exercises are necessary prerequisites for developing capacity and capability in crisis management and leadership. Leadership and decision-making, as well as communication and collaboration are skills that must be trained and exercised if they are to be executed optimally under uncertainty and stress. Improving the effectiveness of crisis management and emergency response training requires the ability to simulate a high stress, high fidelity environment with realistic distress. Inland Norway University of Applied Science (INN) will in the second half of 2023 establish a new Center for Crisis Management Training (CCMT) co-located with INN’s Rena Campus. At Nord University, Business School, Marketing, Organisation and Leadership division in Bodø, Nordlab is situated with computer-based simulation capacities integrated with crisis management decision-support tools and command and control support systems. Nordlab is expected to be an important collaboration partner for the new Center at INN campus Rena. The purpose of this pre-project is to map the infrastructure needed for planned research required to develop novel ways to reduce

barriers while maintaining the quality and realism of training, with the goal of submitting an application to a future call of the Research Infrastructure program.

Prosjektnummer: 347102

INFRASTRUKTUR-arbeidstittel: DigIn: Digital twin Infrastructure for future Mobility Solutions

Vertsinstitusjon: NTNU

Sammendrag:

Accessible mobility is essential for any society, it's an important good for you as a citizen (social sustainability) and a must for the private and public sector (economic sustainability). But efficient land mobility also comes with some downsides, building and maintaining roads, railways, and hubs, as well as the associated traffic that uses the physical infrastructure has severe negative consequences for the environment and the part of the nature affected (environmental sustainability). Furthermore, serious traffic accidents and deaths do happen, causing a lot of human suffering, but it also affects all parts of sustainability negatively to some degree. Most likely, the need for accessible mobility and transportation will increase in the near future (e.g., due to increased online shopping). And we have just started to see the effects of climate change in terms of more harsh weather conditions causing landslides and floods, this will only increase for years to come. Still, ambitious goals have been set, the mobility sector should be climate neutral by 2050, there should be no new traffic deaths etc. As for most sectors, it's believed that technology, electrification, digitalization, and automation will be a big part of the solution. And key stakeholders are now open about the fact that the digital infrastructure is now as important as the physical one. The amount of mobility-related data available is already substantial and will only increase, but to create value from all the data in a structured way, the mobility sector must become much more data-driven in all aspects of its domain. The value of today's land-based mobility infrastructure is massive, and the amount of money spent on mobility each year is also considerable. But even though the challenges are of paramount importance (as we have seen above), the resources spent on mobility-related research is only a small fraction of the resources used on mobility in general each year. There is also a substantial number of stakeholders in the mobility field, especially if you look at all mobility modalities. Many of those share the same challenges, but do not necessarily share the potential solutions. The proposed DigIn project want to contribute to digital transformation in the mobility domain. and will address many of the challenges highlighted above using a case-based approach in a holistic setting. Digital twin infrastructure is seen as a promising technology to foster this transformation and can be regarded as a way to integrate key enabling technologies like IoT, BigData and AI in a structured manner. The underlying ambition of DigIn is to establish a national platform for collaboration and simulation related to mobility research (covering all phases of a typical mobility project). The chosen use-cases will cover a broad range of mobility projects in various phases, from around the country, trying to find a good mix between different mobility modes. For people-related mobility the focus will be on micro, public and shared transportation whenever possible (walking and cycling also have significant positive impact on public health).

For goods-related transportation the focus will be on increased use of the railway and the sea/cost whenever possible and here efficient terminals and harbors are key. On the other hand, last-mile delivery will close to always be done using the road-network. In all use-cases, digitalization and automation will be in focus (e.g., in the construction of the physical infrastructure in question), and all use-cases will show efficient and collaborative use of the digital research infrastructure proposed in DigIn. Finally, the research enabled by the funded equipment will result in several innovations and products that can be put into production and will point in the direction of future mobility.

Prosjektnummer: 347103

INFRASTRUKTUR-arbeidstittel: OpenUI

Vertsinstitusjon: Oslo School of Architecture and Design

Sammendrag:

OpenUI is an e-infrastructure designed for user interface (UI) development, allowing for rapid prototyping and testing of user experiences in complex workplaces. Built upon three key pillars, OpenUI offers a comprehensive solution.

(1) UI Design Tools: OpenUI provides a range of essential tools, including UI component libraries, design systems, design guidelines, code repositories, plugins, and APIs.

(2) Collaborative UI Design Community: OpenUI fosters a vibrant community for collaborative work and research. This community comprises an online user community, local community chapters, comprehensive documentation, onboarding protocols, training materials, e-learning courses, networking events, user support, and a framework for quality management of UI design.

(3) Test Platform: OpenUI features an online-based platform that leverages real-time or time series data from simulators or actual operations. This platform places end-users in realistic conditions to test their experiences with systems through their UIs.

OpenUI serves as a critical research infrastructure for complex workplace design, allowing for the seamless integration of any system, whether simulated or real. Its applications extend to various domains, including the design of control centers for industrial assets like factories, critical infrastructures such as power grids and transportation networks, as well as remote-control centers for ships.

The implementation of OpenUI brings several benefits. Firstly, it enhances the overall usability of independently developed UIs in both industry and research. Secondly, it empowers individual projects to adopt innovative UI technologies. Thirdly, it promotes user-centered interoperability between systems, facilitating seamless communication. Lastly, it enables researchers to conduct comparative analyses across projects, thereby enhancing research capabilities. Importantly, this infrastructure significantly boosts production in both research and industry.

Prosjektnummer: 347104

INFRASTRUKTUR-arbeidstittel: Learning Analytics Infrastructure (LAI): Infrastructure for data-driven research and practice in higher education and workplace learning

Vertsinstitusjon: Department of Education, University of Oslo

Sammendrag:

The proposed Learning Analytics Infrastructure (LAI) pre-project will establish the basis for a national infrastructure for data-driven research on teaching, learning and study program development in higher education. With the digitalization of education and work taking a major leap forward, teaching, learning and many education-related activities take place in **digital environments**. Activities in digital environments generate a large amount of data and digital traces about learners' activities. Such data has great potential for enabling us to understand activity patterns and challenges of learners, educators and institutions, and to support data-informed decision making, evidence-based instruction, and the development of differentiated and inclusive curricula. To be able to capitalize on such data, there is a need for infrastructure that allows researchers to harvest, analyze and interpret activities and contents in a systematic way. Without an infrastructure that makes it possible to connect information systems and data across various digital platforms, it remains challenging to conduct high-quality research, of relevance for both policy and practice. The proposed LAI pre-project will set in motion the necessary activities and initial structures for creating a new, robust digital **infrastructure for learning analytics** for higher education. The envisioned infrastructure will serve as a platform for the **collection, storage, and analysis** of behavioural, product, and structural data from various learning environments, student information systems and survey tools used in higher education. The infrastructure will be designed to support research that applies learning analytics techniques at micro, meso, and macro levels. It will provide detailed data to facilitate personalized guidance and early interventions and enable higher education institutions to utilize previously inaccessible institutional data for strategic decision-making and resource allocation. This infrastructure will be designed to support distributed collaboration and data exchange within the higher education sector in Norway and internationally. It will allow researchers at different institutions to benefit from the same infrastructure and contribute to a common knowledge base on teaching and learning processes and results.

Prosjektnummer: 347105

INFRASTRUKTUR-arbeidstittel: Norwegian Micro- and Nanofabrication Facility (NorFab) IV

Vertsinstitusjon: NTNU

Sammendrag:

The Norwegian Micro- and Nanofabrication Facility (NorFab) IV is a continuation and further development of the successful and well-recognised national infrastructure within micro- and nanofabrication. The infrastructure has been meticulously developed as an open access infrastructure since its inception in 2009, through a long-term commitment and with clearly defined

and complementary roles among the partners NTNU, USN, UiO and SINTEF. NorFab is the only significant provider of micro- and nanofabrication facilities for education, research and commercial pilot production in Norway, and many academic and commercial endeavours are fully dependent on the research infrastructure, competence, and training provided.

In 2022, we hosted 554 users, of which 124 were from industry and start-ups, for a total of over 71,000 user hours.

As an infrastructure we enable projects engaged in many of the prioritised thematic areas defined by the Norwegian governments long-term plan for research and higher education 2023-2032, including in the areas of enabling and industrial technologies; climate, the environment and energy; health; security; and oceans and coastal areas. Likewise, NorFab supports the European Commission's Key Enabling Technologies such as micro/nano electronics, advanced manufacturing, and advanced materials.

More specifically, the research and pilot production facilitated by NorFab supports a "from lab-to-fab" model spanning from fundamental research in natural sciences, early TRL electronics and engineering topics, to applied areas within health, biotechnology, advanced materials, batteries, solar, micro-optics, radiation sensing and others.

The NorFab IV project aims to strengthen, expand, and upgrade the infrastructure to provide a robust, state-of-the-art fabrication facility, accessible throughout the full value chain (from students to industry) within the micro- and nanofabrication domain in Norway.

Prosjektnummer: **347106**

INFRASTRUKTUR-arbeidstittel: **Experimental Infrastructure for Exploration of Computing, Communication and Cyber-Physical Systems (eX-C3): The Norwegian node of the ESFRI infrastructure SLICES**

Vertsinstitusjon: **Simula Research Laboratory**

Sammendrag:

The Experimental Infrastructure for Exploration of Exascale Computing (eX3, 2017 – 2023) is the existing national infrastructure for experimental research on High Performance Computing (HPC) technologies. In the Norwegian Roadmap for Research Infrastructure, eX3 is listed as a key national infrastructure in ICT. In addition to being a core testbed in several nationally and European funded research projects, eX3 is the basis for developing the Norwegian node in the European research infrastructure Scientific Large-scale Infrastructure for Computing/Communication Experimental Studies (SLICES). SLICES was promoted to the ESFRI Roadmap 2021 and is currently in its preparatory phase, with the first services due in 2025. SLICES has the same approach to novel experimentation with hardware and software as eX3, but extends the scope beyond HPC by integrating advanced testbeds for 5/6G and Internet of Things (IoT) technologies.

Cyber-Physical Systems (CPSs) and 5/6G communication are vital parts of the global infrastructure enabling advanced services by interconnecting things based on existing and evolving interoperable ICT. These interconnected things have a physical or virtual representation in the digital world,

sensing/actuation capabilities, programmability features and are also uniquely identifiable. The things can offer services, with or without human intervention, through the exploitation of their unique identification, data acquisition and processing, networking, and actuation. The various application services can be exploited using intelligent interfaces and are expected to be made available anywhere, anytime, and for anything, taking security into consideration. Being deeply involved in research on 5/6G and CPS technologies, Simula has experience in building and operating local infrastructures for this type of research and integrating these with HPC infrastructures like eX3.

The current proposal targets the next generation experimental infrastructure combining and integrating technologies for HPC, 5/6G and CPSs, referred to as the Experimental Infrastructure for Exploration of Computing, Communication and Cyber-Physical Systems (eX-C3). This national infrastructure will be perfectly aligned with the overall mission of SLICES, thus effectively constituting the Norwegian node of this ESFRI infrastructure. Establishing such an integrated infrastructure, at the international forefront, requires a substantial national investment.

Prosjektnummer: 347107

INFRASTRUKTUR-arbeidstittel: Multitrophic Ecological monitoring of Coastal waters (EcoCoast)

Vertsinstitusjon: Møreforskning AS

Sammendrag:

Increased knowledge about key ecological processes within our coastal zone is critical for future management and protection. Currently, an extensive network of sensors provides us with important data on temperature, salinity, current, waves and other physical properties of our oceans. Similar time series on biological processes in the ocean is limited, and for some regions lacking. EcoCoast aims at building an infrastructure consisting of a set of nodes (EcoNodes) that collect site-specific data automatically and continuously on four biological processes: 1) Presence of marine species, through automatic sampling (and possibly *in situ* analysis) of water for environmental DNA, (2) primary production, including identification and abundance estimates of different phytoplankton taxa, (3) pelagic low-trophic secondary production, including presence, abundance and species identification of zooplankton, fish eggs and fish larvae, and (4) measurements of flux of particulate organic matter to the benthos. EcoCoast is primarily planned as an additional biological component of the existing infrastructure currently in place or under development in the Møre region of western Norway, comprising Marine basemaps (Marine Grunnkart) and Møre Ocean Lab, but the infrastructure is generic, and thus applicable in any coastal or fjord region in Norway or elsewhere. We aim to submit a proposal for a pre-project in which we will (1) identify and decide on the most suitable equipment and biological sensors (and associated technical components) for continuous measurements of the above-mentioned biological processes, (2) develop a framework for data handling, quality control and access solutions (including integration with data from the existing infrastructure in the region), and (3) establish a business plan for a long-term operating phase of the infrastructure.

Prosjektnummer: 347108

INFRASTRUKTUR-arbeidstittel: Norwegian Airborne Imaging Radar infrastructure (NAIR)

Vertsinstitusjon: NORCE Norwegian Research Centre AS

Sammendrag:

The Norwegian Airborne Imaging Radar Infrastructure (NAIR) will contribute to develop Norwegian excellence within fundamental and applied use of synthetic aperture radar (SAR) imaging. This cutting-edge infrastructure will pioneer development of innovative radar sensors, signal processing methods like digital beamforming, and foster new algorithms for retrieval of essential Earth system processes. As a key tool for observing geo- and biophysical processes in mainland Norway and Svalbard, NAIR will significantly impact research fields ranging from signal processing and novel radar methodologies to forest and geohazard monitoring and enhancing Norwegian polar research by contributing to an improved polar monitoring system in Svalbard.

The infrastructure is based on two different aircraft, a Vulcanair P68 stationed in Tromsø operated by NORCE (LN-UAV) and a Dornier Do-228 stationed in Longyearbyen, Svalbard, operated by Lufttransport AS (LN-LYR). On LN-LYR, the new infrastructure includes a permanent installation of a dual-frequency, fully polarimetric, L- and X-band SAR. Both aircraft currently have RGB and hyperspectral imaging cameras and will be modified to contain a payload bay accommodating different radar systems. NAIR aims to establish a pool of imaging radar systems, operating on different frequencies (L/C/X/Ku-band), that can be operated independently or together, facilitating important sensor synergies between optical and different radar frequencies.

The new radar infrastructure will stimulate the development of novel methodologies for maritime surveillance, proving invaluable for governmental stakeholders like the Coast Guard and Coastal Administration. The strategically located platform has great potential for improving situational awareness in the Arctic. The NAIR radar infrastructure will attract a broad scientific audience by providing novel observations of the cryosphere (input to NFR SIOS-InfraNor and SIOS-DT), Geohazards (input to NFR EPOS-NG Geohazards), and international organizations such as the European Space Agency (ESA) by providing a platform and sensors for development of next generation space borne SAR systems and validation of current platforms.

Prosjektnummer: 347109

INFRASTRUKTUR-arbeidstittel: Swiss-Norwegian Beamlines (SNBL) at ESRF 2025-2028

Vertsinstitusjon: Norwegian University of Science and Technology, NTNU

Sammendrag:

The Swiss-Norwegian Beamlines (SNBL) are a result of almost 30 years of collaboration between Swiss and Norwegian research institutions leading to construction and development of two of the most successful beamlines at the European Synchrotron Radiation Facility (ESRF) in France. The annual scientific output of SNBL is about 120 scientific papers. SNBL have throughout these years

ensured access to state-of-the-art X-ray facilities for Norwegian researchers studying physical, chemical, and electronic properties of functional materials.

This project ensures continued access to SNBL for Norwegian users also for the period 2025-2028. The Norwegian contribution is a collaboration between NTNU, University of Oslo, IFE, University of Bergen and the University of Stavanger. With financial support from the Research Council of Norway, the Norwegian partners are contributing to 50% of the SNBL budget. The remaining 50% is funded by a broad consortium comprising the major research institutions in Switzerland. SNBL is a cross-disciplinary collaboration where researchers and students can use synchrotron X-rays to benefit Norwegian business and the general society by raising our knowledge about novel materials.

Prosjektnummer: **347110**

INFRASTRUKTUR-arbeidstittel: **NeIC-Norway: Norwegian Participation in the Nordic e-Infrastructure Collaboration**

Vertsinstitusjon: **SIGMA2 AS**

Sammendrag:

This application is for Norway's membership and participation in the Nordic e-Infrastructure Collaboration (NeIC). The current funding period is until the end of 2024. The application to be submitted in November 2023 will be for the period 2025–2029.

NeIC is part of NordForsk which is under the Nordic Council of Ministers and provides an environment for research and research infrastructure cooperation across the Nordic region. NeIC's member states are Norway, Denmark, Estonia, Finland, Iceland, and Sweden.

NeIC contributes to research excellence through a distributed environment for e-infrastructure solutions where the countries can achieve more together than by working independently. NeIC will build towards the Nordic Council of Ministers' Vision 2030 by increasing research productivity that has long-term impacts, and benefits. This will be accomplished through collaborations based on the national e-infrastructure providers, their national research communities, and in conjunction with other international collaborations. NeIC has fulfilled two roles within the Nordic Region. The first is the operational responsibility for the Nordic distributed Worldwide Large Hadron Collider Computing Grid (WLCG) Tier-1 facility, which provides computing and storage for CERN to be used by high-energy physicists worldwide. This is a very long-term research activity by the high-energy physicist community and is expected to continue through 2038. The second role is to foster Nordic collaborations on innovative infrastructure services in response to common strategic priorities within the Nordic region that align with Vision 2030.

Norway is actively involved in all of the current NeIC activities and projects and is represented on the NeIC Board by Sigma2 AS. Through NeIC, Sigma2 connects Norway to other national and Nordic e-infrastructure service providers through these collaborative activities.

Prosjektnummer: 347112

INFRASTRUKTUR-arbeidstittel: Integrated Carbon Observation System (ICOS) Norway and Ocean Thematic Centre (OTC), phase 3

Vertsinstitusjon: NORCE Norwegian Research Centre AS

Sammendrag:

Climate change is one of the largest challenges society faces, with multiple impacts expected on Norwegian society. Managing Norway's pathway to net zero emissions and stabilizing climate requires understanding how the land and ocean respond. In ICOS-3 we request funding to 1) maintain and expand a substantial observational network for greenhouse gases (GHG), and their fluxes, covering Norwegian atmosphere, land ecosystems, and oceans, as part of the pan-European research infrastructure Integrated Carbon Observing System (ICOS); 2) establish a model to estimate Norwegian GHG emissions at local level, including timeseries of consumption based emissions; 3) operate a state-of-the art atmospheric inversion modelling system that integrates observations with transport modelling to provide independent estimates of GHG emissions in Europe with high spatial resolution; 4) host the Ocean Thematic Centre (OTC), one of the central facilities of ICOS ERIC (European Research Infrastructure Consortium), which provides coordination of the marine ICOS observing network in Europe through technical support and data management. For simplicity we refer to points 1-3 as ICOS-Norway, the Norwegian node of ICOS ERIC. Data from ICOS-Norway follow all FAIR principles, so they are traceable, long-term archived and openly accessible without charge. ICOS-Norway covers the major fluxes of GHG within Norwegian territories and surrounding oceans, which underpin national mitigation policies, and support monitoring of future international agreements and targets set to curb carbon emissions. Membership of ICOS ERIC ensures visibility and attractiveness of the Norwegian GHG and carbon cycle research community as proven in contributions to the annual Global Carbon Budget reports, participation in numerous science projects funded by RCN and EU, and collaboration with other research infrastructures such as Argo, EMSO, and ACTRIS. ICOS-Norway also ensures the Norwegian research community is prepared for the influx of data from the Copernicus CO2M satellites. ICOS-Norway data have large additional value beyond this, including monitoring ocean acidification (in support of SDG 14.3), supporting a sustainable growth of the blue economy, and as calibration and validation for satellite data. The OTC, hosted by Norway in collaboration with the UK, is one of the central facilities of ICOS ERIC, without which the European network cannot operate. It provides comprehensive coordination of the marine ICOS observing network through technical support for observations and data management. OTC also support stations in reaching and maintaining the quality standards of CO2 measurements in marine ICOS. In addition, OTC has a leadership role in the ocean carbon community in Europe and internationally and works to secure high-level intergovernmental support and funding for ocean carbon observations.

Prosjektnummer: 347113

INFRASTRUKTUR-arbeidstittel: SUBsurFACE Multiphysics LaboratorY – National Research Infrastructure for subsurface and multiphase flow processes (SUBFAMILY)

Vertsinstitusjon: NORCE Norwegian Research Centre AS

Sammendrag:

Norway has committed to 40% reduction in greenhouse gas emissions by 2030 and all major operators on the Norwegian continental shelf (NCS) have ambitions to reach net-zero emissions by 2050. As the number of mature and legacy fields increases, new subsurface understanding is needed to develop methods and technology to maximize resource utilization while minimizing energy consumption. Increased electrification of offshore operations will strongly contribute to reducing emissions, but dependence on renewable energy sources will impose new subsurface dynamics that need to be understood to maintain production goals. The energy transition will expand the use of subsurface assets to large scale carbon sequestration, cyclical energy storage and geothermal extraction, if supported by continued research and education.

Subsurface Multiphysics Laboratory (short name: SUBFAMILY) will be established as an independent research and innovation platform for subsurface multiphase fluid flow processes based on the research environment behind the two Petrocenters *National Centre for Sustainable Subsurface Utilization of the Norwegian Continental Shelf* (NCS2030) and *Center for Sustainable Subsurface Resources* (CSSR). The proposed infrastructure will be owned by the Petrocenter partners; NORCE Norwegian Research Centre AS (NORCE), University of Stavanger (UiS), University of Bergen (UiB) and Institute for Energy Technology (IFE). The infrastructure will reduce the gap between laboratory testing and pilot validation by combining large-scale models for reservoir conditions flow in porous media with advanced visualization and state-of-the-art equipment for phase characterization and analysis. Development of necessary open-source software for model coupling and data integration will improve experimental planning and interpretation and maximize output from the combined infrastructure.

Prosjektnummer: 347114

INFRASTRUKTUR-arbeidstittel: Integrated Norwegian infrastructure for microphysiological systems including organoids and organ-on-chip systems (NOR-MPS)

Vertsinstitusjon: UiO-IMB

Sammendrag:

Complex in vitro models are needed to recapitulate higher-level anatomical and physiological or pathological aspects of human biology. Micro-Physiological System (MPS) technology including 3D organoids and organ-on-chip technology are quickly advancing as platforms for such complex in vitro models. MPS technology represent aspects of human organs and tissues with the aim of reproducing human physiology in a way that allows i) predictive testing of interventions; ii) personalized

predictive models; iii) on a longer time scale to produce transplantable tissue. As such, MPS technology is on the verge of widespread impact on academia and the pharmaceutical industry as much-needed physiological models and potential alternatives to animal testing. The here proposed national infrastructure for microphysiological systems (NOR-MPS) will provide standardized or customized MPS modules (organoids and Organ-on-Chip) for preclinical experimentation and testing of interventions. An infrastructure for morphological and physiological readout systems and data analysis will be included in the infrastructure. The proposed NOR-MPS infrastructure will link to an emerging European MPS infrastructure with task distribution, joint fund raising, joint standards and joint network events. NOR-MPS complements the proposed Norwegian ATMP infrastructure.

Prosjektnummer: 347115

INFRASTRUKTUR-arbeidstittel: Norwegian Geospatial Hub

Vertsinstitusjon: The Norwegian Mapping Authority

Sammendrag:

The objective of the “Norwegian Geospatial HUB” (NorGeoHub) is to increase availability, quality, and usability of spatial knowledge. Access to detailed, time- and location-bound data is a prerequisite for research within several thematic priorities in “Long-term plan for research and higher education 2023–2032” (LTP). The project aims to extend the existing Norwegian national Spatial Data Infrastructure (SDI) to handle both structured and semi structured observations from multiple sources, ranging from Internet of things (IoT) to satellite remote sensing. Additionally, a semantic guided chatbot system will be developed to ensure easy access to a multitude of cross-thematic geospatial information sources. All will be done in compliance with FAIR principles, to boost use of geospatial knowledge in research and innovation both in Norway and the EU.

Situation: The Norwegian SDI developed over the last 30 years, contains large amount of high-quality data, both from the Norwegian Mapping Authority, national sector authorities, counties, and municipalities. The digital resources are well documented, well-structured and are available as web services, supported by tools such as the catalogue services in data portal “geonorge.no”. However, the potential of the data is released only partially. Data content is difficult to use, and highly complex, limiting the use among start-ups, in innovation actions among public and private organisations, and within academia and research institutions.

Potential: Gartner and the UN expect an exponential growth of spatial data in all sectors, both within personal and professional tools and as a resource for knowledge development. Data about place or location have huge potentials to be used as component in knowledge based developments needed to cope with major issues of our time; climate and nature crisis, green economy, security. In high-performance computing and big data, new user groups with differentiated needs are emerging. Data quality and integrity, as well as long-term preservation and reuse of data will constitute resources for rapidly developing time series analysis in many disciplines. Artificial intelligence (AI) and other assessment tools are developing quickly. Access to and the ability to use the vast amount of both structured and unstructured spatial data will be very important resources for such assessments and tools. The need for SDI that link social science data with climate and/or environmental sensor data has been identified (LTP). This interoperability is supported by the fundamental framework of the

Norwegian SDI. However, to raise the awareness and use of such data to support research requires new capabilities.

Prosjektnummer: 347116

INFRASTRUKTUR-arbeidstittel: **KRYOGENi - Tverrfaglig forskning for sikrere og mer effektiv implementering av kryogent og flytende hydrogen i industri- og transportsektoren**

Vertsinstitusjon: SINTEF Energi AS

Sammendrag:

The wide interest in hydrogen technologies was demonstrated by the numerous national and international projects and research centres launched in the last two years. Among the most promising development, liquid hydrogen (LH2) plays a central role as viable solution for many industrial and transportation applications as demonstrated by the world's first LH2 ferry (MF Hydra), in operation since March 2023 in Norway and operated by Norled company. LH2 is also highlighted to be of high relevance in the Norwegian Government's hydrogen strategy published in 2020. Particularly, LH2 may be important in the transport sector for energy demanding applications within maritime, aviation and long-haul trucking, and as input factor to decarbonize the industry.

LH2 is a cryogenic fluid with a boiling point temperature of -253°C at atmospheric conditions. It has so far mainly been used in the aerospace industry and for hydrogen shipping up to now. Additional interdisciplinary research is necessary to deploy cryogenic hydrogen and LH2 technologies on a large-scale in the coming years. Research relevant for the safe and efficient development of LH2 technologies is already ongoing, especially within the FME HYDROGENi and other national and European projects (e.g. ELVHYS, TULIPS, SCARLET). However, due to the lack of experimental facilities, such research endeavours are confined to modelling activities. In addition, LH2 is not currently produced in Norway, and its procuring and shipping from the main European suppliers (e.g. Linde in Germany) is very expensive and cumbersome.

The main aim of the *KRYOGENi* project is to establish a cryogenic and LH2 infrastructure centre to carry out interdisciplinary research. This will be achieved by upgrading existing facilities and establishing new ones. The *KRYOGENi* infrastructures aim to provide the experimental facilities necessary to reduce the gaps in the aforementioned industrial and academic context and will target, but it is not limited to, energy and thermal engineering, safety and material science. Relevant national and international stakeholders including industries and companies, research centres and universities, will be involved in *KRYOGENi* and work in close collaboration with the project partners (NTNU, SINTEF Industry & Energy). In this way, even if few LH2 labs exist worldwide (e.g. USA, Japan), the additional availability of state-of-the-art multiscale experimental facilities as those here planned, make of *KRYOGENi* a unique infrastructure and place the different research entities involved at the international forefront. An appropriate business model will be proposed to open this exclusive infrastructure to third parties, both nationally and internationally.

Prosjektnummer: 347118

INFRASTRUKTUR-arbeidstittel: National Infrastructure for Experimental Language Sciences (NIELS)

Vertsinstitusjon: UiT – The Arctic University of Norway

Sammendrag:

The National Infrastructure for Experimental Language Sciences (NIELS) is an innovative project that aims to enhance the scope and flexibility of language research in Norway by establishing an integrated infrastructure framework built around existing language labs at several institutions. This framework will consist of a number of components forming a cohesive research pipeline from participant recruitment to data collection and analysis, all accessible through a unified web platform. WP1 focuses on establishing a National Participant Database, recruiting a representative sample of at least 50,000 participants from the Norwegian population. The database will include both adult participants and parents interested (themselves or their children) in taking part in language studies. The database will enable targeted linguistic research and facilitate participant selection for online and lab-based experiments. WP2 will develop an Online Experiments Platform, providing a secure and GDPR-compliant environment for creating, running, sharing, and storing online language experiments. Multiple data collection methodologies will be supported, including reaction-time experiments, self-paced reading, eye-tracking, and audio/video recording. To expand research opportunities beyond stationary labs, WP3 will establish three Mobile Language Labs equipped with eye trackers, EEG systems, and recording equipment. These labs will enable advanced behavioral and neurophysiological studies with previously inaccessible populations, such as those with limited mobility or residing in remote areas. WP4 focuses on Speech Analysis Tools, developing user-friendly interfaces for state-of-the-art speech recognition models and analysis tools tailored to the Norwegian context. The NIELS website, developed in WP5, will serve as a central access point for researchers, providing interfaces for participant recruitment, online experiment management, mobile lab booking, and the application of speech analysis tools. It will also foster collaboration and knowledge-sharing among language researchers across the country. Finally, ensuring the sustainability of NIELS is the objective of WP6, which will collaborate with partner institutions to establish a comprehensive sustainability plan. Overall, NIELS is poised to significantly advance language research in Norway by expanding research capabilities, increasing participant diversity, promoting collaboration, and ensuring longterm sustainability.

Prosjektnummer: 347119

INFRASTRUKTUR-arbeidstittel: Artificial weathering and durability testing

Vertsinstitusjon: SINTEF Community

Sammendrag:

The building industry account for approximately 15 percent of greenhouse gas emissions in Norway and are the largest source of waste in the country. New technology and knowledge can contribute to reducing greenhouse gas emissions through a circular economy by enabling material reuse. In this

context, the assessment of material durability and service life are important variables and needs to be determined for large scale samples and a Nordic climate.

This proposal concerns an expansion and upgrade of the existing infrastructure for artificial weathering and durability testing of building materials and components at SINTEF Community's laboratories in Høgskoleringen 7 in Trondheim. The research-infrastructure has been used in research projects such as MOT, TightEN and Klima 2050. They carry out assignments from customers and partners across the country, including industry and academia.

The primary user groups are:

- Research communities working on method development for durability and service life estimation for materials and structures.
- Research communities and industry parties working on development of new materials and structures where knowledge on durability and service life is needed.
- Industry parties which require knowledge and documentation of their product's durability and service life.

Prosjektnummer: 347120

INFRASTRUKTUR-arbeidstittel: **Forskningsarkivet – National e-infrastructure for archives research**

Vertsinstitusjon: **National Archives of Norway**

Sammendrag:

Archives are an invaluable source of data that can be leveraged in tackling current and future societal challenges. This data is, however, vastly underused due to its limited findability, accessibility, and adaptation for research. It is challenging for researchers to obtain an overview of the potential research material that exists in archives and to locate the data they seek. At the same time, digitalization processes are altering the way records are created and accessed, offering new possibilities and challenges for researchers. Technologies such as digitization, artificial intelligence, and handwritten text recognition make it possible to transform analogue records into a new source of machine-readable data. Researchers today require specialized tools to navigate this changing landscape and take advantage of new possibilities.

The National Archives proposes the establishment of a new e-infrastructure to facilitate research based on archival records. The platform Forskningsarkivet (Research Archives) will include 1) a research catalogue and search engine, 2) an Open Archive database, 3) analytical tools and services, and 4) a digital hub for research services. Researchers will gain digital access to collections spanning from the Middle Ages to the present, including Diplomatarium Norvegicum, Regesta Norvegica, historical population registers, natural disaster databases from the Norwegian Agriculture Agency, and records from the Coronavirus Commission. Archival records have research potential for any field where a look at the past may be relevant, such as geology, meteorology, medicine, social sciences, and history. Forskningsarkivet will provide researchers with specialized functionalities which provide a more complete overview of what data is available in the archives, simplify the process of locating data within the archives, and offer tools for extraction and analysis of structured and unstructured

data. This will expand the research applications of records-based data for a variety of fields which have yet to unlock its potential.

Prosjektnummer: 347125

INFRASTRUKTUR-arbeidstittel: **NoPSYM –Normative and Experimental Data for Psychological Assessment Methods (Norm- og eksperimentdata for psykologiske vurderingsmetoder i Norge)**

Vertsinstitusjon: **Universitetet i Oslo**

Sammendrag:

Clinical psychologists need high-quality assessment methods to deliver empirically founded and ethically viable mental health care. Establishing and continuously updating local normative data and internationally relevant validity data requires specialized and efficient infrastructure. NoPSYM aims to establish a network with informal, logistical, and applied technical infrastructure to coordinate and develop national and international high-quality research on psychological assessment methods (PAMs) in Norway. The infrastructure aims to be built on and integrated with existing and planned infrastructure for data gathering and data storage (NORSMI/UiO Hub-Node/KODEM/Helseanalyseplattformen) to develop efficient solutions for specific research needs in the PAM field. Several national partnerships have been established (UiO, UiT, NTNU, NPF), and more will be sought. NoPSYM will provide critical infrastructure which can support and promote national and international high-quality research as the base for high-quality mental health care.

Prosjektnummer: 347126

INFRASTRUKTUR-arbeidstittel: **Digimatch - Centre for in situ imaging and digital material characterisation**

Vertsinstitusjon: **Norwegian Geotechnical Institute (NGI)**

Sammendrag:

The goal of Digimatch is to provide advanced X-ray imaging combined with mechanical testing and analysis facilities for studying material microstructures and properties at the micro- and nano-scale. The research infrastructure combines Computed Tomography with in situ testing and instrumentation, allowing for multi-physical characterization and analysis of material's deformational processes and the production of high-resolution image-based numerical models. This includes the development of software and expertise for advanced numerical modelling, a user-friendly digital infrastructure for data management and collaboration, training and support for users.

The infrastructure features state-of-the-art high-resolution imaging, a walk-in CT scanner to host large mechanical testing equipment, new CT-transparent testing equipment, sample storage facilities, digital infrastructure and computing resources for production of digital twins and advanced numerical modelling. In addition, procurement of the AutoScan probe will provide an integrated system for scanning and characterizing slabbed core, whole core, or core plugs for gas

permeability, resistivity, ultrasonic compressional and shear-wave velocities, composition, mechanical strength, and elastic stiffness.

This infrastructure will democratize in situ mechanical testing in Norway and lead to innovative discoveries and advancements to support the green energy transition in Norway and globally. In situ geomechanical and geotechnical testing, imaging and digitalization is needed to meet the needs in several fields, including subsurface characterization for CO₂ storage, offshore wind, geothermal energy, hydrogen storage, petroleum operations, structural engineering, transportation engineering and building systems. Material characterization is also essential in other areas such as planetary science, space engineering and biomedicine.

Prosjektnummer: **347127**

INFRASTRUKTUR-arbeidstittel: **ImagingSociety - a national infrastructure for distributed acquisition and central processing of human brain imaging data**

Vertsinstitusjon: **UiO (Universitetet i Oslo)**

Sammendrag:

Magnetic resonance imaging (MRI) is the superior method for studying the human brain in vivo. This joint initiative from UiO, UiB, NTNU and UiT will establish a nation-wide infrastructure for collection, processing, and analysis of MRI data. Identical next-generation 3T MRI laboratories will be established in each of the four cities, connected through dedicated hardware and software solutions allowing harmonized, standardized and coordinated data collection and analysis across Norway, developed and tailored to the infrastructure. Access to distributed state-of-the-art equipment and top-level expertise across the major cities in Norway will greatly expand availability of MRI to research outside traditional biomedical fields by facilitating design, implementation, and execution of experiments in social science and humanity-informed life science. The geographical distribution across East, West, Mid, and North of Norway allows us to take full advantage of Norway's population registries, which when coupled to brain imaging data will constitute a one-of-a-kind resource world-wide. This will place Norway in a unique position internationally in human brain research. We already have strong MRI-based research environments, but there have so far been no possibilities for national integration. ImagingSociety aims to take Norwegian human brain research to a new level in scope by including social science and humanities and facilitate collaboration across disciplines, in size by allowing data collection, standardization and sharing at an unprecedented scale across the country, in representativity, diversity, and inclusivity in allowing coupling to population registry information at a meaningful scale, and quality in development and seamless sharing of expertise across all relevant levels of science. This will also represent a large leap forward in terms of possibilities for data sharing and compliance with FAIR principles.

Prosjektnummer: 347128

INFRASTRUKTUR-arbeidstittel: ARISE – Agricultural Robotics and Intelligent Sensing Ecosystem

Vertsinstitusjon: NMBU

Sammendrag:

The Norwegian University of Life Science sees an opportunity for accelerated progress in robotics and automation in agriculture and food production. The university already holds a world leading position and wishes to take full advantage of the rather unique combination of competence in robotics/mechanics/sensor technology and biology/animal health/soil science. This will be used to solve large and important problems the world – and Norway - are facing.

World food production needs to increase by 60% by 2050, while utilizing decreasing agricultural land, facing a shortage of labor, improving animal health, and addressing the extensive environmental challenges the sector is facing. If the world fails to address these issues, Norway will also encounter supply problems. However, automation and intelligent sensor systems can contribute to increased and improved food production in Norway, such as increasing the domestic share of animal feed. Calculations show that precision farming can greatly contribute to achieve the desired production level. This requires advanced robotics, sensor technology, developed in close collaboration with plant-, soil-, and animal sciences.

The Norwegian University of Life Science's experience is that the development costs for such systems are currently very high, and we consider it a critical task to find solutions that reduce these costs. Because we are working with biological systems, the systems also need to be highly adaptable, and ideally, farmers would prefer dialog-based interaction with the systems, as we are now seeing early examples with generative AI in software.

The development in this field is technologically challenging and demanding in terms of expertise. We are dealing with semi-structured environments and semi-structured objects, to a much larger extent than the experiences in the industry. The need for automation and intelligent systems in semi-structured environments and corresponding objects will also be relevant in various sectors, such as the healthcare industry. Food production currently has a relatively high degree of structuring and will be easier to accomplish automation. The knowledge we develop here can then be applied to many fields with increasing levels of unstructuredness.

Prosjektnummer: 347129

INFRASTRUKTUR-arbeidstittel: Preliminary Planning for the Development of the Norwegian Center for Carbon Utilization

Vertsinstitusjon: Institute for Energy Technology - IFE

Sammendrag:

The proposed Norwegian Center for Carbon Utilization (NCCU) aims to be a forefront player in advancing carbon capture and utilization (CCU) technologies. The center is committed to promoting

biogenic carbon circularity and long-term storage of fossil carbon, emphasizing sustainable practices and efficient carbon management.

NCCU's focus will be on carbon utilization while maintaining an agnostic approach towards capture technologies. This stance fosters diverse collaborations and encourages wide-ranging research opportunities. To be distributed across multiple locations in Norway, the NCCCU is designed to be accessible to a varied user group, encompassing research organizations, industries, policy-makers, and more.

The preparatory phase is vital to establish strategic partnerships, manage resources, and plan advanced e-infrastructure services. Notably, the NCCCU will aim to integrate seamlessly within the existing national and international research infrastructures, fostering a cooperative and supportive network.

The initiative anticipates collaborations with a range of entities, from research organizations and technology companies and environmental sectors. These partnerships are seen as key to achieving NCCU's mission and reinforcing Norway's commitment to a sustainable, low-carbon future.

Prosjektnummer: **347130**

INFRASTRUKTUR-arbeidstittel: **Aquafeed Technology Centre Phase II**

Vertsinstitusjon: **Nofima**

Sammendrag:

Aquafeed Technology Centre (ATC) was included in the Norwegian Roadmap for research infrastructure through funding by the Research Council of Norway from 2017-2022 (NFR 245883/F50). To meet future needs for state-of-the-art research infrastructure within bioresource processing and the goal of the Norwegian social mission on sustainable feed that contribute to reduced greenhouse gas emission in the food system, there is a need for further upgrading and expansion of the existing infrastructure. Phase II will include new equipment that will expand over portfolio of lab and pilot scale unit operations supporting bioprocessing (including strain improvement), downstream processing technology, and improved valorization of bioresources based on biorefinery concepts and the blue-green circular economy. In addition, there is a need for the renewal of some older equipment to enable us to offer state-of-the-art technology, and due to general wear. The ATC infrastructure also offers an advanced analytical platform for the characterization of physical and chemical properties that will be further expanded to meet identified and upcoming demands. The present ATC infrastructure is in full operation and used by a high number of national and international researchers and industry partners, and for education of master and PhD students. Phase II will further expand this portfolio and enable us to offer lab scale and relevant pilot scale infrastructure meeting academic and industrial research needs within development of sustainable food and feed products, and bioactive compounds.

Prosjektnummer: 347131

INFRASTRUKTUR-arbeidstittel: Infrastructure for Sámi metadata enrichment and access to Sámi audiovisual collections

Vertsinstitusjon: Sami Archives / National Archives of Norway

Sammendrag:

As Norwegian public institutions, the National Archives and the National Library have an obligation to “create conditions enabling the Sámi people, as an indigenous people, to preserve and develop its language, culture and way of life” (Norwegian Const., art. 108). The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and Indigenous and Tribal Peoples Convention (1989) make similar statements. In its recent report, the Truth and Reconciliation Commission highlighted that public institutions and state authorities have, “an independent responsibility to deal with their own history and practices in order to enable reconciliation to take place” (2023, p 90). This responsibility applies to both the National Archives and the National Library.

Many of the photos, film and audio in Sámi collections have historically been created by people outside of the Sámi community. The metadata associated with these collections reflect outdated, stigmatizing views of Sámi people and Norwegianization politics. Additionally, metadata in Sámi languages is scarce, limited in Norwegian, and largely unstandardized. These collections are therefore underused in research despite their potential within fields such as Sámi language and language development, culture, society and Norwegianization politics. There is a need to supplement these original metadata with enriched metadata to situate the material in a Sámi context and include Sámi perspectives.

Indigenous participation and authority in data management and governance is vital to the preservation of their history and cultural heritage (GIDA, 2023). The Sámi Archives, which is now part of the National Archives, was created with the purpose of preserving Sámi documentation and is a key national authority within Sámi language and culture. The Sámi Archives as a part of the National Archives, together with the National Library, propose a pre-project to create a methodology for metadata enrichment which incorporates and preserves Sámi perspectives. This will be a central component of a larger project to establish a distributed research infrastructure for Sámi audiovisual collections across cultural heritage institutions.

Prosjektnummer: 347132

INFRASTRUKTUR-arbeidstittel: Research infrastructure for webdata

Vertsinstitusjon: National Library of Norway

Sammendrag:

The web plays a pivotal role in ongoing societal and cultural transformation. The speed at which changes take place makes access to fresh data or even real-time data more important than ever. At the same time, web data is highly ephemeral compared to traditional media. An average web page survives only a couple of months, and thus we need robust archival processes and systems for data persistence in order to preserve and explore the digital past.

The National Library of Norway has collected web data from the Norwegian top-level domain since the early 2000s, producing time-situated records of web content, including text, images, audio, video, and source code (approx. 1.8 petabyte). These collections provide the potential for an almost unlimited number of possible researcher interactions. As pointed out by the leading web media scholar Niels Brügger (Brügger, 2021, 224), there is a need for specific and advanced research infrastructures to facilitate research on web archives, to provide access, produce relevant data derivatives and aggregates, and offer analytical tools. Researchers desire to perform advanced, quantitative analysis on these collections, studying document networks, word frequencies and topics. However, due to curatorial, technical, and legal constraints, few of those needs are supported today.

The proposed research infrastructure seeks to address these needs. It will allow researchers to access National Library web data collections both for qualitative and quantitative research and assist researchers working with web data. To make this happen, the National Library will join forces with researchers specialised in data sanitisation, natural language processing and web technologies. The project also has a special commitment to national minorities. In Norway, three Sami and three national minority languages with very few text resources are spoken. The project aims to identify and collect resources for these languages.

Prosjektnummer: 347133

INFRASTRUKTUR-arbeidstittel: DIGI-LAB for animal and aquatic research

Vertsinstitusjon: Faculty of Biosciences, Norwegian University of Life Sciences (NMBU)

Sammendrag:

In this pre-project we will develop state-of-the-art solutions for a new DIGI-LAB research infrastructure for studying primary livestock (cattle, pigs, poultry, sheep, goat, horses and dogs) across different fields of expertise (welfare and health, behaviour, breeding, nutrition, genetics) by using latest digital tools. The focus is going to be on environment as well. Therefore, we will accommodate numerous digital measurement technologies such as portable X-ray imaging, lidar technology, video (depth, colour, thermal, 2D/3D) cameras and audio recordings in real time using sensors and by continuously monitoring green gaseous concentrations/emissions such as CO₂, N₂O, CH₄, CO, SO₂ and NH₃. We will re-build one part of the current physical infrastructure at Senter for Husdyr forsøk (currently not in use, NMBU) according to latest sustainable standards. This facility will be used for non-invasive digital recording of livestock and storage of portable digital equipment whilst it is not in use. We propose a flexible and adjustable physical research facility as well as the mobile phenotyping platforms. We will use portable digital tools that can be used in other laboratories (FISH-LAB at NMBU). DIGI-LAB infrastructure will be complementary to existing infrastructures in Norway and abroad. Parties involved in designing pre-project are Faculty of Biosciences (NMBU), Norwegian Veterinary Institute, Faculty of Veterinary Medicine (NMBU), NOFIMA and Senter for husdyr forsøk (NMBU).

Prosjektnummer: 347135

INFRASTRUKTUR-arbeidstittel: robotics-driven REseArch infrastruCTure for human-robot TEAMing in emergency management (REACT-TEAM)

Vertsinstitusjon: University of Agder, Top Research Centre Mechatronics (TRCM)

Sammendrag:

The robotics-driven REseArch infrastruCTure for human-robot TEAMing in emergency management (REACT-TEAM) aims at establishing a cutting-edge infrastructure centred on robotics and its critical role in emergency response. The centre will bring together multidisciplinary teams from esteemed Norwegian research organisations to revolutionise emergency operations, with a primary focus on human-robot teaming (HRT).

REACT-TEAM will promote innovation to address important challenges faced during crises by utilising advanced technologies such as artificial intelligence (AI), machine learning (ML), and smart sensors. Researchers will have access to cutting-edge facilities, resources, and specialized equipment to undertake HRT research, simulations, and field trials. Collaborations with emergency response organisations, industry leaders, and international partners will increase the impact of research findings.

REACT-TEAM will exploit the crucial role of human-robot interfaces such as virtual reality/augmented/mixed reality (AR/VR/MR), and haptics. Improving communication, control, and situational awareness through the optimisation of these interfaces will result in a more collaborative emergency response.

REACT-TEAM has the potential of transforming emergency response, augmenting responders' capabilities, and improving overall performance. The centre aspires to put Norwegian robotics research at the forefront of worldwide breakthroughs while contributing to society, national priorities, and the larger emergency management research community by encouraging research excellence, cooperation, and technical innovation.

Prosjektnummer: 347136

INFRASTRUKTUR-arbeidstittel: The Norwegian High Arctic multi-disciplinary Ocean Observing System (NOR-HiAOOS)

Vertsinstitusjon: Nansen Environmental and Remote Sensing Center (NERSC)

Sammendrag:

The overarching aim of the NOR-HiAOOS is to improve and fill gaps in the Arctic Ocean observation system, and to sustain long-term observations of ocean and sea ice variables in the central Arctic. Such observations are needed over several decades to distinguish climate change signals from natural variability, but in situ observations from the central Arctic are few and lack long-term

support. It is also important to have observing systems that can detect environmental changes including natural hazard events. NOR-HiAOOS will operate and sustain a multidisciplinary network of bottom anchored moorings, floats, and drifting buoys in the western Eurasian Basin. The network of moorings will integrate sea ice and ocean point measurements (physical, biological, and biogeochemical) with a multipurpose acoustic network for basin wide underwater geo-positioning of floats, acoustic tomography, and passive acoustics. The acoustic receivers in the mooring network will be used to monitor vocalizing marine life, acoustic impact of human activities, and geophysical hazards (e.g., earthquakes, landslides, tsunamis). Ice-tethered platforms (Drifting Ice-Based Observatories) will be used to collect atmospheric, sea ice and ocean data, which are transmitted in near-real time as they drift with the ice. To ensure that the observing systems can operate autonomously over long time, only well-proven instrumentation for the platforms will be used. NOR-HiAOOS data will be managed by data infrastructures at IMR, NERSC, UiB, FFI, and NPI. Data products will be disseminated through NMDC.

In the EU-HiAOOS project a digital platform is under development by Kongsberg Discovery based on their Blue Insight solution. The digital platform will be further enhanced in NOR-HiAOOS to become a digital window for the Arctic Ocean. The Arctic Window will be used to promote NOR-HiAOOS towards users within education, research, public and private sector. The NOR-HiAOOS system will be part of a coordinated Pan-Arctic observing network in collaboration with European, North American, and Asian partners and will complement existing ocean observation systems in the Arctic.

Prosjektnummer: 347137

INFRASTRUKTUR-arbeidstittel: Norwegian Infrastructure for Waste Upgrading – NIWU

Vertsinstitusjon: Norwegian University of Life Sciences

Sammendrag:

Waste valorization is becoming more and more relevant today as part of our efforts to achieve sustainability. Different organic wastes produced in households, farms, public services, and forest industries as well as animal and wood-based waste, can be transformed into biobased chemicals, bioplastics, and biofuels, providing a more green and sustainable production and therefore, reducing the environmental footprint of society in general.

The Norwegian Infrastructure for Waste Upgrading will be a new infrastructure that will reduce the gap between the lab scale development and the industrial needs for upgrading diverse types of waste such as sludge, plastics, rubber, municipal waste .

NIWU will consist of a national infrastructure with three nodes where each node will specialize in one step of the process: One node for the purification and preparation of the feedstock, one node for the transformation of the waste into new chemicals and the final node for the purification and separation of those chemicals to produce highly pure final high value-added products. The technologies will comprise chemical and thermochemical processing and upgrading of crude products. Development of novel catalytic transformation pathways will be essential in this approach. This requires access to experimental facilities with suitable equipment for catalyst preparation, waste conversion and separation of products, and a wide range of instrumentation for analytical characterization of the products.

The infrastructure will be organized with three levels of production capacities, at 2-liter and 20-liter batch processing technology as well as a 60 liters/hour (continuous processing) technology. These will permit the different actors involved to not only scale up the process from lab to pilot while tackling all the upscaling problems and finding innovative solutions but also to move from batch to continuous process which is of high interest for the industrial sector. This infrastructure not only contributes to reducing waste and promoting circular economy principles but also aligns with the global transition towards a greener and more sustainable future.

Prosjektnummer: 347138

INFRASTRUKTUR-arbeidstittel: ThermoCool Co2 Flowloop – National Research Infrastructure for Co2 injection

Vertsinstitusjon: NORCE

Sammendrag:

The planned infrastructure will be owned by the partners of the project and NORCE research, yet open to anyone for testing, verification and demonstration of research, technology or solutions within the CCS topics. Additional R&D partners within the academia and institutes will be invited and included in the partner program. TherMoCO2L is a new research infrastructure which will fill the gap between novel and lab scale CCS transport, wellbore injection technologies and industrial scale technology validation and qualification. It is planned to accelerate technology development by large scale pilot and demonstration of novel technologies from research groups, innovation start-up, SMBs as well as technology developers from larger organizations to prepare investment decisions.

Optimized injectivity for maximizing Co2 storage capacity.

- Today, in 2023, the energy transition is well underway. However, the world still uses fossil fuels to meet ~80% of its energy needs. Keeping global warming well below 2°C, in line with the COP21 Paris Agreement, requires that fossil fuel consumption is drastically reduced and building the new low-carbon energy system is accelerated at a much faster pace.
- To meet the challenge of carbon neutrality, and still ensure reliable energy is available to the world, large scale CCS solutions are key to offsetting residual fossil fuel emissions.
- As part of the Energy companies cross-functional CCUS (Carbon Capture, Utilization and Storage) R&D program, the “Geological Storage of CO2” program aims to demonstrate & de-risk issues related to the storage of CO2 in depleted reservoirs or in deep saline aquifers.
- Several themes and findings have been identified which include:
 - A lack of experimental data acquisition related to the thermodynamic behavior of CO2 in CO2 storage injection wells (used for depleted reservoirs & saline aquifers), which makes it impossible to validate numerical models used for full scale projects. CO2 is a particular fluid, that differs significantly from the more common hydrocarbon molecule in terms of dissolution, Joules Thompson cooling & chemical reactions. Predicting the flow assurance behavior of CO2 within the wells is key to optimizing CCUS projects.
 - Regulatory constraints on CO2 storage require strict monitoring of CO2 injection, including not only the injection phase, but also several decades after the injection

phase to ensure geological containment & containment within the well. This involves monitoring the behavior of the injector well and the reservoir during injection and post-injection, therefore having appropriate technologies.

Prosjektnummer: 347139

INFRASTRUKTUR-arbeidstittel: ELIXIR4

Vertsinstitusjon: University of Bergen

Sammendrag:

ELIXIR, the European infrastructure for life science data ESFRI landmark¹, was established in 2013. ELIXIR Norway (ELIXIR-NO), the national node of ELIXIR, has been hosted by UiB since 2014, with partners at UiO, NMBU, NTNU and UiT. ELIXIR-NO provides key services to various life science research infrastructures, academia, healthcare, the institute sector, and industry in Norway. The services provided by ELIXIR-NO have been recognized as important in the new infrastructure roadmap². ELIXIR-NO is of core strategic importance for fulfilling the ambitions on research data infrastructure for molecular life science and health research data in the long-term plan for research and higher education 2023 – 2032³ and for the engagement of the involved institutions towards EOSC and other open science initiatives.

In this proposal we are focusing on extension of our activities within two strategic areas: To align the federated data concepts from the European level across Norway with the Norwegian Trusted Research Environments (NorTRE): TSD, which hosts the FEGA solution and additionally HUNTCloud and SAFE. ELIXIR-NO has been central in developing solutions for federated GDPR compliant archiving, discovery, and access to human sensitive biomolecular research data: the Federated European Genome-phenome Archive (FEGA) network. **Federated data approaches** address the challenges raised by the growing number of data silos and satisfy GDPR requirements for sensitive data, while allowing **FAIR** interlinking, thus enabling **Data Mobilisation** towards multiple users nationally and internationally. The central goal of this proposal is to achieve a strong technical alignment between Norwegian Directorate of Health, National Genome Centre, e-Helsedirektoratet and FHI, for ELIXIR-NO to provide long-term services for and beyond the Genomic Data Infrastructure (GDI)⁴ and 1+MG5 projects which are key to ensure Norway's alignment with the European Health Data Space⁶ (EHDS).

Simultaneously, we will facilitate users to efficiently find, access, deposit, and use molecular biodiversity data associated with rich metadata including geolocation and time stamps. We will collaborate with two major infrastructures; GBIF Norway (the Global Biodiversity Information Facility) and NBIC (Norwegian Biodiversity Information Centre/ Artsdatabanken). By mobilising and interconnecting different federated sources of biodiversity data we will elevate the ability of researchers and monitoring agencies including NBIC, the Norwegian Veterinary Institute and FHI to access biomolecular data and answer pressing scientific questions and identify relation to human health.

We will continue to provide training to researchers in the use of the new tools being developed and research support and e-infrastructure as previously, for bioinformatics and data management.

Prosjektnummer: 347140

INFRASTRUKTUR-arbeidstittel: Growing Up in Digital Europe – preparation in Norway (GUIDEPREP-NOR)

Vertsinstitusjon: NTNU, IPS

Sammendrag:

The Growing Up in Digital Europe (GUIDE) – Norwegian preparation (GUIDEPREP-NOR) project aims for Norway to participate as member in the GUIDE ESFRI project. As a current member of the international GUIDEPREP consortium, funded by Horizon Europe (2022-25), the proposed GUIDEPREP-NOR hereby seeks to **establish a Norwegian node** at NTNU, which will prepare **new research infrastructure (RI)** (2024-29) necessary for the start-up of the first wave of the **GUIDE birth cohort study in Norway** (2027-29), with the long-term goal to carry out the second and third wave in Norway in the consecutive funding period (2030-34), and to further operate until 2053. **GUIDE will be Europe's first comparative birth cohort study of children's and young people's wellbeing.** The aim of GUIDE is to track children's wellbeing and development, together with their key background information (homes, neighborhood, and schools) across Europe in years 2027-2053. In total, 21 countries including Norway will provide nationally representative samples that are designed to retain statistical power throughout the lifetime of the study. The **harmonized design** surveying at regular intervals will create the **first internationally comparable, nationally representative, longitudinal study** of European children. GUIDE will employ an accelerated cohort design, starting with a child cohort age 8 in 2027, and a new-born infant cohort age 9 months in 2029, and will follow the participants until the age of 24. Together these repeated measurements will enable **researchers from multiple fields** (e.g., social science, psychology, sociology, health, economics, education, social policy, statistics, demography, life course studies) to analyze children's wellbeing and development in response to children's experiences of growing up in different European states. **Currently, there is no single data source** to support a comparative analysis of the wellbeing and development of children across Europe as they grow up. Here we seek to establish the Norwegian part of the international RI, which includes scientific, technical and IT **tools that will set up the RI ready** to collect and archive data, assure the data quality and make them available for research, with the aim for Norway to become GUIDE ESFRI member. GUIDE will **complement and collaborate with two other existing cohort studies** - The Generations and Gender Programme (**GGP**) and The Survey of Health, Ageing and Retirement in Europe (**SHARE**), and a **cross-sectional study** - The European Social Survey (**ESS**) which all collect pan-European data on adults. GUIDE will be integrated with these RIs through fieldwork, data management protocols and computer-assisted personal interviews (CAPI) programming. GUIDE will be an important source of evidence in developing **social policies** for children, young people, and families both nationally and across Europe for years to come.

Prosjektnummer: 347141

INFRASTRUKTUR-arbeidstittel: Norwegian Platform for Bioprinting and Cell Production for Tissue Engineering & Personalized Medicine (NorPrintLab)

Vertsinstitusjon: Dept. of Clinical Dentistry, University of Bergen (UiB)

Sammendrag:

The proposed Norwegian infrastructure (NorPrintLab) is aimed to establish a cutting-edge platform for 3D-bioprinting and modelling for tissue engineering and personalized medicine. The proposed platform will include state-of-the-art 3D-printers, an automated cell culture platform based on robotics, dynamic in vitro platform (advanced bioreactor), and advanced equipment and software for simulation and modelling.

Tissue engineering aims to assemble stem cells and biomaterial scaffolds in functional constructs that restore, maintain, or improve damaged tissues or organs. We have conducted several preclinical and ATMP-based **clinical trials** to regenerate damaged or lost bone tissue using mesenchymal stem cells. In addition, we are collaborating with other national and international research groups to develop tissue engineering strategies for the treatment of skin burns, corneal defects and multiple sclerosis. Our mission is to promote stem cell-based tissue engineering strategies into a standard treatment offered to patients at hospitals worldwide. However, several obstacles must be tackled in order to achieve our mission. Firstly, methods for assembling constructs that exactly mimic the size, dimensions and geometry of affected tissue or organ must be developed. Secondly, the handling and propagation of cells to be used clinically must be conducted only in accredited facilities which involves several logistic and financial challenges. The development of the proposed platform will facilitate fabrication of biomimetic and patient personalized constructs for different tissue engineering attempts and offer a cost-effective research infrastructure for handling and propagation of clinical grade stem cells. Moreover, bioreactors mimic *in vivo* conditions by providing sufficient oxygenation and nutrients as well as waste product removal. It was also reported that perfusion bioreactor prevented the formation of a necrotic core in thick constructs and enabled branched vascularisation. Additionally, bioreactors can provide a tissue-specific physiological environment when accompanied with **computational modelling** studies to adjust the flow and shear characteristics of scaffolds with specific architectures.

The benefits of the proposed platform are not limited to **tissue engineering strategies** of different tissues and organs but extends to the development of different organoids to be used in **drug testing** and **personalized medicine, fabrication of prosthesis** and construction of **surgical models** for the purpose of training in complex surgeries.

Prosjektnummer: 347142

INFRASTRUKTUR-arbeidstittel: Generations and Gender Programme Norway

Vertsinstitusjon: Research Department, Statistics Norway

Sammendrag:

The main objective of the proposed project is to establish Norway as a stable partner and active contributor to the existing international research infrastructure “Generations and Gender Programme” (GGP). GGP is an interdisciplinary research and data infrastructure on population and family dynamics, processing and disseminating cross-nationally comparable longitudinal data on the life courses of women and men. In 2021, GGP entered the ESFRI Roadmap and successfully applied for funding of their “Preparatory Phase Project” GGP-5D (Project number 101079358, HORIZON-INFRA-2021-DEV-02, European Research Executive Agency), enabling GGP to establish itself as a permanent research infrastructure with its own legal entity (ERIC: The European Research Infrastructure Consortium). The Norwegian Ministry of Family and Children has officially supported the GGP application to the ESFRI Roadmap. The Research Department of Statistics Norway has been a partner of GGP (and its’ precursor, the Family and Fertility Survey) since the beginning of the programme, and currently it is an active partner in the GGP-5D Project and an observatory member of the Consortium Board of GGP. To achieve a stable and active participation of Norway in GGP, we propose the following three aims for this infrastructure project: (i) establishing a fully functional GGP node in Norway and a stable membership of Norway in GGP, including a full membership of Norway in the Consortium Board of GGP, in order to promote interests of the Norwegian research community and Norwegian stakeholders in GGP; (ii) coordinate scientific and methodological contribution of the Norwegian GGP node to GGP, in order to enhance the technical and scientific excellence of GGP; (iii) position Norway and Sikt as the data archive and infrastructure for GGP in order to increase the use of GGP data in line with the FAIR Guiding Principles for scientific data management and stewardship.

Prosjektnummer: 347143

INFRASTRUKTUR-arbeidstittel: Living Norway – An infrastructure for open, reproducible and transparent ecological research

Vertsinstitusjon: Norwegian Institute for Nature Research

Sammendrag:

The accelerating degradation of our planet's ecosystems and the associated biological diversity is among the main present-day societal challenges, and cutting-edge ecological research is increasingly needed to describe, understand and mitigate these challenges. There is currently a severe mismatch between data availability and research needs, and a general agreement within the environmental research sector that improved data management following FAIR principles would be greatly beneficial to the scientific progress. Improved access to data from ecological research and monitoring is also a key element when operationalising the goals set in the Kunming-Montreal agreement. It is therefore a dire need for an infrastructure that mobilize data from research projects and monitoring programs collecting data about the state and functioning of our biosphere. *Living*

Norway Ecological Data Network is a direct answer to this challenge, and will be in high demand by the research community. To this end, Living Norway Ecological Data Network will:

- Serve as the main data-infrastructure for sharing terrestrial and freshwater ecological data, including software to prepare, map, publish and archive data through established e-infrastructures, retrieval of data relevant for state-of-the-art ecological research, and helpdesk services supporting the community throughout the data life-cycle.
- Serve as a hub facilitating the necessary cultural transition and increasing the human know-how with respect to data sharing and FAIR data management in the ecology community.
- Contribute to continued development and implementation of open standards for ecological data, making them more widely applicable and used in ecological research.
- Work closely together with the Norwegian GBIF node, and serve as an extension for mobilizing and reusing new data types that are needed for state-of-the art ecological research.
- The infrastructure will complement IMR's data infrastructure from marine environment

The consortium consists of eight institutions that together represent the breadth in Norwegian ecological research. Our ambition for Living Norway is that this will be the core hub for Norwegian ecological data in science and society. These institutions represent main Norwegian research institutions working on terrestrial ecology. We will work to extend the consortium further during the project period.

Prosjektnummer: 347144

INFRASTRUKTUR-arbeidstittel: Norwegian Ocean Dataspace

Vertsinstitusjon: Norwegian Institute of Marine Research

Sammendrag:

Norway is an ocean nation, with an economy that is highly dependent on a sustainable ocean. Digitalisation of the ocean space is impediment to tackle the challenges that we are facing with respect to sustainable ocean industries as well as marine spatial planning which includes marine protected areas (30% by 2023) and co-existence of industries in the ocean. The new blue economy is based on the information and knowledge of sustainable ocean development, derived from ocean data. It requires that these ocean data are available to all stakeholders in a FAIR and distributed fashion. The Institute for Marine Research, SINTEF Ocean, The Norwegian Meteorological Institute and The Norwegian Mapping Authorities have joined forces to create a Norwegian Ocean Dataspace to address this. We look towards the EU and the Green Deal Dataspaces. A data space is defined as a decentralized infrastructure for the trusted sharing and exchange of data in data ecosystems based on commonly agreed principles. The concept of data spaces is already explicitly used as an approach in the European Union's data strategy, see e.g., <https://green-deal-dataspace.eu/about/>. and also, to provide a basis for Norwegian Digital Twins of the Ocean related to the emerging European Digital Twins of the Ocean – with European fundings through EU Mission Ocean, Green Deal and Destination Earth and also related to the UN Ocean Decade DITTO (Digital Twins of the Ocean) program.

Prosjektnummer: 347145

INFRASTRUKTUR-arbeidstittel: BiobanX - a biobank network initiated by public research institutes serving primary industries

Vertsinstitusjon: Norwegian Veterinary Institute (NVI)
Norwegian institute of Bioeconomy Research (NIBIO)

Sammendrag:

Biobanking includes registration of sample data, technical solutions and procedures for long term storage, recordkeeping and retrieval of the samples with metadata when used again for research. The biobanking term also highlights the value of biological samples, referring to the collection as a bank holding valuable assets. Oftentimes samples are hard and resource demanding to collect, and valuable research funding has been spent to recover them for use in research only to see them thrown out or stored in a far too unavailable form when a project has come to an end. Often, even though a sample is collected for only one purpose, it may fit the needs for multiple research-projects. Reusability of samples is both more sustainable and increases the intrinsic value of the sample as research results accumulates, it enhances our understanding of the sample and the intricate workings of living organisms. It will also save project costs by reducing the amount needed for new sample collection. Consequently, this facilitates interdisciplinary research and generation of new hypotheses to be tested. Biobanking, according to the FAIR principles, is an essential infrastructure for capturing this value of biological samples.

Both NIBIO and the NVI perform interdisciplinary research within the primary industry, and both institutes experience that the tools for efficient reuse of biological samples and respective metadata are not in place. Today, many of the critical steps for an efficient FAIR practice is lacking or at best, not harmonized. As similar institutes experience common challenges in finding available resources for a FAIR biobank infrastructure, and have common interests in using such infrastructure, we aim for an initiative that will coordinate the Biobanking efforts and capacities from these institutes and be instrumental for enabling sustainable and cost-efficient research in this sector. This will enhance the utilization of sample resources and harmonize solutions and resources for biobanking. This pre-project initiative will critically explore which criteria and what solutions fit best to implement FAIR-promoting biobank infrastructure for the public research institutes serving the primary industry. By establishing a core project team of biobank experts, project leaders, and managers we will use their knowledge to design a project canvas, driven by methodical tools, and invite key collaborators from the industry (aquaculture/agriculture), governmental agencies (food authorities), research institutes (HI, NOFIMA, NINA), and potentially some key academic partners from the same sector (NMBU), when relevant. The output of the pre-project will be documented and implemented into an application towards a biobank network infrastructure that is tailored to the research in this sector.

Prosjektnummer: 347146

INFRASTRUKTUR-arbeidstittel: National Advanced Fertilization, Embryo and Cryopreservation Technologies Network (FertECT-Net)

Vertsinstitusjon: Inland Norway University of Applied Sciences

Sammendrag:

Inland Norway University of Applied Sciences is established as a research hub in the interdisciplinary approach between livestock industry business, veterinary and human medicine, in both applied and basic research for understanding gamete (sperm and oocytes) quality parameters and their influence on reprogramming of genomes for healthy embryo development. The FertECT-Net infrastructure initiative is designed to establish a national advanced fertilization, embryo and cryopreservation technologies network for national and international scientists being partners in long term ongoing projects, and beyond. The research infrastructure proposal will be focused on UpToDate germcell/*ex vivo* and *in vitro* fertilisation labs, and cryopreservation facilities. The comparative aspect to livestock species will add a fundamental dimension, as the breeding focus for decades has resulted in Norwegian cattle and swine being international exceptional in reproductive performance. FertECT-net will give scientists in human and animal fertility research access to biological material and lab facilities to reveal mechanisms of fertilization by exploring gametes and embryo quality parameters across species with its consequences for embryo development and adult life of laboratory animals, livestock animals, and ultimately humans.

Prosjektnummer: 347147

INFRASTRUKTUR-arbeidstittel: SINLAB - National Infrastructure for Experimental Research on Sustainable Immersive Networking

Vertsinstitusjon: University of Oslo (UiO)

Sammendrag:

Human society has always depended on collaboration and interpersonal interactions. Interacting with people around us starts at a very young age, and we apply all of our senses when we do it. However, when we try to extend such natural interaction to long distances, all existing forms of communication today limit the depth of interaction severely. We are capable of internalizing the translation of one kind of motion from our physical domain into a different kind of motion in a virtual or remote domain, as it happens for example for gamers. It becomes natural for them to move through a virtual world using a keyboard, and to interpret audiovisual clues in replacement of arbitrary sensory feedback. But in spite of the prevalence of these learned replacements, they provide neither intuitive nor natural human interactions. The COVID-19 pandemic highlighted the need to make distributed collaboration and remote interaction more humane, natural and seamless, and to achieve this, we need disruptive technologies that can overcome the need for learning, abstraction and sensory translation. However, the promise of these technologies can only be assessed through extensive experimentation.

The SINLAB National Infrastructure will provide researchers in Norway and Europe with a toolset that helps them to explore a vision of natural, multisensory interpersonal interactions over long distances. Our goal for such explorations is to achieve true, full physical remote embodiment, which includes also timely rich bidirectional haptic interactions between humans. This infrastructure will provide a key foundation to enable long-term disruptive theoretical and experimental research in all the associated challenges. In terms of societal impacts, this infrastructure will pave the way to revolutionizing how humans interact with each other, transforming how remote work, education, care, socialization with our elders, are performed, leading to a full integration into a remote cyber-physical environment.

As a national infrastructure that is about exploring advanced opportunities for the collaboration between and interaction of people, SINLAB will also provide the means of exploring new ways of measuring physical signals that can be used to measure and express the comfort or stress that people experience when remote (inter-)actions succeed or are impeded. With its strong focus on experimental exploration of the human aspects, the lab is prepared to support users both technically and in finding solutions for ethical and societal questions in the preparation and conduct of research involving human participants.

Prosjektnummer: 347148

INFRASTRUKTUR-arbeidstittel: The Norwegian Large Scale Sustainability Infrastructure (NSI)

Vertsinstitusjon: SINTEF AS

Sammendrag:

The long term goal of NIS is to establish a research infrastructure for sustainability in a scale and composition not yet available globally. The facility will offer large amounts of hydrogen, ammonia, natural gas, biogas, electricity (grid and renewables), and cooling water, enabling a combination and quantity of R&D projects along the different value chains not seen anywhere else in the world. This is of critical importance in further training of new personnel, testing of full-scale applications, products and solutions for a sustainable future.

The infrastructure will be located within the regulated area of Norway's largest and most complex, knowledge-based industrial areas (Herøya, Porsgrunn). About 70 companies with 2500 employees are in this industry park, out of which 400 work with R&D.

The total investment is foreseen to be approximately 500 NOK. This includes several costly items not applicable for funding by FORINFRA. At this stage we plan to apply for 200 MNOK, primarily covering equipment costs.

The establishment of NIS will be in line with new political guidelines, roadmaps and measures, such as in The Norwegian Government's 'Hydrogen Strategy' (2020), Mld.St. 36 on Energy to Work (2020-2021), and the 'Green Industry Lift' (2022).

Prosjektnummer: 347149

INFRASTRUKTUR-arbeidstittel: Sustainable healthcare – digital sandbox to enable integrated healthcare

Vertsinstitusjon: Nordland hospital trust

Sammendrag:

The project will establish a new research data infrastructure with the overall objective of enabling sustainable healthcare solutions for citizens and society. Valid and effective health care research and innovation for citizens must be done in collaboration with the citizens and users themselves. The project involves facilitation and operation of a digital sandbox where healthcare personnel, patients and citizens are drivers for research and innovation of new digital solutions. The project will look at how to make real patient data more easily available for research related to clinical efficacy for patients, especially for patient pathways across service levels. Synthetic patient data or consent data from citizens can be used for research and development, "plug and play" related to patient pathways. The project will develop and organize a database of synthetic and anonymized data, based on new and existing datasources, that researchers can use to develop and validate digital technologies in a real-life environment. The goal is for the digital sandbox to work as an ICT ecosystem and test environment where solutions for primary care, hospitals and GP's are all installed in the same location. This way the e-health industry, healthcare services, academia, decision makers, patients/citizens' can all contribute to development, research and testing of IT solutions to underline integrated information exchange and cocreation of patient pathways. The infrastructure will meet Norwegian and international needs for research on resource-saving digital solutions in the health sector, and how to achieve integrated and good patient pathways.

Prosjektnummer: 347150

INFRASTRUKTUR-arbeidstittel: OpenPower– Open platform for power system analyses

Vertsinstitusjon: SINTEF Energi AS

Sammendrag:

The vision of a zero-emission society is materializing in national and international policies and initiatives such as the EU Green Deal and the REPower EU plan. Strategy documents such as Energi21 and Digital21 outline the power system as a key component for the Norwegian transition towards such a society. A robust power system is critical to progress in the electrification of Norway. The future power system will also need to evolve according to present development trends often summarized through the 4 D's (Decarbonization, Digitalization, Decentralization and Democratization). To meet the ambitious goal of a zero-emission society, it is essential to research and develop technologies for analyzing and operating the future energy infrastructure considering faster dynamics, tighter market interaction, higher variability in both production and consumption patterns and a fundamentally increase in the level of digitalization in every part of the power system. OpenPower will be based on an open-source software framework where third-party modules and models can be integrated. It will provide a research infrastructure to research, develop, test, and

demonstrate state-of-the-art tools capable of analyzing the future power system and interplay with other parts of the energy system. The infrastructure will encompass the present needs for educational purposes (e.g. study programs in Digital Electrical Energy) and for research and development covering the TRL levels from prototyping to production-ready testing. The OpenPower platform is a collaboration between NTNU, SINTEF and potentially further partners. A national infrastructure covering these focus groups is identified to be needed to enable the development that makes the operation of the future power system robust and efficient.

Prosjektnummer: 347151

INFRASTRUKTUR-arbeidstittel: The Norwegian Fuel Cells and Hydrogen Centre – Towards Component Manufacturing and Large-Scale Testing

Vertsinstitusjon: SINTEF AS

Sammendrag:

The present proposal describes the extension of the already established Norwegian Fuel cell and hydrogen centre (NFCH). The existing infrastructure will be updated with expanded capabilities and capacities, and a manufacturing node is added. Manufacturing of high temperature components using sustainable and scalable processes is a crucial addition to ensure that innovation at materials and components research is implemented at cells and stacks levels. Presently the targeted components are not commercially available, and in-house component manufacturing will provide an added value to the HT test node.

The NFCH is a national infrastructure that was established in 2017 and currently consists of three main nodes: a low temperature node, a high temperature node and a system node. This existing infrastructure involves three major Norwegian R&D stakeholders (SINTEF, IFE and NTNU), engaged in Fuel Cells and Hydrogen (FCH) technology development. Cutting-edge equipment for testing fuel cell and electrolyzer components, cells, and small stacks have generated widespread national and international interest. An expansion of capacity and capability is crucial at this point, as the industry, and hence the market, is growing rapidly. Some industries will invest in their own standardized test equipment, but in order to bring the industry and research forward, more specialized test stations, with more advanced and unique *in situ*, *in line* or *ex situ* characterization and diagnostic equipment, is necessary. As Norway is a high-cost country, adding unique capabilities will make us more relevant for participation in international projects. In addition, some infrastructure is included to replacing outdated and obsolete equipment.

Digitalization is becoming a crucial part of any laboratory or manufacturing operation, and the infrastructure will include auxiliary components to enhance the possibility of data and metadata collection. There are already efforts within the consortium to utilize the immense possibilities stemming from machine learning, and systems for the creation and sharing of FAIR data will be set up.

Prosjektnummer: 347152

INFRASTRUKTUR-arbeidstittel: Distributed Sensing uniTs (DiSenT) for Smart Building Hub

Vertsinstitusjon: SINTEF AS

Sammendrag:

Distributed Sensing uniTs (DiSenT) is a distributed research infrastructure designed to complement the existing Smart Building Hub (SBHUB) e-infrastructure in Norway. While SBHUB collects available data from buildings at large scale (national level), DiSenT aims to overcome its limitations by providing more accurate and higher resolution measurements of various parameters related to energy use, indoor environmental quality (IEQ), occupant satisfaction, and building-integrated photovoltaic (BIPV) systems. DiSenT consists of distributed monitoring units with hardware and software packages for both portable and stationary sensing equipment. It serves four main purposes: 1) enriching SBHUB datasets by increasing monitoring frequency and accuracy, 2) extending the dataset by including additional parameters through direct physical measurements, 3) validating the existing data by proposing calibration corrections and 4) enabling fault detection and maintenance needs through automatic data analysis. The infrastructure operates at two levels: DiSenT-basic, which provides a quick evaluation of overall building performance, and DiSenT-advanced, which conducts further investigation based on user satisfaction feedback at the basic level. DiSenT will be distributed over different climate zones and building typologies in Norway. The collected data is stored and processed by the SBHUB e-infrastructure and made available to users in compliance with GDPR (General Data Protection Regulation). DiSenT as part of SBHUB will participate in the European Digital Innovation Hub and common European data spaces. Overall, DiSenT aims to enhance the understanding of buildings' performance and improve user satisfaction and energy efficiency through comprehensive monitoring and analysis.

Prosjektnummer: 347153

INFRASTRUKTUR-arbeidstittel: HVDC-lab: Enabling reliable long-distance power transmission

Vertsinstitusjon: SINTEF Energi AS

Sammendrag:

HVDC technology enables integration of renewable energy sources into the European power system, facilitating a sustainable and reliable energy transition. With the increasing demand for renewable energy integration and the need for robust and reliable HVDC technology, this infrastructure will play a crucial role closing the main knowledge gaps related to this technology. The HVDC-lab is a planned research infrastructure aimed at addressing the challenges and opportunities associated with high-voltage direct current (HVDC) technologies.

The infrastructure will consist of two main laboratories: the Ageing Lab and the Health Prediction Lab. The Ageing Lab will focus on investigating ageing mechanisms under HVDC conditions, enabling long-term experiments under controlled environmental conditions. It will feature equipment for

energizing test objects with high-voltage DC sources, controlling ambient conditions using heat and climate chambers, and conducting characterization tests for better understanding of ageing mechanisms. The Health Prediction Lab will concentrate on developing techniques and sensors for monitoring and predicting the health of HVDC components, such as cables, terminations, and gas insulated switchgear (GIS). It will include equipment for partial discharge (PD) detection, temperature monitoring, vibration and PD sensing using optical techniques, and online measurements of space charge accumulation. The synergy between the two labs will enhance the overall research outcomes by bridging the gap between understanding ageing mechanisms and developing effective condition monitoring techniques.

To support the research activities, the HVDC-lab will establish a secure laboratory network, ensuring safe handling and easy accessibility of the generated data to both academic researchers and publicly funded projects. It will also provide dedicated computational resources. This infrastructure will facilitate data analysis, numerical simulations, and the implementation of machine learning algorithms for a better understanding of HVDC ageing mechanisms and advancement of condition monitoring techniques.

The HVDC-lab will draw on the existing resources at SINTEF Energi and NTNU, including Elpowerlab, SINTEF Energy Lab, and the high-voltage laboratories at the university in Trondheim. By leveraging these established assets, the HVDC-lab will be contributing to the development of robust HVDC technologies through improved understanding of ageing mechanisms, and improving condition monitoring techniques.

Prosjektnummer: 347155

INFRASTRUKTUR-arbeidstittel: MARINO Utsira Nord– Marine Research Infrastructure Norway

Vertsinstitusjon: NORCE

Sammendrag:

Floating wind power is widely regarded as an important part of the energy mix of the future. But it comes with fundamental un-answered questions:

- Will floating wind power be financially competitive?
- What is the environmental footprint of a full-scale floating wind farm?
- What is the societal footprint of a full-scale floating wind farm?

MARINO is an inter-disciplinary and integrated research infrastructure, aiming to underpin the knowledge-building during the development and operation of Utsira North floating wind farm.

The Utsira North Wind Farm is the world's first full-scale floating wind farm, estimated to a total of 100-150 floating wind turbines (FWT). Although several floating wind farms are in operation today, none of these are even nearly as large and complex as Utsira N, the largest one being Hywind Tampen (Equinor) counting 11 turbines. Another unique feature of Utsira N is the proximity to shore and populated areas, as the distance to the Utsira community is about 7 km. The scale and proximity to shore makes Utsira N a truly unique site where noel knowledge and experience in a wide range of disciplines can be gained (see map).

Furthermore, the proximity to MetCentre – test facility for offshore energy, Utsira Living Lab and national test area for autonomous and remote navigation makes the area highly suitable for experimentation, test and research.

The lessons learned from the first full-scale floating wind farm will undoubtedly be applicable to new and planned wind farms and will provide a good basis for decision making and development of policies, governance models as well as commercial and financial considerations.

MARINO addresses the common needs for of all stakeholders of the development including local municipalities, developers, supply industry, authorities, academia and research centres.

The thematic nodes of the MARINO infrastructure are Societal, Technical, Geophysical, Biological and Digital. We propose an integrated research infrastructure that will harvest data within each thematic node and ensure that data are handled according to the FAIR principles.

Prosjektnummer: 347156

INFRASTRUKTUR-arbeidstittel: **Interdisciplinary simulator infrastructure for safe, secure and optimised energy systems (SimSafe)**

Vertsinstitusjon: IFE

Sammendrag:

This infrastructure application targets the need to ensure future energy systems' safety, security and optimisation. EU states: *“There is a need to research the design, operation and integration of all parts of the energy systems of the future in a safe and secure manner as Europe transitions from a traditionally centralised system of generation to a much more distributed energy generation portfolio”*. The proposed infrastructure will enable existing systems, simulators, hardware-in-the-loop and control room solutions to interconnect and facilitate analysis, development and training on complex scenarios for resilience, sustainability and optimisation of energy systems.

The energy system will be vital in achieving climate neutrality by 2050. Further, the Norwegian Committee for Energy, stated in the recently released report that new solutions are needed and that there is a need to perform stress testing in extreme scenarios. Further, they point to the necessity of such simulations and testing to establish national emergency preparedness and resilience strategies. This calls for a new national infrastructure where expertise from multiple domains is brought together to *connect their existing simulators*, control centres and hardware-in-the-loop. This will enable public and private actors to analyse, train, and develop interconnected systems and procedures. Industries could easily leverage involved stakeholders' research and operational competence for safer and more efficient operations. This allows for rapid and iterative prototyping of alternative human-centred control room configurations, analysing risk, cyber security, and crisis management. The research activities supported by the infrastructure shall impact the energy system's resilience, optimisation, energy innovation and sustainability.

Prosjektnummer: 347157

INFRASTRUKTUR-arbeidstittel: OceanLab Extraordinary Operational Costs

Vertsinstitusjon: SINTEF Ocean

Sammendrag:

OceanLab currently provides online data on the marine environment, and a platform for rapid development and prototyping of sensors and autonomous technology. Many elements of OceanLab are already in use by research projects (ahead of schedule for the implementation period), and its use so far has provided excellent experience in operating the infrastructure and in how research will come to benefit use the infrastructure in the years ahead.

The running costs for elements of the OceanLab infrastructure are high due to logistic requirements and heavy exposure to environmental factors like seawater/corrosion, mechanical stress and fouling of equipment that is continuously operational in the ocean. A large part of the running costs in the infrastructure will not be directly related to the projects and it is difficult to argue that the projects should cover such costs. We therefore apply for financial support from the Research Council to partly cover the running costs and maintenance of OceanLab.

Within the OceanLab Observatory node, sensors and instrumentation need periodically (weekly/monthly/yearly) maintenance and mechanics and moorings require a full recovery every year (Ingdalen buoy) or on a 5-year interval (Munkholmen buoy). Running costs and maintenance will, in a normal year, amount to 1,5-2 mNOK with an additional cost of 5 mNOK every 5th year due to full service on the Munkholmen bouy.

The OceanLab subsea node is placed in a physically extreme environment on the seabed, and is exposed to sedimentation, corrosion, and marine growth. The structure will hence need yearly maintenance to remain operational. Like the buoy infrastructure, several instruments are available in real-time and hard to apply all costs to specific projects. The infrastructure is also valuable to both MSc and PhD students that do not always have project funding available to cover expenses in the range required for the cost level of this infrastructure.

Prosjektnummer: 347158

INFRASTRUKTUR-arbeidstittel: Norwegian Infrastructure for Safety and Security (NORISS)

Vertsinstitusjon: University of Bergen (UiB), Department of Physics and Technology (IFT)

Sammendrag:

The vision for NORISS is to establish a national research infrastructure that will enable collaborative experimental research of critical importance for the safety and security of industrial facilities, energy systems, and critical infrastructure in society. The proposed infrastructure consists of experimental test sites with varying capabilities, enabling large-scale testing that cannot be conducted in indoor laboratories. The aim is to enable experimental investigations of critical phenomena at spatial scales

and complexities representative of actual systems in industry and society. Examples of relevant phenomena that can be investigated include the release and dispersion of hazardous materials, ignition processes, a thermal runaway in battery systems, turbulent combustion and flame instabilities, vapour cloud explosions, mist explosions, dust explosions, hybrid explosions, deflagration-to-detonation-transitions, the detonation of condensed explosives, rapid phase transitions, boiling liquid expanding vapour explosions, propagation of shock and blast waves, structural response, and the effect of various risk-reducing measures. This will allow researchers to develop, test and validate science-based models, devices, and systems for protection against explosions, innovative measurement technologies, protective structures, energy conversion, storage systems, etc. As such, the project will support national and international collaborative research in an area of strategic importance to Norway as the net exporter of energy commodities: safe and sustainable conversion, transport, storage, and use of energy. The infrastructure will be unique for Norway and Europe and enable fundamental and applied research of high relevance to a wide range of practical applications in industry and society. The foreseen impact in a longer perspective includes new knowledge about physical phenomena, improved predictive capabilities of state-of-the-art consequence models, innovative solutions for explosion protection, new and updated regulations, codes, and standards for safe design and operation, national and international collaborative research projects, improved competence in the workforce, and ultimately enhanced safety and security in industry and society.

Prosjektnummer: 347159

INFRASTRUKTUR-arbeidstittel: Sustainable Space Laboratory (SSLab)

Vertsinstitusjon: UiT the Arctic university of Norway, Faculty of Engineering Science and Technology

Sammendrag:

Utilization of near space is growing, and still expected to significantly grow further in the years to come. Rockets and satellites have become very important tools for science and technology in our daily life, spanning from communication, navigation, geology, weather forecasting and climate predictions. With an increase in space activities, we become increasingly dependent on space, and reduced space access will have severe implications for our society. What once was a frontier for technology and exploration, is now turning into a crowded technological super-highway, and there is an immediate need for ensuring near space as a sustainable arena for years to come. Adding to the problem is the growing number of objects classed as space debris. According to an estimation done by the ESA Space Debris Office in 2021, there are about 130 million debris objects between 1 mm to 10 mm, and one million objects larger than 1 cm. Only 33 550 objects of any size are currently tracked. This problem will continue to grow, even if we stop launching, unless new policies can remedy the problem. These will need new methods for debris mitigation and a better understanding of its distribution.

The Sustainable Space Laboratory (SSLab) will establish a national research infrastructure to increase our understanding of debris distribution in space and develop mitigation solutions. The infrastructure will consist of equipment for both ground-based and on orbit observation of space debris particles, as well as equipment to support technology development to enhance reliability and

quality of on orbit observation methods. We also aim at developing necessary infrastructure for analysing hypervelocity impact phenomena, to support in-orbit collision detection and mitigation. SSLab will be a solid foundation for a future SFI initiative on sustainable space operations. The lab infrastructure will be developed by UiT IVT/NT-faculties, in dialogue with the Norwegian Space Agency and close collaboration with world-leading partners in academia (ITS/UiO, SIMLab/NTNU), research institutes (NORCE) and industry (KDA/KNA, KSAT, EIDEL, Solstorm, Andøya Space). We thus align perfectly with governmental goals to strengthen Norwegian space industry (including research) on the axis Andøy Narvik Tromsø Svalbard. This also provides increased focus on space situational awareness and sustainable space operations, often neglected when considering the full value chain for the space industry.

Prosjektnummer: **347160**

INFRASTRUKTUR-arbeidstittel: **FAIRify through data sovereignty - Enhanced value of data**

Vertsinstitusjon: **University of Oslo**

Sammendrag:

The goal of this infrastructure is to increase the value of research data within materials and new energy technology by harmonizing the process from the data origin to its utilization in research or business. The infrastructure aims to make this process FAIR (Findable, Accessible, Interoperable, Reusable) and based on principles that protect data sovereignty. The infrastructure will focus on developing solutions close to the researcher's everyday work and close to the data's origin in experiments, measurements or modeling.

According to Meld. St. 5 (2022-2023) Long-term plan for research and higher education, research data is public information. Without suitable infrastructure to handle and prepare data for sharing, as well as simple solutions to share either the whole or parts of a dataset, data will not be publicly available in practice. Moreover, it is not enough to make data publicly available if they are not at the same time FAIR. What it takes to make data FAIR varies between research fields, making this work large and complex if one tries to encompass all. This infrastructure will therefore focus on coordination with already existing international projects and initiatives, such as the German FAIRmat initiative. Thus, we will ensure that the developed solutions are broad, compatible and complementary. Furthermore, we want to focus on research data related to energy research. This is a priority area both nationally and for the infrastructure's partners, and also a research field with lower maturity in FAIR data handling.

In addition, one can read in Meld. St. 22 (2020-2021) Data as a Resource - Data-driven Economy and Innovation about the necessity and potential of data and data sharing for future value creation in Norwegian industry. Annual value creation is estimated at NOK 300 billion and about 200,000 jobs, if the right conditions are in place. At the same time, the European Commission has given clear signals that the European Union (EU), through The European Data Act and the EU's strategy for data, will stimulate data-driven innovation by making data available to everyone and strengthening Europe as a sovereign data economy. None of this is possible without focusing on how we treat data in the "value chain" from sensor to data consumer, where FAIR promotes the verifiability and reusability of

the data, while data sovereignty enables the trading of data in a safe, secure, fair, and profitable manner.

We want to promote this by establishing a sovereign FAIR data market, where research data from energy research will be searchable, accessible, interoperable, and reusable, while also being a tradable asset through further processing and traded to public and private value creation in a data economy that protects owners and contributors in a fair and safe manner.

Prosjektnummer: 347161

INFRASTRUKTUR-arbeidstittel: Research infrastructure for space systems and technology development (RIST)

Vertsinstitusjon: FFI

Sammendrag:

In recent years, enabling earth observation capabilities has become more and more important. Small satellites in earth orbit are core elements in systems of navigation and communication, and play an important role in for example environmental and resource monitoring, security and surveillance, and detection of off-nominal events like forest fire or flooding. FFI has since 2010 launched several research satellites for earth observation. Most recently, the twin satellites Huygens and Birkeland were developed, built and launched through a collaboration between FFI and the Dutch research institutes NLR and TNO. Space exploration seeks to improve our understanding of the solar system, and for example answer questions related to past and possible future habitability of other planets. The design, development, delivery and operation of the RIMFAX ground penetrating radar to the Mars 2020 Perseverance rover demonstrate that Norway has a national capability to be part of complex space missions. Lately, the focus on the Moon has increased. NASA is planning for manned missions to the moon, and several companies and countries have done or are planning scientific missions to the Moon.

The development of space systems demands a research infrastructure to design, develop, integrate, test and exploit scientific data from such systems. The Research infrastructure for space systems and technology development (RIST) will consist of research infrastructure for test and evaluation of instruments and systems. Main elements of RIST are laboratories for prototype development and functional testing, thermal vacuum chamber for temperature cycling, shaker for vibration testing, shock table for shock testing, EMI/EMC facilities for electrical testing, radiation testing facilities, and systems for research and development support. The infrastructure will also support mechanical and thermal research, and research related to for example characterization of materials. RIST will also be play a role in education, with users from the Master program in space systems at UiO, and from student projects at universities.

As an option RIST, can be equipped with a facility for shock testing of military systems. These systems have mandatory requirement for testing and there are no Norwegian test facility to support this either for The Norwegian Defence or for the defence industry. Building competence in this field is also very important from a national preparedness perspective.

Prosjektnummer: 347162

INFRASTRUKTUR-arbeidstittel: Research Infrastructure for Technology-Supported Crisis Management

Vertsinstitusjon: University of Agder, Centre for Integrated Emergency Management (CIEM)

Sammendrag:

Norway is facing an increasingly complex set of risk and threat scenarios, resulting from both from natural and man-made hazards. Increasing digitalization of the vital functions in society creates interdependent mission-critical ecosystems depending on well-functioning and secure critical infrastructure. Societal security and resilience increasingly depend on advanced technology support for collecting, analyzing and sharing information related to maintaining the vital functions in society, and for effectively training responders at different levels (strategic, tactical, operational) for collaborating in digital and information intensive environments.

Research on how to support technology-based work practices in crisis preparedness and response is currently undertaken at several research institutions in Norway. But while these institutions have established facilities that each address parts of the related research challenges, there is no established research infrastructure supporting the national need for coordinated research and sharing of data and results in this domain. Based on the research facility at the Centre for Integrated Emergency Management (CIEM), the University of Agder intends to coordinate the development of a proposal for a national research infrastructure for technology-supported crisis management.

The proposed e-infrastructure will provide access to research data from evaluation of exercises and real events, accumulated research knowledge and the methodological basis for this, supporting replication of research studies and planning and conduct of joint studies among the national research institutions. The infrastructure will support interdisciplinary research, involving several disciplines within social science, technology and engineering, with a joint focus on how to develop improved inter-agency collaboration by innovative use of technology. The infrastructure should also support joint demonstrations and collaboration on technological solutions that can support crisis preparedness and response.

Prosjektnummer: 347163

INFRASTRUKTUR-arbeidstittel: ESSENTIAL minerals and metals processing for sustainable growth

Vertsinstitusjon: IFE – Institute for Energy Technology

Sammendrag:

Availability of materials for the green transition and for general development is largely compromised by imports dependencies and rapid demand growth. Meanwhile, their production is often energy intensive, with large, related CO₂ emissions and other problematic waste, like tailings. These negative outcomes set a serious dilemma about global sustainability of the green transition itself, unless materials are sourced at lower environmental impact than at present. Unfortunately, there is a

concerning lack of mature technologies, new metallurgical processes, and specialized knowledge to fulfil the challenge.

Norway has plentiful of unexploited mineral resources, advanced knowledge, and infrastructure on mineral beneficiation and pyrometallurgy, and world-class entrepreneurship and sustainability ambitions. In this scenario, the main infrastructure gap for completely leading this field lays on these main lines: Expanded advanced hydrometallurgy including organometallurgy, biometallurgy, electrometallurgy, solid-liquid operations and digitalization. After the golden age of Norwegian metallurgy in the 70's and 80's, limited attention has been given to this field in the last 50 years, with the exception of ore beneficiation (physical methods), pyrometallurgy and some hydro and electrometallurgy investments (e.g. Infrastructure projects 269842 and 322654), almost entirely in Trondheim by SINTEF and NTNU, with smaller laboratories in some Universities (e.g. UiO). The importance and high demands of the oil industry first and the renewable energy initiatives later, somehow kept out of sight the underlaying basis for any development: sustainable sourcing of all the necessary materials to produce devices, buildings and, actually, all the physical commodities for society.

“ESSENTIAL minerals and metals for sustainable growth” will establish a new, crucial infrastructure node for research on raw and circular materials processing in Southern Norway. This experimental center is the missing piece for Norway to become a unique provider of critical, strategic and essential materials and technology for Europe and the world. The project will establish a new, large experimental facility at IFE, it will enable partner-Universities to expand their existing laboratories and the resulting new node will be complementary to existing players in the country. As a result, Norway will host an exceptional national network, covering all key areas of minerals and metals processing for sustainable growth.

Prosjektnummer: **347164**

INFRASTRUKTUR-arbeidstittel: **Norwegian Thermal Energy Storage Hub (TES-HUB)**

Vertsinstitusjon: **SINTEF Energi AS**

Sammendrag:

The “**Norwegian Thermal Energy Storage Hub**” (**TES-HUB**) initiative will be a research infrastructure hub dedicated to thermal energy storage (TES). Originating from the Gemini Center Thermal Energy Storage (GC-TES) with the most renowned research groups in this field, TES-HUB seeks to be a central hub for all experimental activity within short-to-medium term TES across technology readiness levels (TRL) and utilization areas. TES-HUB will be accessible for national research and will be used in further collaboration with GC-TES to establish larger international collaborations that strategically position the TES environments in Norway as strong partners in larger European research consortiums.

TES is expected to play a significant role in the diversification of energy storage technologies and integration of renewable energy systems in future energy networks. The growing demand for solutions across industries, requires a large effort across TRL scales to tailor TES technologies to

each specific application. Up until now, Norwegian experimental research in this area has been scattered and often in lack of dedicated equipment for TES purposes. Thus, a combined effort is necessary to upgrade and implement the specific research infrastructure required for dedicated characterization and analysis through the thermal energy storage value chain; from materials, through devices and up to system integration.

Prosjektnummer: **347165**

INFRASTRUKTUR-arbeidstittel: **Center for Preventive Technology (CPT)**

Vertsinstitusjon: **University of South-Eastern Norway (USN-IMS)**

Sammendrag:

There is a great need for infrastructure for a national centre capable of developing, evaluating and test-producing new preventive technologies that can 1) test and treat health and environmental hazards or deviations on-site in real-time, 2) defend Norway and Europe against future pandemics and 3) defend the environment and nature against unwanted molecular changes. The infrastructure includes several partners who are able to build up national capacity for the development, testing and validation of new RNA based drugs, and enabling and converging sensor platforms in high-quality plastic and cellulose materials. Technologies must be established that can both detect and treat unwanted conditions in an automatic manner. Such technologies can provide sustainable, preventive and curative technologies for e.g. smart cities, industry, molecular events in nature and agriculture or health issues in the society in general. The national infrastructure must be capable of producing and testing prototype- and pilot series of identical lab-on-a-chips (LOC), biosensors or micro-total-analysis-systems (μ TAS) to conduct evidence-based performance evaluation, verification, and validation studies. Today's NORFAB infrastructure in Norway lacks the ability to manufacture and test prototypes at a technology readiness level (TRL) higher than 3. This includes the ability to qualify and certify enabling prototypes in quality plastics up to test-produced pilot products. Real-time on-site automatic monitoring and screening of large populations of humans, and other biological species, over days and weeks may be possible if new bionanotechnology - based injection moulded devices can be fabricated, produced, and evaluated in this new Center for Preventive Technology (CPT).

Prosjektnummer: **347166**

INFRASTRUKTUR-arbeidstittel: **High-pressure tank facility for studies on the safe handling of hydrogen (HP-H2SAFE)**

Vertsinstitusjon: **RISE Fire Research**

Sammendrag:

The main purpose of the planned infrastructure is to serve research and development on the safe usage and handling of hydrogen. In addition, the infrastructure can be used for education and training on hydrogen safety. Another application can be the study of system integration for hydrogen production and distribution.

The infrastructure comprises a large-volume, high-pressure hydrogen tank at its heart (500 litres, 900 bar). It has a booster pump for charging the tank from hydrogen bottles at 200 bar. Discharge of hydrogen is possible at a wide range of pressure at a controlled amount and temperature.

The site of the infrastructure allows safe operation with unintended or intended release of hydrogen. Infrastructure will be designed and constructed to be able to relocate to other sites if required.

Personnel at the site is experienced in fire research of various kind. They are trained in handling inflammable gases, including hydrogen and have the required skills to conduct fire and explosion hazardous experiments.

The infrastructure will be unique in terms of the volume and pressure of hydrogen available for the study of hydrogen safety.

Prosjektnummer: 347167

INFRASTRUKTUR-arbeidstittel: FjordOcean Connect

Vertsinstitusjon: NTNU Institutt for marin teknikk

Sammendrag:

FjordOcean Connect will be an integrated full-scale research infrastructure in the Norwegian Ocean Technology Centre, which represents a long-term investment to enable and develop research in marine technology. The project will facilitate development that gives Norway a technological self-reliance to improve tools for efficient mapping and presence in our ocean areas. The infrastructure will cover the needs for education, research, and innovation in the marine and maritime fields and create value for society at large. FjordOcean Connect will be an attractive infrastructure providing opportunities for innovation and industry development. It will attract projects and facilitate the contribution of expertise to sustainable and knowledge-based societal development. FjordOcean Connect will be transparently and efficiently operated, maintained, and further developed with grants from projects and industrial activities using the infrastructure.

The following research and academic partners will collaborate on FjordOcean Connect: NTNU Department of Marine Technology, SINTEF Ocean, SINTEF Digital, NTNU Department of Marine Operations and Civil Engineering, SINTEF Ålesund, and UiT - Department of Arctic and Marine Biology. FjordOcean Connect will be organized into topical nodes that collaborating to achieve the overarching goal. These nodes will cover underwater operations, testing autonomous vessels and full-scale structures, marine observatory, digital twin and visualization theatre in Ålesund, aquaculture with visualization at the IO centre in Trondheim, OceanInfo hub developed by SINTEF Ocean and models and data analysis, and marine communication.

The research will be based on equipment platforms such as buoys, autonomous underwater vehicles (AUVs), wave and drift-driven vehicles (gliders), unmanned boats (USVs), ship models, and workboats. The technology will make it possible to operate multiple autonomous vessels, AUVs and technologies in a network, that are currently gaps identified. For example, preparedness has been raised as important by the Norwegian defence and NATO, the infrastructure described in this proposal will allow to integrate data for communication and awareness building across the different layers, from underwater, through surface, air and to use satellite technologies for observation and

communication. The installed solutions will be to build a higher situational awareness for navigation, positioning, timing to allow for future technology.

This equipment and infrastructure will be used to conduct experiments and collect data on the conditions in the ocean, by using technologies in the separate layers, within the first layer, vessels and robots operating in an area can use mesh technology to stimulate for better range of communication. The measurements will be complemented with numerical simulations to get a complete picture of the processes taking place in the ocean. FjordOcean Connect will also be equipped with sensors and communication systems that enable wireless transmission of data and control of equipment. In addition, the infrastructure will be connected to digital twins that enable virtual testing and optimization of marine constructions and operations.

Prosjektnummer: 347168

INFRASTRUKTUR-arbeidstittel: NORSPART - NORwegian Laboratory for Solid PARTICle Research

Vertsinstitusjon: Institute for Energy Technology - IFE

Sammendrag:

Primary industries which provide the raw and processed materials necessary to achieve a global green shift and a sustainable economy will rely on advanced high-tech innovation. Most of these industries depend on processes where fluid-solids systems are involved. These systems are complex to model and simulate, and, for reliable upscaling, experimental validation is often needed. Advanced solids flow diagnostic equipment and instrumentation applied in relevant process conditions will allow industries to de-risk upscaling and optimise processes in a cost-efficient way.

To bridge the research gap, IFE is proposing the establishment of the Norwegian Laboratory for Solid Particle Research (NORSPART). NORSPART will be a state-of-the-art facility equipped with versatile reactors, advanced diagnostic systems, and AI integration.

The laboratory will focus on areas like CCUS, mineral processing, and granular flow, providing precise data on particle behaviour and motion. NORSPART aims to drive advancements in these fields and support the development of sustainable technologies crucial to Norway's future. By fostering collaboration between academia and industry, NORSPART will accelerate innovation in sectors such as energy, construction, mining, and manufacturing.

In synergy with other national infrastructures, NORSPART will form an integrated approach to tackle sustainability challenges. Through international partnerships, the laboratory will enrich its research activities with global insights and experiences. The establishment of NORSPART is a strategic step for Norway, acting as a catalyst for innovation, economic growth, and reinforcing the country's commitment to environmental sustainability. With advanced facilities, interdisciplinary research, and collaborative partnerships, NORSPART will contribute significantly to sustainable technologies and the green transition.

Prosjektnummer: 347169

INFRASTRUKTUR-arbeidstittel: ACCESS Life Course Database: Upgrade, Expansion and Innovation

Vertsinstitusjon: NOVA, Oslo Metropolitan University

Sammendrag:

The proposed infrastructure represents an upgrade, expansion, and innovation of the ACCESS Life Course Database. The main aim is to provide easy access to updated, well-documented, quality-assured, longitudinal survey and register data from The Norwegian Study of Life course, Ageing and Generations in innovative ways. The expansion and upgrade of the infrastructure will consist of the inclusion of a new wave of survey data (data collection scheduled for 2024), as well as updated register data (linked to the survey data) for the period 2023–2027. After the establishment of the upgraded infrastructure, the database will consist of data from four survey data collections (2002, 2007, 2017 and 2024), carried out by Statistics Norway, and 25 years of register information (2002–2027), including approximately 15,000 individuals aged 40 and older. The upgrade of the infrastructure will ensure that users (e.g., researchers and students) have access to high-quality life course data, where the same individuals are followed over time, delivered through systems that are up-to-date, flexible, secure, and user-friendly. Currently, the data, as well as the documentation of the data, are available through a web portal at Sikt developed specifically for ACCESS. In the proposed upgrade of the infrastructure, the system designed for the accessibility of the longitudinal data will be further developed and updated to meet future needs and standards. The innovation will include considerable improvements, such as enhanced and more powerful search capabilities, improved visualisation of variables and documentation, online analyses options, and a custom dataset creation tool to facilitate user-friendly dissemination of the NorLAG data. The ACCESS infrastructure is hosted by NOVA at Oslo Metropolitan University and project partner Sikt – Norwegian Agency for Shared Services in Education and Research.

Prosjektnummer: 347170

INFRASTRUKTUR-arbeidstittel: OpenLab Drilling 2.0 –Supporting energy transitions and reproducible research

Vertsinstitusjon: NORCE Norwegian Research Centre AS

Sammendrag:

According to the Research Council of Norway's recent draft for the 2023 Norwegian roadmap for research infrastructures there is a need for continued utilization and development of research infrastructure to meet existing and future needs within Petroleum, focusing on energy efficiency and emission reductions. Autonomy, automation, robotics, and artificial intelligence (AI) are specifically mentioned areas expected to play an important role together with efficient workflows and interaction across disciplines. This is also in line with OG21's strategy stating that the ability to adopt technology and knowledge fast, will be instrumental in keeping costs down, reduce CO2-emissions and continually improve safety. OpenLab Drilling, an existing national research infrastructure, has emerged as a key player in accelerating research and innovation within AI, automation, autonomy,

and cyber-security since its establishment in 2019. With nearly 40 unique users per week and over 600 users in 2023, OpenLab has demonstrated its effectiveness in fostering research and innovation. Notably, it facilitated the development and was crucial for the successful demonstration of the world's first autonomous drilling system on Ullrigg in Stavanger in 2021. The infrastructure has gained recognition and adoption in Norwegian research institutions, with users at NTNU, UiB, UiS, UiA, HVL, NORCE and IFE, validating its acceptance in education and research.

While OpenLab Drilling traditionally has served the oil and gas drilling sector, it has also seen an increasing number of users in geothermal energy systems, CO2 storage, and mineral mining sharing many of the same drilling related challenges. Despite the demand for FAIR (Findable, Accessible, Interoperable, and Reusable) data in research pertaining to these and other disciplines, OpenLab Drilling remains the only openly available online drilling simulator worldwide. Moreover, OpenLab's versatility has led to its application in non-drilling related research and higher education, particularly in AI-related projects outside the drilling domain. This expansion is driven by the infrastructure's provision of realistic and accessible data for complex physical processes, enabling testing, verification and validation of automation systems and AI methods. With coming AI regulations OpenLab will therefore play an important role to assist users to validate their technologies. Moreover, there is a potential in linking OpenLab to existing and new national and international research infrastructures. OpenLab Drilling 2.0 will therefore be an expansion along several paths to serve a broader community of researchers, students, and engineers. Based on our experience with OpenLab for the five years of operation, and the needs in higher education, new and ongoing PhD projects, and research projects and innovations, we have identified six main extensions with high impact, each constituting a work package. These are (1) Field Data Integration, (2) Expansions for Geothermal wells, CO2 wells and mineral mining, (3) Expansions for Geosteering and Plug and Abandonment (P&A), (4) Energy Consumption Calculations, (5) Geospatial data integration and (6) Onboarding and AI powered virtual assistance. Altogether, these extensions complement the existing OpenLab Drilling infrastructure and significantly increases the infrastructure's ability to attract and serve new users. The extensions will be implemented upon the existing framework.

Prosjektnummer: 347171

INFRASTRUKTUR-arbeidstittel: Norwegian Metabolic Phenotyping center (MetPhe)

Vertsinstitusjon: Avdeling for ernæringsvitenskap, Institutt for medisinske basalfag, Medisinske fakultet Universitetet i Oslo (UiO)

Sammendrag:

Disturbances in energy metabolism are linked to many human diseases, including cancer, immune dysfunction, cachexia and obesity. Improved understanding of energy metabolism is fundamental to develop treatment strategies to combat metabolic dysregulation. Energy metabolism can be measured in a broad variety of biological systems, ranging from simple biological systems such as single cells, organoids, and tissues, up to living organisms such as mouse models and humans. A common platform for determination of energy metabolism across biological systems does not exist in Norway.

To establish a research environment with strong competence in energy metabolism, we propose to establish a *novel* national platform for metabolic phenotyping (**MetPhe**) at Department of Nutrition, University of Oslo (UiO). Department of Nutrition already has a long-standing tradition and success for studying how nutrients affect energy metabolism in relation to various metabolic diseases. MetPhe will be linked to already existing instrumentation at Department of Nutrition, UiO. Current infrastructures enable energy determination in animal models using *Phenomaster* (TSE Systems), coordinated by the well-established Norwegian transgenic Center (**NTS**), as well as an advanced facility for energy determination in humans using Whole-room indirect calorimeters (**WRIC**). The WRIC facility was recently established successfully and is presently fully operational at Department of Nutrition. The Department also possesses a 24-well Seahorse (Aglient) enabling energy determination in single cells isolated from animal models or humans. The Seahorse instrument is made available to the research community and operates presently with several users across UiO and Oslo University Hospital (OUS).

To establish a fully operational and state-of-the-art metabolic platform (from cells to organisms), Department of Nutrition will require the following upgrades and new instrumentation:

- 1) For a fully functional MetPhe, an upgraded state of the art Seahorse instrument (96 well, 4 channels) is required. This instrument will secure capacity and enable metabolic phenotyping of not only cells, but also tissues, organoids and 3D-printed tissues of any organism.
- 2) For a fully functional and efficient preclinical MetPhe and NTS, Department of Nutrition will require upgrading of existing infrastructure for micro injectors, mouse phenotyping measurements and implementation of telemetry for remote data collection of biological parameters directly from the animal (e.g. heart rate). Moreover, upgrade platform for single cell analysis to simplify generation of novel genetically modified mouse models, and convert the local national cryopreservation unit into a national unit to simplify import/export of models between academic research institutions.

Prosjektnummer: 347172

INFRASTRUKTUR-arbeidstittel: REgional Downscaled Dataset through SUPERMOdeling (RESUMO)

Vertsinstitusjon: Geophysical Institute, University of Bergen

Sammendrag:

Climate change will lead to more extreme weather events and more severe climate impacts. The national Long Term Plan for research (LTP) therefore clearly calls for research facilitating improved climate adaptation and societal preparedness. In particular, it urgently calls for “knowledge about how the risk of damage related to climate and weather conditions and major incidents develop in and vary between different parts of Norway” (LTP p55). Currently, Norway lacks a robust infrastructure to generate reliable local-to-regional scale climate information that is explicitly tailored to addressing challenges faced by different Norwegian locales. RESUMO will fill this gap.

Existing regional climate models (RCM) provide this knowledge to some extent; however, there are still many uncertainties of the future projection partly because RCMs and Earth system models (ESM) have systematic and inevitable “biases”. Therefore, the predictions and projections are not always

reliable. Local municipalities and other stakeholders, however, need reliable predictions and projections about expected climate risks and impacts now, in order to plan meaningful adaptation measures.

Supermodeling can overcome the limitations of the current RCMs. Supermodeling significantly reduces the ESMs' systematic biases (more details in Section 5) leading to less-biased downscalings. In RESUMO we will demonstrate the applicability of the supermodel technology for regional climate downscaling. Another central aspect of the pre-project will be our close communication with climate service providers and other future users of the infrastructure, to use their knowledge and knowledge needs for shaping the future full project. **RESUMO will provide a new data set, as e-infrastructure, of regional climate downscaling of high certainty** which will enable reliable climate projection on a regional scale. The resource will enable local municipalities, and representatives of, for example, the agriculture, hydrological and energy sectors, to plan climatesmart developments and tailored solutions securing supply of food, drinking water and renewable energy for their geographical region.

Prosjektnummer: 347173

INFRASTRUKTUR-arbeidstittel: Extending the functionality of the NORCE multiphase flow loop

Vertsinstitusjon: NORCE Norwegian Research Center

Sammendrag:

NORCE Multiphase flow loop is a test infrastructure for research and development of multiphase flow meters. The first multiphase flow loop was constructed in the late 1980's, the current loop was finished in 2009. In order to meet the new challenges experienced by technology companies and research institutions, there is a need to upgrade and expand the current infrastructure with new capabilities. One examples of this is the possibility to make controllable complex flow regimes. The intention is also to adapt the facility to be applicable for research on flow metering aspects related to renewable energy carriers and CCS (e.g. hydrogen and CO₂). We are therefore applying for a pre-project to develop a research infrastructure concept that meets the international R&D needs within flow metering testing.

Prosjektnummer: 347174

INFRASTRUKTUR-arbeidstittel: ImAge – Pre-Project for a National Rock Art Research Infrastructure

Vertsinstitusjon: University of Bergen, University Museum, Department of Cultural History

Sammendrag:

This pre-project will propose a novel humanistic national research infrastructure, which responds to the need of a data infrastructure for rock art research, dissemination and data management.

The field of rock art consists of a wide range of data; rock art sites and archaeological material in museum collections, documentation and archival material, and of course scientific and popular

disseminations. The proposed future infrastructure will unify these diverse categories and features, by digitising and exploring rock art sites and archival material from all the university museum collections in Norway and at Alta Museum.

In order to create such an infrastructure there is a need for coordination, dialogue, testing and networking among the partners in Norway, but also with other national and international, institutions research groups and infrastructures. The pre-project will explore the possibilities, perspectives and organisation of such an infrastructure. Based on the feedback from earlier applications, workshops and empirical testing, the pre-project will create a base for a full FORINFRA application in 2025.

The pre-project is coordinated from the University Museum of Bergen. The partners in the pre-project are all Norwegian university museums, the Alta Museum and the Directorate for Cultural Heritage (Riksantikvaren). This ensures a robust and long-term structure, as well as a national and international impact.

Prosjektnummer: **347176**

INFRASTRUKTUR-arbeidstittel: **Underground rock engineering facilities for research, innovation and education in mining and tunnelling**

Vertsinstitusjon: **Department of Geoscience and Petroleum, Norwegian University of Science and Technology (NTNU)**

Sammendrag:

The research and education groups within tunnelling and mining at NTNU and SINTEF aim to establish full-scale underground facilities for rock engineering research, innovation and education in mining and tunnelling. The main purpose of the facilities is to create an environment representative for real operating conditions. Full-scale underground facilities will provide possibilities for development, testing and monitoring of rock engineering technology and digital tools. Equipment relevant for underground facilities will be installed in a safe underground environment, including equipment for data processing and modelling.

Underground technology is crucial for the development of safe and sustainable infrastructure, such as road and railway tunnels, mining (design and extraction), geothermal energy, safe storage of e.g., hydrogen and food, long-term storage of radioactive waste, shelters, and defence facilities. Norwegian underground technology enjoys international recognition, but in competition with other countries, Norway lacks full-scale research facilities to be able to link lab-scale and numerical models with measurements from full-scale experiments, as well as to perform full-scale testing and monitoring not feasible to perform on a lab-scale or with numerical modelling.

The applicants are already cooperating closely in the Gemini centre Tunnel Technology 2.0, with an overall goal to develop underground technology with a 10-year outlook.

Prosjektnummer: 347177

INFRASTRUKTUR-arbeidstittel: Infrastructure for mapping, monitoring and exploration of the deep oceans: Deep Sea Video Assisted Multi Sampler

Vertsinstitusjon: Institute of Marine Research

Sammendrag:

Exploration, mapping and monitoring of the environment and resources in the deep oceans is challenging and demands specialized infrastructure for cost effective operations down to 6000 m depth. The need for this infrastructure is urged by the White paper Meld. St. 25 (2022-2023) that propose continued mapping for deep sea minerals and the start of additional environmental mapping of the seafloor utilizing the Mareano program. The planned "Deep Sea Video Assisted Multi Sampler" (DS-VAMS) will be a new tool for deep sea research designed to serve the Mareano programme, but also other deep-sea research projects. The DS-VAMS will be designed as a mobile unit for use from research vessels in national and international waters. The DS-VAMS consist of a garage equipped with a work class ROV, cameras, sonars, CTD and sensors, and sampling gears like grabs, cores and slurps that can be individually released under video monitoring. The infrastructure will represent a hub for Mareano and national deep-sea science.

Prosjektnummer: 347178

INFRASTRUKTUR-arbeidstittel: Norwegian Infrastructure for Ocean energy in Sørlandet (NIOS)

Vertsinstitusjon: University of Agder

Sammendrag:

The National and European ambitions of more than 300 GW of offshore wind in the North Sea by 2050¹, provides an unprecedented opportunity for the southern Norway to play a central role across the life cycle of these offshore renewable energy installations and maintain Norwegian leadership in offshore operations. Given the access to the offshore sites and decades of offshore industry experience, Sørlandet, the southern Norway, is recognized as a strategically important area for development both by industry² and the Norwegian government³. To seize the opportunity of large scale offshore renewable energy installations in the North Sea, Norwegian industries need to develop novel service solutions that support these across lifecycle. Widespread automation will be central to realizing, safe and efficient products and solutions to support windfarms through construction and installation, operations and maintenance, and decommissioning. While being a leader in offshore operations in oil & gas serves provides a strong basis, rapid adaptation to new challenges the wind industry poses, is necessary.

In this context, the regional universities and research organizations are crucial in development of essential technologies and fostering the right technical competency to enable local industries adapt to the green shift and seize the opportunity. Towards this end, NIOS builds the next generation infrastructure in the southern Norway, with focus on digitalization, robotics, and automation for

unmanned and efficient lifecycle services. The infrastructure also serves as a rapid prototyping test bed for the local industry, a crucial element in gaining first-comer advantage for new products and gain dominant position in the international markets.

While the major focus is towards offshore wind, the infrastructure will also enable research and development of offshore fish farming and cleaner maritime, that are among the National agenda for development.

The aim of pre-project will be to coordinate with the local industries and academic institutions in Sørlandet to further refine the infrastructure requirements and build use-cases for optimal utilization of the infrastructure. Refinement of the infrastructure plan will also be investigated to maintain complementarity to existing infrastructure across Norway.

Prosjektnummer: 347179

INFRASTRUKTUR-arbeidstittel: Infrastructure for research on bimodal visual material

Vertsinstitusjon: Oslo Metropolitan University

Sammendrag:

The National Library (NB)'s image collection is one of Norway's largest. It includes more than 2 million digitized photographs, approximately 4 million photographs in books, an estimated 100 million newspaper photographs and about 150 million web images. The collection is, however, almost impossible to access for researchers in a meaningful way.

This project aims to provide a knowledge based technological infrastructure that will make the NB material available for high quality qualitative and quantitative research. This is of particular interest to research areas such as journalism and media/communication studies, library and archival studies, digital humanities, pedagogy, public and fine arts, technology studies and more.

In order to meet the needs for research on this material, the project will develop technology that enables efficient searches across different material types within NBs archives and collections. This is not possible today. The new technology in question will specifically target bimodal material (text and image) and reverse image search.

We consider this infrastructure to be of national importance in an increasingly image-based culture. Photographs have a special status as truth guarantors (visual documentation) and emotional storytellers, which affects issues of trust, verification and belonging in today's society. The visual dimension of Norway's media and technology history is also underexplored. National ownership of this type of infrastructure is also important in itself, in a technological landscape dominated by large, transnational companies (often referred to as "big tech").

Prosjektnummer: 347180

INFRASTRUKTUR-arbeidstittel: E-infrastructure for decentralised trust

Vertsinstitusjon: UiO

Sammendrag:

The scientific theme unifying the network is developing solutions for decentralized trust as a technological facilitator of democratization within digital infrastructures. The proposed infrastructure is going to address this theme in a multi-faceted way: The European Blockchain Service Infrastructure (EBSI, see <https://ec.europa.eu/digital-building-blocks/wikis/display/EBSI/Home>) is a pan-European network that aims to create cross-border services for public administrations, businesses, citizens, and their ecosystems to verify information and make services trustworthy. Smart contracts are poised to replace human intermediaries, leading to higher automation and digitalization in the society. Blockchain promotes accountability, transparency, and verifiability.

The infrastructure is relevant to Government's Long-Term Plan for Research and Higher Education, specifically for "muliggjørende og industrielle teknologier", for "samfunnssikkerhet", and for "tillit", with applications to Healthcare and Energy. At the European arena, it is relevant to the blockchain topic listed under ESFRI.

The infrastructure will address the following needs:

- Facilitation for participating in the EBSI network, including the ability to test new EBSI services
- Better technical capacity for experimental research
- Better technical capacity for prototype-oriented collaboration with industry
- Better capacity for educational activities oriented towards the students
- Deployment of tools developed by the Blockchain Lab and used by the partners, such as simulators and synthetic workload generators
- Deployment of a small datacenter for benchmarking performance of developed technologies and tools

It is also important to ensure that infrastructures for decentralised trust are environment-friendly and energy-efficient. The infrastructure will facilitate experimental research towards addressing this need.

Prosjektnummer: 347181

INFRASTRUKTUR-arbeidstittel: Multi-use platform for marine biological monitoring and assessment

Vertsinstitusjon: NTNU

Sammendrag:

We propose to build a multi-use platform for biological marine coastal monitoring and simulation to aid ecosystem assessment, sustainable development and green transition of marine industries.

Understanding ecosystems, effects of climate change and human activities on these, and the sustainable use of marine resources demands cross- and interdisciplinary knowledge and the integration of diverse knowledge and data, as physio-chemical factors in the sea and marine organisms mutually influence each other. This complex system is further complicated by the interplay with terrestrial ecosystems and the atmosphere, as well as human activities, such as fisheries, aquaculture, release of energy and matter, as well as other changes to the coastal zone that directly or indirectly impact marine ecosystems. The western Norwegian coast is one of the sea areas with best data coverage on benthic and pelagic environments in Norway and globally. *Marine grunnkart, Hafast, Møre Ocean Lab* and *Digital Havrom* already deliver data on benthic environments and on physical and chemical parameters in the Ålesund region. **This new platform will complete existing infrastructure for physio-chemical ocean monitoring with biological data that is crucial to solve most pressing challenges in sustainable coastal development. This project will directly address Sustainable Development Goals 4, 9, 12, 13 and 14, and it will be a major support to solve complex problems through interdisciplinary collaboration and to contribute to competitive industry and sustainable development.**

The project has 5 high level goals that are within core areas of strategies and funding programs at the regional, national and international level, and which address challenges in biological ocean monitoring, effects of human activity, climate change and sustainable food production:

- 1) Supply biological data on coastal ecosystems for integration with ongoing physio-chemical monitoring.
- 2) Build a much-needed experimental platform to further support applied research on human-environment interactions and ecosystem services.
- 3) Build upon the consortium's cutting-edge competence and existing infrastructure to create digital twins of coastal areas and aquaculture sites as well as an ecosystem simulator.
- 4) Supply and aggregate data necessary for sustainability analytics in marine industries, to aid knowledge-based operational and guide investment decisions.
- 5) Increase quality and relevance of education and further education within biological, marine and environmental sciences, as well as sustainable and safe marine food production.

Prosjektnummer: 347182

INFRASTRUKTUR-arbeidstittel: Norwegian Motion Laboratory (MotionLab)

Vertsinstitusjon: University of Agder (UiA)

Sammendrag:

This outline proposes improvements and expansion for the existing infrastructure, Motion-Laboratory (RCN project no. 245717), located at the University of Agder in Grimstad, Norway. Currently, MotionLab aims to be a world-leading centre for motion-compensated offshore applications, providing a unique facility for students, researchers, and external partners to conduct tests and measurements. The laboratory has been instrumental in the SFI Offshore Mechatronics project (237896) since 2015, supporting offshore energy projects and helping industry partners mitigate risks and reduce costs.

Considering the growing emphasis on offshore wind energy and upcoming research projects in Norway focused on offshore wind turbine installation and service, upgrading MotionLab is deemed essential. The goal is to enhance its accessibility, user-friendliness, facilitating safer and more efficient research and experimental testing. The upgrade/expansion plan encompasses the following main categories:

- 1) Service, maintenance, and upgrade of the existing infrastructure.
- 2) Development of a digital twin to enable multiple users to perform experiments and pre-tests in a validated virtual environment before moving to the physical laboratory.
- 3) Establish necessary sensors and equipment to enable research and testing of equipment and control systems for autonomous offshore operations.
- 4) Upgrade the mobile MotionLab infrastructure with relevant sensors and equipment for testing motion compensation and autonomous operations outside the laboratory at UiA.

By implementing these improvements, MotionLab will be better equipped to support cutting-edge research, address the demands of offshore wind energy projects, and provide enhanced capabilities for international research institutions, academia, and industry partners.

Prosjektnummer: 347183

INFRASTRUKTUR-arbeidstittel: NUCLEI: National Radionuclide Laboratory for Research and Innovation

Vertsinstitusjon: INSTITUTT FOR ENERGITEKNIKK

Sammendrag:

IFE plans an extensive upgrade to our existing infrastructure by establishing a new national laboratory on nuclear research especially related to work with open radioactive sources, high-activity sources and activities involving complex radioactive sources. This infrastructure will address the pressing needs of the following end-users: the radiopharmaceutical industry, the process- and mining industry, and the energy sector.

Currently IFE has initiated a process of designing a new, modern laboratory building suitable to address the experimental R&D needs for the decades to come. The new national laboratory on nuclear research will be part of this building. Radionuclide laboratories are expensive to construct and operate and a positive outcome of this infrastructure call will allow the necessary adaptation of the new building in terms of size and structural requirements to accommodate the required infrastructure for the radionuclide laboratories.

The proposed infrastructure for radionuclide laboratories consists of a complete package to equip the new low (C-classified), high (B-classified) and very high radiation level (A-classified) laboratories, together with the necessary state-of-the-art radiation protection facilities. It will serve as the missing link between the academic and the industrial world by fostering basic and applied research and by acting as an incubator of new technologies. We foresee that this approach will have a positive impact on sustainability, by enhancing the collaboration among different industries. This infrastructure is strongly interconnected with the Norwegian Nuclear Research Centre (NNRC) and the Competence Hub in Neutron Technology (HUNT).

Prosjektnummer: 347184

INFRASTRUKTUR-arbeidstittel: **People in Norway in the Middle Ages (PiNiM): National infrastructure for the study of medieval Norwegian society**

Vertsinstitusjon: **UiT The Arctic University of Norway**

Sammendrag:

People in Norway in the Middle Ages (PiNiM) is an open-access, open source-based research infrastructure project initiated by the research group *Creating the New North (CNN)* at UiT The Arctic University of Norway. The objective is to establish and make publicly available a prosopographical database based on digitized source material pertaining to medieval Norway. Prosopography may be defined as a collective biography, meaning biographies of all known individuals within a specified group. A prosopographical database, however, is not a collection of biographies, but rather an array of biographical information on people, their relationships and interactions in an ordered system that can be sorted, compared, and studied from a host of perspectives and angles.

The first phase will be limited to all people (and groups of people) recorded in *Regesta Norvegica (RN)*, a chronologically ordered catalogue of all known medieval documentary sources, currently covering more than 13.000 sources from the period AD 822–1430. *PiNiM* will thus entail a database of all known people in Norway in this period and how these individuals and groups were connected, making a crucial contribution to the national repository of knowledge and the history of the Norwegian realm and its inhabitants.

PiNiM will impact society in several ways. In research, *PiNiM* will provide scholars with a unique tool both in terms of widening the scope of existing research and developing new and innovative avenues of study. The database will enable more fine-meshed examinations of interactions, and its chronological breadth will make prosopographical studies on an entirely new scale possible. In education, *PiNiM* will open a wide range of possibilities in teaching, student projects and examination, from upper secondary school level and beyond. A readily available and accessible database will improve how medieval sources and information on individual people can be incorporated into education, communicated through exemplification and in-depth studies. Finally, *PiNiM* will be of value to the history-interested public at large. With the prevailing Norwegian interest in genealogy and onomastics as well as national, regional, and local history and the multitude of adjoining subjects, *PiNiM* has the potential to become a cornerstone in the dissemination of knowledge about medieval Norwegian society.

Prosjektnummer: 347185

INFRASTRUKTUR-arbeidstittel: National biobank and health register for gut-brain axis investigations, pre-project (preGUTBRAIN)

Vertsinstitusjon: Norwegian university of Life Sciences (NMBU)

Sammendrag:

A dysfunctional gut flora has been associated with a wide range of mental health disorders, such as anorexia nervosa, anxiety, depression, autism spectrum disorders, and even neurodegenerative diseases. While the understanding of how the microbes in the gut modulates the social and emotional behaviours via the gut-brain axis is still in its infancy, the treatment of nervous disorders and mental health problems via manipulating microbiota via dietary means has been proposed as an attractive strategy. The aim of the current proposal for the pre-project (preGUTBRAIN) is to develop a grant application for submission in 2024 to establish a national biobank and health registry (GUTBRAIN) for investigations on the associations between diet and the gut-brain axis in different human patient populations and healthy individuals in Norway. In addition, the biobank will provide biomaterial for future experimental studies that can provide more mechanistic insight into the connections between the gut and the brain. preGUTBRAIN involves collaboration across several disciplines, sectors and service levels. The partners of the current project (NMBU, UIO, OUS, SØ) represent expertise within clinical-, nutrition- and biomedical research as well as computer science. In collaboration with TSD/USIT at UIO we aim to develop and evaluate a secure technical solution for personalized reports to the participants. In future research projects such personalized reports could be adapted to the different projects and the immediate or scheduled personalized feedback on health status can be used to motivate for study participation. Also, personalized reports can be used as intervention strategies to test the impact on various health outcomes such as the gut flora, gastrointestinal- and mental outcomes. The grant for the pre-project will be used to identify possible solutions for the GUTBRAIN biobank infrastructure including solutions for sample collection, long term biobank storage, long term data storage, secure digital pipelines for participant recruitment, informed consent, and develop a secure pipeline for two-way communication between study participants and research administration.

Prosjektnummer: 347186

INFRASTRUKTUR-arbeidstittel: Securing Scientific Diving in Norway

Vertsinstitusjon: Institute of Marine Research

Sammendrag:

Diving as a tool for science is challenged in Norway by new regulations increasing costs of equipment and certification. Several institutions have terminated scientific diving while the activity of others has been greatly reduced.

The project applies for the purchase of 6 sets of surface supplied diving gear to be distributed geographically to be locally accessible on a shared basis among scientific institutions. It will also apply to certifying 25 new scientific divers and 10 dive supervisors across 5 years.

Providing accessible gear and support for certification will lower the threshold to introduce, reintroduce or increase scientific diving activity in Norway. And may provide an option for students and young researchers to embrace the tool of diving and by time replenish the dropout of senior scientists who quits due to health or retirement. This to ensure diving remains a tool for science in many years to come.

Prosjektnummer: 347187

INFRASTRUKTUR-arbeidstittel: Norwegian Soilscales (NorSc) – Research infrastructure for sustainable management of Norwegian soil resources

Vertsinstitusjon: NMBU

Sammendrag:

Rise and fall of human civilizations are tightly linked to soils and their functioning. Today, soils are under fierce pressure through increasing human population and economic growth leading to agricultural intensification, land use change, urbanisation and infrastructure development, local and diffuse contamination, erosion and climate change, including hydrological change. Together, this results in continent-wide soil degradation. The incremental loss and deterioration of Europe's soil resources is a serious problem affecting an estimated 70% of all European soils¹ and improving soil health is an important element of the European Green Deal, to which Norway subscribes. Besides providing humans with food and other bioproducts, soils are the very basis for terrestrial biodiversity and ecosystem functioning. They are also important sources and sinks for greenhouse gases (GHG) and affect local weather by controlling water cycles. Humans interact with soils mainly through agriculture, forestry and infrastructure development. While isolated effects of these activities are well documented, soils play an increasingly critical role in the 'circular' bioeconomy by acting as recipients for biores from the 'green' and the 'blue' bioeconomy. Amending soils with biores can replace energy-consuming synthetic fertilizers, improve soil quality and opens for the possibility to modify physical, chemical, and biological properties of soils towards a more environmentally friendly circular economy with reduced GHG emissions.

A common feature of soils is their multifunctionality. Traditionally, soil research is carried out by marked-off scientific communities pursuing distinct endpoints (soil functions). The pressing question of how to safeguard the quality and health of soils as a finite national resource for future generations calls for overcoming disciplinary boundaries and full integration of research efforts through a national research infrastructure. **NorSc** takes on this challenge and will foster ground-breaking research on soil management in agronomy and forestry. **NorSc** will be distributed among the two main players of Norwegian soil research (NMBU and NIBIO), who have a well-documented record of attracting national and international funding on soil research. Links to the EU mission 'Living Labs' will be sought.

Prosjektnummer: 347188

INFRASTRUKTUR-arbeidstittel: Research infrastructure for marine low trophic species

Vertsinstitusjon: Institute of Marine Research

Sammendrag:

Food and feed security are central sustainability issues and currently alarming caused by the geopolitical situation. Locally farmed low trophic biomass can contribute to meet the rising demands and promote a more sustainable source to food and feed. Low trophic aquaculture is a strategic prioritized area internationally, nationally and within the Institute of Marine Research (IMR). The existing national research infrastructure for low trophic animals is fragmented and not specialised for research and industry development. This proposal suggests a national infrastructure providing research capacity for the full cycle from low trophic animal production biology to the nutritional value and growth of fish on formulated feed. This aligns with industry priorities (Norwegian Seafood Cluster and Råvareløftet, Bellona) on developing new feed resources, assessing benthic filter feeders (mussels, tunicates) as the prime candidates. Several components of the infrastructure will also be highly applicable for production of food for humans. The proposed infrastructure comprises update and expansion of:

- 1) An international state of the art laboratory on ecophysiology of low trophic animals.
- 2) An industrial scale farm facility for biological and technological research specialized for mussel feed resources.
- 3) A research- and industrial scale processing capacity to secure access to formulated feed.
- 4) An experimental sea cage and laboratory facility to test the nutritional value and growth of formulated feed on fish.

The IMR infrastructure at Austevoll Research Station will be open to national and international research institutions. The infrastructure will broaden and accelerate the research at the IMR and the consortium in their strategic work of assessing and developing low trophic animals as a source to new ingredient in fish feed or as human food. The infrastructure is also suited to study marine algae. The acquired data for the full production cycle and a national knowledge database will enable improved biological, technological, economical and modelling assessment of the potential of aquaculture of low trophic animals as feed or food.

Prosjektnummer: 347189

INFRASTRUKTUR-arbeidstittel: LE-IMF (Low Emissions Infrastructure for Multiphase Flows)

Vertsinstitusjon: Institute for Energy Technology

Sammendrag:

The Well Flow Loop (WFL) is an integral component of the Norwegian Infrastructure for Multiphase Flows (IMF) located at the Institute for Energy Technology (IFE) at Kjeller. Renowned as a world leading laboratory facility, the WFL offers extensive expertise and state-of-the-art scientific

instrumentation that is readily available for international research communities. Notwithstanding this, the WFL faces upcoming challenges which need to be addressed.

The WFL currently uses SF₆ (sulphur hexafluoride) as the gas phase. While satisfying several technical requirements, SF₆ is an extremely potent greenhouse gas. In January 2023, a tax reflecting greenhouse warning potential (GWP) was introduced by the Norwegian government, and the gas price increased by 2000%. As a consequence, the WFL is at risk of closure if measures are not taken. By replacing SF₆, the proposed project, called LE-IMF (Low Emission-IMF), aims at reducing IFE's total carbon footprint by 89%. This is in line with the focus on sustainability in the draft for the *Norwegian roadmap for Research Infrastructures 2023*. A safe and low-carbon future petroleum industry requires research infrastructures like the IMF to meet the UN sustainability goals, and the upgrades proposed here will ensure that the infrastructure maintains its position globally.

Furthermore, the WFL plays a unique role as a tool for fundamental academic research on multiphase flows and as an educational facility for PhD- and undergraduate students and postdoctoral fellows. Several public reports and national strategies, such as Energy21 and the roadmap mentioned above, outline the need for educating tomorrow's experts for both the petroleum technologies and the green transition. These competences are largely interconnected, and LE-IMF will contribute by providing a training facility for future talents, bridging between process technology knowhow from petroleum to CCS, geothermal energy and hydrogen. Currently, several of the multiphase flow research facilities in Norway have been shut down or re-purposed away from activities targeting multiphase flows. Access to modern laboratories that offer practical, hands-on training is essential for students looking to acquire relevant skills and knowledge, as well as for engineers and researchers needing to handle a flow assurance problem.

Prosjektnummer: 347190

INFRASTRUKTUR-arbeidstittel: Norwegian National *In Situ & Operando* Laboratory for electrochemical energy conversion and storage (EC•REC)

Vertsinstitusjon: Western Norway University of Applied Sciences (HVL)

Sammendrag:

Energy conversion and storage devices, including fuel cells, electrochemical cells for hydrogen production, as well as N₂ and CO₂ reduction for production of ammonia and other sustainable fuels and chemicals, batteries, and solar cells, are key technologies enabling the transition towards a sustainable future. Performances and lifetimes of these technologies are significantly affected by dynamic processes in the bulk materials, at the interfaces between cell components, and on surfaces in contact with reactants/products.

The proposed national research infrastructure, EC•REC-Lab, is aimed at establishing a world-leading national laboratory for advanced multimodal characterization techniques specially designed for in situ and operando real-time monitoring and analysis of dynamic processes in energy conversion and storage devices at operating conditions. It will be based on further development, upgrading and coordination of existing laboratories, located at each node of the three consortium members of the Norwegian Centre for Hydrogen Value Chain Research (FME HyValue): HVL, UiB, and NORCE. It will

provide advanced research facilities which are required to fulfil the goals of FME HyValue and will serve the needs of national and international scientific communities and the industrial sector. It is designed not only to strengthen the capacities of the existing national research infrastructures dedicated to materials challenges of renewable energy technologies, but predominantly to complement them with state-of-the art equipment for real-time analysis and monitoring of dynamic processes being at the core of these technologies.

Prosjektnummer: 347191

INFRASTRUKTUR-arbeidstittel: A national analytical platform bridging health innovation and translation in metabolic diseases (MitoHealth)

Vertsinstitusjon: Stavanger University Hospital (SUH)

Sammendrag:

The global burden of non-communicable diseases (NCD) is increasing with an ageing population. Mitochondrial dysfunction significantly contributes to several NCDs, including obesity and obesity-related diseases, cardiovascular diseases (CVD), and neurodegenerative disorders. Accurate management of the dysmetabolic state can attenuate the progression of metabolic diseases. To alleviate and possibly treat these metabolic changes, this project aims to strengthen and expand the national infrastructure required to develop and validate the clinical effects of novel compounds targeting mitochondria to treat NCDs. **MitoHealth** seeks to establish a collaborative national analytical platform bridging industrial biotechnology, health innovation, and clinical medicine. Specifically, this application focuses on mitochondrial-targeted compounds produced from marine resources that can prevent and attenuate the progression of metabolic diseases.

To achieve this goal, there is an urgent need to better coordinate, strengthen, and expand the analytical platforms required for identifying and characterising new mitochondrial targeted products and associated biomarkers. This application describes the current infrastructure situation of the collaborating partners and defines the need for new infrastructure to fully harvest the potential of our Norwegian coastal biosphere to develop new attractive compounds to target NCD. The new infrastructure will enhance our national industrial and research collaboration and stimulate novel analysis.

Ten large food processing companies within both human and animal markets, mainly using marine resources, have expressed a clear need to analyse and validate the clinical effects of novel compounds in collaboration with academic partners. A collaborative national analytical platform bridging industrial biotechnology, health innovation, and clinical medicine is highly relevant and beneficial for academia and industry, aiming towards the Norwegian and international markets. Two private biotechnical companies, two public institution and academic partners representing southern Norway's leading universities and research groups will provide expertise in analytical methods and data interpretation. Metabolic diseases are also relevant for the pet-food industry, whereby large industrial partners such as Felleskjøpet (Stavanger) is a natural partner. To build the necessary infrastructure for the MitoHealth community, instrumentation and personell in the order of 100 million Norwegian kroner is needed.

Prosjektnummer: 347192

INFRASTRUKTUR-arbeidstittel: Norwegian Research Infrastructure for Cyber Security in Critical Sectors

Vertsinstitusjon: SINTEF

Sammendrag:

The “Norwegian Research Infrastructure for Cyber Security in Critical Sectors” will create a simulation, verification and training infrastructure environment and an ecosystem for empirical research on cyber security and cyber safety. Preparedness, training of humans and intelligent systems, data driven prediction, impact analysis and incident detection in/across critical sectors in Norway, will be facilitated and enabled.

For enabling this, a hybrid and distributed infrastructure of physical technologies, emulators, software, digital twins, ecosystem of stakeholders – is planned. We will leverage and supplement/complement the relevant existing technology/data/network infrastructures and develop a world leading state-of-the-art empirical research environment for data-driven and collaborative cyber security management across main critical sectors in Norway. The infrastructure will be comprehensive, data-driven, cross-sectorial, long-term sustainable, secure, real-time updated as well as realistic/representative. This imposes many research goals as well as many benefits for the society in terms of security, safety, innovation and sustainability – related impacts.

The potential benefit for research and the users is significant, as this infrastructure will be an enabler for secure digital transformation, through providing a uniquely complex research use-case from the very start of its design, as well as in the long term (making the infrastructure and the ecosystem sustainable and relevant in the long term). The targeted stakeholders are very diverse in terms of sector and size, and we trust that the infrastructure will provide learning/innovation/network/security and safety – effects for all the stakeholders involved, regardless of their size and role.

Prosjektnummer: 347193

INFRASTRUKTUR-arbeidstittel: The Norwegian centre for surface characterization of materials for the green transition (NORsurf)

Vertsinstitusjon: SINTEF

Sammendrag:

NORsurf will be a national competence centre for surface characterization of present and future materials required to meet the need for green growth and restructuring. The centre will provide the Norwegian industry and academic community with the equipment and expertise to study surface reactions and electronic properties of functional materials not only before or after, but *during* operation. Understanding materials under their working conditions (*operando*) is imperative to facilitate green technology innovation. *Operando* characterization enables vital understanding of the relationships between structure and performance of materials on the micro- and nanoscale and can be applied to a wide range of topics of high importance to society, e.g., batteries, CO₂ capture and

utilization, production of green hydrogen, synthetic fuel production, photovoltaics, materials for control and conversion of electric power. The NORsurf competence spans from use of home lab instruments all the way to advanced synchrotron facilities, enabling full Norwegian utilization of existing and future technological breakthroughs in surface science.

The partners of NORsurf are SINTEF (with nodes both in Oslo and Trondheim), the Norwegian University of Science and Technology (Trondheim) and the University of Stavanger. The centre is based on the experience developed through the FORINFRA project “National Surface and Interface Characterisation Laboratory (NICE)” which was granted in 2009. NORsurf is centred around instruments for X-ray photoelectron spectroscopy (XPS), accompanied by investments in selected complementary equipment that together forms a powerful toolbox for investigation of a wide range of materials and processes necessary for the green transition. In addition to providing the Norwegian community with state-of-the-art equipment, NORsurf will expand the scope to be a national competence centre that also includes utilization of international large-scale synchrotron infrastructures as a natural extension of the national facilities.

Prosjektnummer: **347194**

INFRASTRUKTUR-arbeidstittel: **Health Behaviour in School-aged Children. A WHO Collaborative Cross-National Study – high quality open access data**

Vertsinstitusjon: **University of Bergen**

Sammendrag:

The «Health Behaviour in School-aged Children. A WHO Collaborative Cross-National Study» (HBSC) has since 1983 collected nationally representative data from samples of 11-, 13- and 15-year-olds. From 1985 surveys were undertaken every four years in an increasing number of countries. Today 51 countries and regions are a member of the research network and the most recent international datafile was ready in June 2023, including nationally representative data from 44 countries. The infrastructure builds on existing data from 11 surveys including more than 2000 000 participants and new data that will be collected over the coming years. The uniqueness of the data is the possibility to compare data across countries and across time. The topic areas covered by the HBSC study range from health behaviours, perceived health and life satisfaction to school, family and peer correlates of the behaviours and health perceptions. The Department of Health Promotion and Development, Faculty of Psychology, University of Bergen has collected data for Norway for all the eleven surveys. The data is used by the Ministries of Health and Education for policy development in all countries, and by the WHO, OECD and Unicef.

The Databank of the HBSC study has since 1985 been coordinated by the University of Bergen. From June 2024 the University of Bergen will take over the role as International Coordinator of the HBSC study. There is thus a need to develop an infrastructure that supports both the coordination of the international study as well as the data bank. To comply with open and FAIR data standards the current infrastructure must be developed and upgraded. The plan is therefore to make use of the Norwegian national data research infrastructure <https://sikt.no/en/surveybanken> by sharing the HBSC data open access nationally and internationally through their system. An important

requirement of the Sikt system is documentation of the data in terms of both data collection procedures and psychometric properties of the variables and scales included. There is a need to better document the reliability and validity of the more than 400 items used in the HBSC study. For this purpose, we will develop quality control pilots, including validation and reliability documentations. Given that the data are collected among 11-, 13-, and 15-year-olds, we find it important to strengthen the societal good of the data use by making the data available to the survey population as a citizen science pilot.

Prosjektnummer: 347195

INFRASTRUKTUR-arbeidstittel: National Industrial Process Tomography Infrastructure (NIPTI)

Vertsinstitusjon: Sintef Digital (Sintef AS)

Sammendrag:

The proposal outlines the establishment of a tomographic research infrastructure, the **Norwegian Industrial Process Tomography Infrastructure (NIPTI)**, to support advancements throughout various industrial sectors. These industries include, energy, chemicals, pharmaceuticals, mineral processing, construction, FMCG (Fast Moving Consumer Goods), food, feed and beverage, all significant contributors to the global economy and emissions. The traditional methods within these sectors are often energy-intensive and emit carbon, necessitating improvements in process optimization, energy efficiency, and emission reduction. This need is particularly acute in the Norwegian economy, which heavily relies on carbon-intensive industries and is undergoing a significant green shift.

NIPTI, a deployable, modular, and scalable research infrastructure, aims to accommodate a variety of relevant industrial tomographic methods such as gamma, acoustic, impedance, microwave, and optical tomography. These techniques can offer real-time, detailed visualizations of processes, and cross-section distribution of products to improve understanding and enhanced operational control thus increasing energy efficiency and reducing emissions. Furthermore, NIPTI aims to facilitate the exploration and implementation of new process technologies, high-efficiency equipment, alternative energy sources, and energy recovery systems. This infrastructure also supports the study and development of cleaner processes and technologies for emission reduction. Overall, the establishment of NIPTI seeks to promote efficiency and sustainability across the process industry sectors.

Prosjektnummer: 347196

INFRASTRUKTUR-arbeidstittel: G3 2.0 - Empowering the Energy Transition through Enhanced Subsurface Imaging

Vertsinstitusjon: UiT Arctic University of Norway

Sammendrag:

In 2009, the Research Council of Norway granted the Geosystem 3D Seismic Imaging (G3) national infrastructure to a consortium of UiT the Arctic University of Norway, University of Bergen, Geological Survey of Norway and P-Cable 3D AS (Project number 195379). The G3 infrastructure is

hosted and maintained at UiT the Arctic University of Norway. The central technology of the G3 infrastructure is the P-Cable high-resolution 3D seismic system (Planke and Berndt, 2003; Planke et al., 2004; Planke et al., 2009). This ground-breaking technology emerged from a collaborative effort between UiT the Arctic University of Norway, VBPR AS, Geomar (GER), and NOC (UK), following a rigorous development and testing phase from 2001 to 2008 that explored various cable and connection prototypes. The G3 infrastructure was the first of its kind available to academia worldwide. Over the subsequent decade, the cable technology made significant strides, providing enhanced flexibility in system configurations, more robust connectors, improved digital communication, and advanced positioning control and troubleshooting options, among other upgrades. Concurrently, the existing G3 system has endured natural wear and tear after twelve years of operational excellence. Consequently, we now seek an upgrade to the Geosystem 3D Seismic Imaging (G3 2.0) technology that includes flexibility towards ultra high-resolution (UHR) 3D seismic imaging. This upgrade will focus in large parts on enabling renewable energy development and mitigating environmental risks by improving spatial resolution to one meter or lower. Enhanced subsurface imaging is vital for the energy transition as it supports the identification, evaluation, and optimization of energy resources, facilitates the deployment of renewable energy projects, enables efficient carbon capture and storage, and helps mitigate environmental risks. By leveraging advanced imaging technologies, we can make informed decisions, maximize energy efficiency, minimize environmental impacts, and accelerate the transition to a more sustainable and clean energy future. This transformative upgrade promises to redefine the exploration landscape, breaking boundaries and unlocking unparalleled insights into the subsurface. By harnessing the latest advancements in seismic technology, the enhanced G3 2.0 P-Cable system will propel the energy industry forward towards electrification, opening new frontiers and driving us towards a future driven by sustainable and efficient renewable energy sources.

Prosjektnummer: 347197

INFRASTRUKTUR-arbeidstittel: The Norwegian Advanced Battery Laboratory II (NABLA-II)

Vertsinstitusjon: IFE

Sammendrag:

The Norwegian Advanced Battery Laboratory II (NABLA-II) aims to further strengthen the existing NABLA-I and to build up competences to approach upcoming challenges associated with the exponentially growing battery ecosystem. To support the existing and emerging industry within battery technology in a holistic manner, there are several topics that are in need of focused research attention: materials processing and recycling, next-generation materials and chemistries, manufacturing, system integration and safety. These are the main building blocks of FME BATTERY's work package structure, where cross-cutting research and knowledge-building activities serve as work packages that accommodate these elements. The extension of infrastructure is required to spearhead the development of next-generation energy storage technologies to increase the visibility of the Norwegian academic battery community and provide the current - but in particular the future - Norwegian industrial players an advantage as a technological transition takes place.

The present application is primarily focused on the acquisition of the research equipment to establish NODES for tackling the upcoming challenges in the FME BATTERY and overall to strengthen our R&D capabilities in the various research institutions to perform advanced and competitive research and to secure access to high-level infrastructure for industry partners. This research comprises the full battery value cycle, including fundamental research on key performance characteristics of battery technology evolution such as sustainable materials development, characterization and validation, scaling, energy and power density, life span, safety investigation, cost, etc. for Li-ion battery technologies and beyond. Crucially this infrastructure can also be efficiently utilized with appropriate expertise developed through the FME mechanism of the Research Council, which provides the essential sources of raw talent.

Prosjektnummer: **347198**

INFRASTRUKTUR-arbeidstittel: **ATMP Norway – A National Multimodal Infrastructure for ATMP**

Vertsinstitusjon: **Oslo University Hospital (OUH)**

Sammendrag:

The proposed formation of the Norwegian Infrastructure for Advanced Therapeutic Medicinal Products (ATMP Norway) aims to expedite the creation and distribution of novel cell and gene therapies for Norwegian patients. This infrastructure will bridge existing gaps in the national ATMP landscape and maximize the potential of existing Good Manufacturing Practices (GMP) and pre-GMP infrastructures. ATMP Norway's four core strategies include:

- 1) Organizing training and knowledge exchange: National-level training programs will be promoted, facilitating knowledge sharing among researchers, scientists, and regulatory authorities. This will ensure that professionals are equipped with the necessary skills and regulatory understanding.
- 2) Guiding the evolution of mature ATMP products: The infrastructure will provide support to transition initial ATMP concepts into mature products that adhere to GMP standards, assisting with process optimization, quality control, and regulatory compliance.
- 3) Manufacturing innovative ATMPs: ATMP Norway will create manufacturing capabilities for novel cell and gene therapies from academic and industry sources. Access to state-of-the-art facilities will enable the translation of promising research into effective treatments.
- 4) Enabling patient enrollment in ATMP trials: ATMP Norway will facilitate Norwegian patients' participation in clinical trials involving ATMPs, collaborating closely with clinical research institutes, hospitals, and healthcare providers for efficient patient recruitment and data collection.

This unified approach will bolster Norway's standing in the ATMP field, attract investments and partnerships, promote dialogue between all stakeholders and ultimately enhance patient access to pioneering therapies for various conditions, including cancer, neurological and cardiovascular disorders, genetic and autoimmune diseases, among others.

Prosjektnummer: 347199

INFRASTRUKTUR-arbeidstittel: National proton therapy research infrastructure

Vertsinstitusjon: Oslo University Hospital (OUS)

Sammendrag:

Proton therapy is a type of cancer treatment that is expected to cause less side effects than standard radiotherapy. However, there is a lack of clinical studies providing evidence supporting this assumption. Proton centers are being built at Radiumhospitalet, OUS, and Haukeland University Hospital, which together will form a multi-regional treatment service nationally. The proton therapy units will have a unique infrastructure for clinical and preclinical research. We aim to include 75% of patients in clinical studies to strengthen the scientific evidence and further develop proton therapy for new indications. These will mainly be national multi-centre studies, with extensive international collaboration, and great potential for multi-disciplinary translational research. A National Proton and Radiation Therapy Registry is under development and will form a central supplement to the clinical studies. The clinical studies will be designed interdisciplinary with various professionals from clinics, basic research, universities and colleges, and be accompanied by translational radiobiological and radiation physical research. Preclinical research will include animal and cell studies to discover new mechanisms and treatment approaches. Large investments have been made in buildings and equipment. Clinical treatment will be ensured by the hospital staff and existing infrastructures. It is very important that the development of this new treatment modality is supported with the necessary national research infrastructure to carry out clinical studies and register clinical data and to perform translational and preclinical research. For this infrastructure application, we plan for OUS to be the host. Key partners are Haukeland University Hospital (HUS) with its separate proton unit, St. Olav's Hospital (SOH) and University Hospital Northern Norway (UNN), and the universities UiO, UiB, NTNU and UiT. We apply for funding of infrastructure and temporary technical staff for 1) Proton therapy – preclinical and translational research and 2) Norwegian proton and radiation therapy registry. The infrastructure applied for will enable Norwegian researchers in clinical, translational and pre-clinical radiotherapy to carry out advanced cancer research at the international forefront.

Prosjektnummer: 347200

INFRASTRUKTUR-arbeidstittel: UiT Manned and Unmanned Aviation Laboratory

Vertsinstitusjon: UiT, The arctic Univeristy of Tromsø

Sammendrag:

UiT, The Arctic University of Norway, aims to develop a joint laboratory for research and development in manned and unmanned aviation together with international capacities. The facility will include an indoor drone and aviation laboratory, as well as an outdoor test site for full-scale drone operations. The infrastructure will be used by universities, national and international research institutions, private and governmental collaborators, as well as for internal use within study programs and research activities. The planned infrastructure includes an indoor test facility for UAVs, a wind tunnel, workshops, laboratories, simulators for manned and unmanned operations, auditoriums, meeting rooms, server rooms, offices, storage facilities and lab facilities for human

performance and skill-set assessment. The outdoor test site will have a runway, workshops, a control room, briefing rooms, kitchen facilities, and accommodation for visiting personnel.

The establishment of such infrastructure will facilitate national and international collaboration projects, some of which would require the facilities that we now are seeking funding for. Additionally, the facilities will attract external institutions, and broaden UiT's research capacity on unmanned and manned aviation technologies. The proposed budget for the project includes costs for the building, equipment, wind tunnel, simulators, and the outdoor test site.

The infrastructure will fill the lack of suitable facilities for research and development in the fields and cater to the growing demand for testbeds of cutting edge technology and proof of concept projects in the field of sustainable aircrafts and performance. Furthermore, the infrastructure will facilitate the much-needed interconnectivity between operational education programs and the research fields, particularly in the context of manned and unmanned aviation. The total budget is estimated to 190 MNOK.

Prosjektnummer: 347201

INFRASTRUKTUR-arbeidstittel: RISE-H2: Research Infrastructure for the Sustainable and Efficient use of H2 in the decarbonisation of Industry

Vertsinstitusjon: SINTEF Industri

Sammendrag:

The green transition recognizes the urgent need to address the challenges posed by the climate change, resource depletion, and environmental degradation. Electrification with renewable power is part of the solution to mitigate potentially devastating climate changes, however, not all CO₂-emissions from industry can be solved through electrification. Our quality of life has been vastly improved by our capability to produce and refine metals and chemicals to indispensable applications within transportation, infrastructure, energy generation and storage, electronics, food production and more. Their production today relies on fossil carbon, not as an energy source, but because of its chemical properties. In the production and refining of metals from ore, the green transition focuses on non-fossil reductants, and hydrogen is an attractive candidate to replace fossil carbon as reductant since it can be produced entirely from renewable power and water. For production of chemicals the key challenge is the transition to climate friendly carbon sources, which could be non-fossil industrial off-gases including CO and CO₂, or bio-based feedstocks that have been converted into intermediate carbon carriers in the form of oils and gases. Chemically bound hydrogen is an integral part of most chemicals, and reactions with hydrogen therefore play indispensable roles in the refining of non-fossil feedstocks into the platform of chemicals that the society is dependent on. **RISE-H2 will fundamentally strengthen our national research infrastructure on reactions with hydrogen for metals and chemicals production**, which is critical to supporting the industry in the green transition and towards a clean hydrogen economy.

Prosjektnummer: 347202

INFRASTRUKTUR-arbeidstittel: The Norwegian Laboratory For Silicon-based Solar Cell Technology

Vertsinstitusjon: SINTEF

Sammendrag:

The aim of the Norwegian laboratory for silicon-based solar cell technology that was established in 2016, is to coordinate and unify cutting-edge infrastructure into an "open-lab facility" in Norway, combining facilities at SINTEF, IFE, NTNU and UiO. We conduct "frontier research" along the entire photovoltaic (PV) value chain, from silicon feedstock to use of solar modules, including recycling. By coordinating and unifying national infrastructure, Norwegian research groups and companies are working together in a high-tech environment, gaining the in-depth knowledge base necessary to assume and maintain leading positions in the development of future PV technologies. Our activities are in line with the prioritizations in the Norwegian governments long term plans for education and research, concerning increased use of renewable energy and enabling and industrial technologies.

The infrastructure host institutions SINTEF, IFE, NTNU and UiO have a strong position in the international PV society and have large activities in European projects, R&D project for national industry and a key role in education of candidates to the PV industry and research.

The infrastructure will enable Norwegian industry, which already holds a unique position in Europe, to develop into a key supplier for Europe's transition into a zero-emission society. Norway also needs to make this transition, and the renewed infrastructure will also serve the purpose of developing solar energy into a relevant and significant part of the Norwegian energy mix. The infrastructure will be used for training and teaching purposes, which in turn will be very important for the Norwegian industry as it provides relevant competence.

Prosjektnummer: 347203

INFRASTRUKTUR-arbeidstittel: Research lab for HVDC long-distance power transmission HVDC-lab

Vertsinstitusjon: SINTEF Energi AS

Sammendrag:

HVDC technology enables integration of renewable energy sources into the European power system, facilitating a sustainable and reliable energy transition, by enabling high power transmission over long distances with low losses. The HVDC-lab is a planned research infrastructure aimed at addressing the challenges and opportunities associated with high-voltage direct current (HVDC) technologies.

The infrastructure will consist of two main laboratories: the Ageing Lab and the Health Prediction Lab. The Ageing Lab will focus on investigating ageing mechanisms under HVDC conditions, enabling long-term experiments under controlled environmental conditions. It will feature equipment for energizing test objects with high-voltage DC sources, controlling ambient conditions using heat and

climate chambers, and conducting characterization tests for better understanding of ageing mechanisms. The Health Prediction Lab will concentrate on developing techniques and sensors for monitoring and predicting the health of HVDC components, such as cables, terminations, and gas insulated switchgear (GIS). It will include equipment for partial discharge (PD) detection, temperature and vibration sensing using optical techniques, and online measurements of space charge accumulation. The synergy between the two labs will enhance the overall research outcomes by bridging the gap between understanding ageing mechanisms and developing effective condition monitoring techniques.

To support the research activities, the HVDC-lab will establish a secure laboratory network, ensuring safe handling and easy accessibility of the generated data to both academic researchers and publicly funded projects. It will also provide dedicated computational resources. This infrastructure will facilitate data analysis, numerical simulations, and the implementation of machine learning algorithms for a better understanding of HVDC ageing mechanisms and advancement of condition monitoring techniques.

The HVDC-lab will be a highly valuable addition to the existing resources at SINTEF Energi and NTNU, including Elpowerlab, SINTEF Energy Lab, and the high-voltage laboratories at NTNU. By leveraging these established assets, the HVDC-lab will be contributing to the development of robust HVDC technologies through improved understanding of ageing mechanisms and improving condition monitoring techniques.

Prosjektnummer: 347204

INFRASTRUKTUR-arbeidstittel: Trace-Clean: Mobile infrastructure for study of biogeochemical processes of trace elements & microbiology in marine systems

Vertsinstitusjon: NTNU

Sammendrag:

Trace element-clean & biologically sterile laboratories are essential to avoid contamination during sampling, immediate manipulation of samples from sea, atmosphere, sediment, and on-site lab-scale experiments during research cruises and field work. Even though some Norwegian research institutes (i.e. NTNU and NIVA) have clean lab facilities on their campuses, these facilities are inadequate in terms of levels needed (class 100/ISO 5 or better) and accepted in the current research community: GEOTRACES; bio-essential and toxic trace elements; microcosm experiments especially in polar seas and open ocean.

Cleanroom/sterile laboratories are essential to avoid contamination during sampling, immediate manipulation of trace elements and their isotopes as tracer for following natural and human made biogeochemical processes, organic molecules with high background level, conduct microbiological experiments in field studies, including E-DNA reserch and other procedures on samples from sea, atmosphere, sediment during research cruises and field work under controlled conditions.

Norwegian research communities do not have mobile clean field infrastructures that are essential for highquality research, contamination control and analysis of samples in order to support field studies

and research cruises addressing on biogeochemical process & pollution and connected biological and toxicological impacts. Improvement the existing stationary clean lab will be complementary part of the **Trace-Clean**.

A multidisciplinary consortium leading by NTNU developed “**the observational pyramid**” which is next generation observation/ monitoring platform; it includes optical imaging from small satellites, observations from buoys, autonomous vehicles and ships at low-altitude and in-situ, provides a highly effective approach to marine ecosystem research relevant from pole to pole and in different temporal and spatial scales. Trace-Clean will be part of the **observational pyramid**, as a supplier of molecular ground-truth data on biogeochemistry and microbiology.

Trace-Clean proposal received strong support from national institutes that would be potential users and collaborators (SINTEF, NIVA, NPI, UiT...) as well as from international collaborators (GEOTRACES, Oxford Univ...) interested in polar and open ocean research on biogeochemistry and microbiology for following natural and human made processes, molecular & microbiology, including e-DNA research.

Prosjektnummer: **347205**

INFRASTRUKTUR-arbeidstittel: **Infrastructure for large-scale, research-based ideation, design, development and early testing of software-enabled Health technologies (SyntHealth)**

Vertsinstitusjon: **Helse Midt-Norge RHF**

Sammendrag:

We envision an infrastructure that will enable a data-driven and iterative approach to ideation, design, engineering and empirical testing of software for the health-, welfare and wellness domains.

The environment for software ideation, design, prototyping and empirical testing is to sit on top of an open, REST-based and standardised API that will provide access to data models and synthetic versions of Healthcare-, health- and welfare- data sets. The pre-project will bring together representatives from different regional health authorities, registry owners and other relevant companies/institutions with the ultimate aim of providing a research infrastructure that consists of APIs, data models and synthetic data from the entire health- and welfare sector. The API will secure national access to test versions of health record systems from different health regions, among others Helseplattformen which is a regional pilot for the national vision of “One citizen — one health record” and whose accounts of care are unique in their standardisation, detail and comprehensiveness.

The infrastructure will contribute to an arena where researchers and product developers can design and empirically test the potential end-user value of their product idea without having to obtain regulatory approval for each design cycle. The arena will resemble that of the development of medicinal products in the sense that it will enable developers to conduct concept studies and very early clinical trials at a minimum of costs. The infrastructure will create an arena that can bring Norwegian researchers and innovators at the international forefront of this field.

This research infrastructure will complement the regional health data centres under construction in most health regions.

Prosjektnummer: 347206

INFRASTRUKTUR-arbeidstittel: **The Next Generation Health Data Infrastructure for Research (NextGen Health Data)**

Vertsinstitusjon: **Folkehelseinstituttet (FHI)**

Sammendrag:

To unleash the full potential of health research in Norway, we need to invest in infrastructures for fast sharing, collecting, storing, and managing population-based health data. Norway governs some of the world's largest national, longitudinal, and population-based health data cohort studies such as The Norwegian Mother, Father and Child Cohort Study (MoBa), which includes ~284,000 individuals, the Norwegian Counties Public Health Surveys, and Covid-19 cohorts. In addition, Norway harbors world-class health registries such as the Norwegian Medical Birth Registry, The Norwegian Patient Registry and others. The cohorts include biospecimens with triads of mothers, fathers and children to be used for research purposes. The ability to combine population-based lifespan data from the start of pregnancy with biological data, and link these to individual-level health registry data, places Norway in a position to lead the next wave of research in public health, precision medicine, and life sciences. Furthermore, the MoBa-offspring are turning into young adults. With the proposed new infrastructure, we can include a third generation (children of MoBa offspring), and new cohorts into a truly unique research infrastructure worldwide.

Today the process of finding, acquiring, combining and using Norwegian health data is cumbersome, and the collection of new data is hindered by lack of technology implementation. A new type of national health data infrastructure is critically needed. The Norwegian *Long-term plan for research (2023-2032)* states improved use of health data as an explicit goal. The cancelling of the national Health Analyses Platform (HAP) in Norway, has caused a reorientation of the process for renewing Norwegian health data infrastructures. From 2024, most national health registries and cohorts in Norway will be governed by the Norwegian Institute of Public Health (NIPH). There is now a window of opportunity for the NIPH, together with expert collaborating partners, to take a leading role in the design of a new national infrastructure ecosystem for health data to release optimal value for health research.

Prosjektnummer: 347207

INFRASTRUKTUR-arbeidstittel: **infrastructure for Virtual & Augmented Reality Experiences (iVARE)**

Vertsinstitusjon: **Høgskolen I Innlandet**

Sammendrag:

The Game School (Høgskolen I Innlandet) at Hamar (UNESCO Creative city) is a leading actor in training students in Game Design and Game Programming in Norway. It is also a leading actor in applying Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) (together designated as Extended Reality (XR)) tools and methods for various contexts and challenges in our society today. For example, the application of VR tools have significantly altered the landscape of teacher training

and our university is unique in pioneering this. We have already contributed significantly in the healthcare domain in the form of safety critical training. We are starting to play a significant role in the maritime, leadership training and public health domains as well. These range from simple operational planning and training, user centred control room design, safety critical public health scenarios and many more interesting facets of social and professional landscape in our everyday life. Currently our facilities include the largest Motion Capture studio in Norway. It has played a stellar role and served the Norwegian research and innovation landscape very well. Its use by our research and educational personnel for answering key research and education needs so far has given wings to our ambitions. Therefore, we hope to play a much larger role in the education, maritime, leadership training and public health domains. This, we have estimated, requires us to strengthen our infrastructure and add new infrastructure by a substantial margin to allow us to play a leading research and innovation role on behalf of Norway. Our close partner Oslo School of Architecture and Design (AHO) are a reputed institution and an outstanding design research milieu, especially in the maritime domain. The infrastructure requests in this proposal are distributed between Hamar and Oslo and are designed to not just increase our research and innovation capabilities but also to take the collaboration between our institutions to the next level.

Prosjektnummer: 347208

INFRASTRUKTUR-arbeidstittel: Modern reference frame Svalbard

Vertsinstitusjon: The Norwegian Mapping Authority (NMA)

Sammendrag:

This project aims to expand and improve the geodetic infrastructure on Svalbard to facilitate better monitoring and understanding of the interaction between climate, geodynamics, glaciology and sea level on Svalbard. The current research infrastructure does not meet the needs for modern research and mapping in the polar region.

The project aims to install more permanent tide gauges and Global Navigation Satellite Service (GNSS) stations on and around Svalbard, and to improve the height system. By doing this, a more precise determination of crustal movements in Svalbard will be possible and consequently give useful and precise research data of national and international importance for e.g., climate scientists and geoscientists.

This infrastructure will benefit various research areas related to Svalbard. The infrastructure aims to enable better monitoring of ice mass changes and glacier dynamics, and benefit navigation at sea and monitoring of the ocean climate and sea level changes. It will also improve the performance of satellite altimetry around Svalbard and mapping of ocean currents, and significantly improve our understanding on the development of stress fields and land uplift. Other benefits will be to better characterize the crustal and upper mantle geological structure of the Svalbard archipelago, and the modelling of the glacial isostatic adjustment.

There is a wide group of users who will benefit from this project both nationally and internationally; Members of the Svalbard Integrated Observing Systems (SIOS) research collaboration and all others who carry out research activities on and around Svalbard related to climate monitoring or other research where fixed time series are collected. These are e.g., the Geological survey of Norway, the

Norwegian Polar Institute, the University of Svalbard, the Norwegian Water Resources and Energy Directorate, NORSAR, the University of Oslo (UiO), and the International Earth Rotation and Reference Systems Service.

The data will be distributed via established data portals nationally and internationally.

Prosjektnummer: 347209

INFRASTRUKTUR-arbeidstittel: PerMReg: Personalised Medicine Regional network

Vertsinstitusjon: University of Agder

Sammendrag:

We propose to build up a regionally based, nationally oriented network of partner aiming at establishing research infrastructure in the field of personalised medicine in the South of Norway, complementing already existing research infrastructure, and creating possibilities of regionally initiated research projects as well as serving as an arena for national and international cooperation. Partners will include, but not be limited to, universities, the health care sector and industry.

Today's personalised medicine is characterised by large amounts of data from various sources and laboratory technologies to map genetic and other biological conditions of an individual patient. The complexity of health data has brought an increasing need for interdisciplinarity, competence building and integrated research for all stages of the patient's course and development. This challenges the national strategy of equal access to personalised medicine in all parts of Norway, which the proposed network and infrastructure will help prevent.

Prosjektnummer: 347211

INFRASTRUKTUR-arbeidstittel: Infrastructure for Computational Pathology in Norway
COMPATNOR

Vertsinstitusjon: Helse Bergen, Laboratorieklinikken

Sammendrag:

The implementation of computer-aided diagnosis (CAD) tools in digital pathology faces two significant hurdles that need to be overcome: the lack of data exchange between research groups and the limited education of medical students, pathology residents and pathologists in the field of digital pathology and advanced image analysis. In Norway the digital pathology landscape varies across health regions. Two of four health regions – Helse Vest and Helse Midt – are fully digitized, while Helse Sør-Øst is currently in the process of implementing digital pathology. Multiple research groups across all four health regions are actively engaged in training, testing, and validating CAD tools.

Hurdle 1 - Inadequate Data Exchange: Methods used to share Whole Slide Images (WSIs) among research groups are outdated and do not comply with existing regulations, such as the General Data Protection Regulation (GDPR). Portable hard drives and dropboxes are being used as rudimentary means of data transfer. These methods not only pose security risks but also hinder efficient collaboration. To address these challenges, COMPATNOR will provide an enhanced infrastructure to

enable secure and compliant sharing of data among research groups. This infrastructure must prioritize data privacy and security while facilitating seamless access and collaboration. By implementing such a system, research groups can streamline their CAD tool training, testing, and validation processes, leading to significant advancements in this critical research area.

Hurdle 2 – Nonexisting teaching and training in digital pathology and CAD tools for medical students, pathology residents and pathologists: COMPATNOR will also offer a platform for formal teaching and training improving the understanding of pathology and providing in-depth knowledge of the principles, methods, and applications of AI algorithms and other advanced image analysis tools. In conclusion, fostering national collaboration for data exchange and incorporating WSIs into medical education and pathology training will significantly contribute to the development and successful implementation of robust CAD tools into pathology practice.

Prosjektnummer: 347212

INFRASTRUKTUR-arbeidstittel: Infrastructure for Precision Diagnostics for Clinical Cancer Trials, InPreD – Norway

Vertsinstitusjon: Oslo University Hospital, Clinic for laboratory medicine

Sammendrag:

Personalized Cancer Medicine (PCM) is established as an important concept in cancer care where patients are given more precise and targeted diagnostics and treatment. A key component is clinical trials, where **tailored advanced cancer diagnostics is provided**, matched to the drugs tested. This type of precision diagnostics can vary from comprehensive genomic profiling (CGP) of tumors, digital pathology using artificial intelligence (AI) to *in vitro* functional and drug sensitivity screening of tumor cells. To be able to run such complex clinical trials, **an infrastructure dedicated to establishing and providing adequate advanced diagnostics as well as a clinical decision support system is crucial.**

As of now, providing broad access to PCM is especially important for cancer patients with the poorest prognosis who have exhausted all lines of standard treatment, those with rare tumor types (including paediatric cancer) and patients with carcinoma of unknown primary. In Norway, an entire PCM ecosystem is established and are getting international attention and collaborations. In this ecosystem, the national Infrastructure for Precision Diagnostics (InPreD-Norway) was initiated based on strategic research funding from the regional health authorities (2019-2023). The aim was to build a network between the university hospitals in Norway to secure a robust, interactive structure providing advanced/experimental diagnostics based on **facilitating an interface between translational research and clinical cancer trials**. InPreD-Norway aims at providing equal access for researchers to experimental diagnostics with state-of-the-art competence and technology, and resources to design logistics and perform procedures during patient inclusions. In this initial phase, InPreD has established CGP testing for the **identification of patients eligible for clinical biomarker-based trials**. In two years, more than 1000 patients with advanced cancer across Norway have been tested by InPreD. Moreover, the infrastructure has built competence in four university hospitals both with regard to performing wet lab including next-generation sequencing (NGS), implementing dedicated bioinformatic pipelines, and developed interpretation tools and a standardized reporting system, including the molecular tumor board (National, virtual molecular multidisciplinary team

meeting, Mol-MDT). *There is now a need to expand and strengthen such a national multidisciplinary, dynamic research infrastructure that can facilitate the transition of more concepts from translational research into experimental diagnostics, increasing the number and feasibility of clinical cancer trials.* InPreD will be complementary to other infrastructures supporting clinical trials and synergize with established technology-defined infrastructures.

Prosjektnummer: 347213

INFRASTRUKTUR-arbeidstittel: EMBRC-NO fase II

Vertsinstitusjon: University of Bergen

Sammendrag:

EMBRC-ERIC (European Marine Biological Resource Centre) is a distributed European research infrastructure, spanning ten countries and 70 localities. Bringing together 45 institutions. EMBRC-ERIC provides researchers and stakeholders with resources and tools to develop innovative solutions for contemporary biological, environmental, and societal challenges. The infrastructure offers a range of services, including access to marine organisms and ecosystems, advanced technology, and field and laboratory facilities. These services are geared towards encouraging collaboration between researchers and institutions.

In 2019, Norway (NO) joined EMBRC-ERIC (ESFRI roadmap 2021), featuring seven Norwegian institutions in Phase I (UiB, UiT, UiO, NIVA, HI, NTNU, NOFIMA). In the Phase II application, EMBRC-NO aims to expand and develop facilities and services, which were established and offered during phase I. The focus of this expansion will be: 1) Bolstering the visibility of the node's research facilities and implementing remote access to its services, 2) Providing a continuous inventory of Norwegian coastal biodiversity and physical environment baselines to support research, bioprospecting, health, and environmental management efforts. A key focus will be on active participation in EMO-BON, a European-wide marine genomic network initiated by EMBRC-ERIC with the aim of long-term monitoring of marine biodiversity. Under EMBRC-NO, the participation in EMO-BON will be expanded involving multiple observatories and services, 3) Strengthening the emphasis on studying and utilizing the rich local marine biodiversity, including establishing novel marine model species with basic scientific or commercial potential, 4) Investigating cumulative effects of multiple stressors (anthropogenic and environmental) on Norwegian biodiversity, such as climate change, aquaculture, marine pollution (oil, toxins, light), hypoxia, 5) Exploring the biological and chemical diversity of marine resources deposited in partner facilities, and exploit their potential for developing innovative products, processes, and solutions to enhance and boost the national blue bioeconomy.

These objectives are in line with both the NFR call and the Norwegian Roadmap for Research Infrastructures. In addition, they also align with EMBRC ERIC's new general research strategy, which prioritizes biodiversity and marine model organisms.

Prosjektnummer: 347214

INFRASTRUKTUR-arbeidstittel: NORGES TREMEKANISKE OG BIOMATERIAL LABORATORIUM – (Acronym BIOLAB)

Vertsinstitusjon: NTNU – Norwegian University of Science and Technology, Department of Manufacturing and Civil Engineering (IVB)

Sammendrag:

BIOLAB project will deploy wood-based and bio-material research infrastructure for Norway. The main hub of the project will be Skjervan BIOPARK¹, the novel Industrial Symbiosis Park in Gjøvik, taking advantage of the national rich forestry and in combination with industrial competency, develop circularity solutions, based on industrial symbiosis, for the reduction of waste and respective CO₂ emissions. Innlandet county houses the 46% of the total Norwegian productive timber, therefore, it is naturally, the leading area of Norway, for timber-based products. Timber, is a sustainable material, that is increasingly being used, because of its low environmental impact, high versatility and also increased thermo-mechanical properties, making it ideal for sustainable construction and building applications. The increasing exploitation of timber, has undoubtedly, increased the amount of respective waste, stemming from various sectors, with the construction and manufacturing process industries, generating the largest amounts of both used and un-used timber. Therefore, it is of paramount importance to develop circularity solutions around timber, which will effectively function as a paradigm shift to other countries worldwide, reducing timber waste, and also providing an inherent boost, to the increasingly expanding interest growth on timber-based products and subsequent increasing amounts of timber-waste. Timber waste, depending on its origin and previous history, can be upcycled, reused, repurposed or downcycled into lower value products. Given its value, as a natural resource, different solutions exist, on how to recover End-of-Life timber, with the optimum option being the reuse with marginal treatment or upcycling into higher added value products and applications. Distinct examples of high value products of timber waste are Glulam (Glue-laminated timber), CLT (Cross-Laminated timber) and others, which are ideal elements for structural applications and high-rises, as well as particleboards, MDF (Medium Density Fibreboards), WPC (Wood Plastic Composites) and others, which depending on application, can be employed for both structural, but importantly for non-structural applications in the built environment, as well as for furniture, agriculture, etc. In the majority of engineered timber products, different types of glues, adhesives, coatings, additives as well as plastics are employed, to develop different types or qualities of products. To fulfil the UN sustainable development goals², engineered timber products, should be manufactured employing both recycled and bio-based polymers, in a way to reduce environmental impact from fossil-fuel based products and also ease the circularity of EoL timber waste, allowing for further use or ease in disassembly and remanufacturing, let alone decomposition without toxin creation. Given the above, there is a great need to increase the circularity of both timber and also plastic waste, increase the knowledge on bio-based polymers for adhesives/glues and coatings and couple this with advanced manufacturing, testing, quality control, circular economy principles, robotics as well as sensing and IoT systems. **BIOLAB** will unlock the potential of timber and engineered timber products, with a view to valorizing timber and plastic waste, contributing largely to the Norwegian and European circular economy. The consortium is composed by strong relevant

partners to timber and engineered timber products (Treteknisk & NTNU Gjøvik), robotics (NTNU Gjøvik & NTNU Trondheim) as well as polymer-based products & processing (NTNU Gjøvik & Sintef Oslo).

Prosjektnummer: 347215

INFRASTRUKTUR-arbeidstittel: NorTRE - Norwegian trusted research environments
(Norsk: Trygge digitale forskningsrom)

Vertsinstitusjon: UiO

Sammendrag:

With the Norwegian Trusted Research Environments (NorTRE) proposal, we aim to upgrade and consolidate the national services for sensitive research data. Access to such services, commonly referred to as trusted research environments (TRE) is currently provided by three Norwegian universities: UiO (TSD), UiB (SAFE), and NTNU (HUNT Cloud). As both research and diagnostics in the health sector is becoming increasingly data driven, the demand for TREs is increasing dramatically. Norway has assembled an unprecedented collection of health registry data that offers a vast potential for innovation. In addition, novel methods for personalised analysis within both clinical and research practice generate enormous amounts of sensitive data. Such data can only be analysed in highly secure settings, and the need for even better TREs is frequently described in national policy- and strategy documents.

UiO, UiB and NTNU have invested heavily to establish their local TREs during the last ten years to enable utilisation of sensitive data in line with national and international legislations. The TREs are now essential for research in the range of health data via religion, education, behavioural studies, economy, high-tech chip design to socio-economics. The TREs also support ever more external users within the academic- and health and private sector. Today the TREs host ~10.000 users spread over 2000+ projects on behalf of ~90 institutions and companies. The services of NorTRE underpin the scientific activities of several cutting edge research groups and centres across Norway, and support and collaborate with other data- and data-generating bodies including Biobank Norway, ELIXIR Norway and NorSeq. Notably, the TREs are currently working pro bono with the Directorate of e-health to leverage our existing solutions to resuscitate the terminated health analysis platform. On the European level, the Norwegian TREs are repeatedly highlighted as leading examples providing useful secure environments for research, and are deeply involved in developing services enabling cross-border sharing of sensitive data both within 1+MG, EOSC- and EHDS context. Realising the ambitions of the various road maps and ongoing initiatives on sharing of sensitive data on national and European levels will require massive efforts on both technological and policy levels. Such accomplishments cannot be achieved by separate actors alone, but rather requires joint actions and investments. In this proposal, the partners are joining forces to develop technological solutions and expertise that will enable Norway and Norwegian researchers to meet future research needs, policies and regulations regarding sensitive data. We will achieve this, in short, by improving the interfaces between our respective services, streamlining data flow to, from and between the TREs, easing data access by establishing a national trust domain and strengthening our user support and training.

Prosjektnummer: 347216

INFRASTRUKTUR-arbeidstittel: The National Tourism Monitoring System

Vertsinstitusjon: University of South-Eastern Norway, School of Business

Sammendrag:

The Norwegian Travel Industry directly employs 7.1 % of all employees in Norway and indirectly 14.5%. Tourism is Norway's fifth-largest export industry, with an export value of NOK 59 billion in 2019. Despite the industry's importance, data about the industry is fragmented and poorly connected. The national tourism strategy 2030 prioritizes the establishment of a national monitor, a collaborative big data analysis tool for Norwegian tourism, as one of their proposed actions to strengthen the industry's sustainable value creation and growth. The availability of comprehensive and unique industry data may increase research with the industry, which has now had limited interaction with research institutions (Meld. St. 19 (2016-2017), p. 89).

The National Tourism Monitoring System will access and integrate relevant data sources that relate to (1) travel flow and market data, including future bookings (2) economics, jobs, and value creation, (3) drivers of demand, (4) brand value and reputation, and (5) sustainability with a focus on emissions, biodiversity, and responsible tourism. These areas reflect the priorities of the National tourism strategy 2030 and the subsequent feasibility analysis of the availability of public data (Dybedal et al., 2022). Additionally, we will add proprietary data from the travel industry members of Norwegian Tourism Partners to perform accurate "nowcasting" and forecasting by sales and future booking data. Information about events such as campaigns and the opening of new experiences, accommodation capacity, or new transportation routes will also be included as a base for effect analysis.

The system will provide a single source of corresponding travel industry data for Norway, available for researchers, public portals (e.g., Visit Norway Insight), and companies that want to add the system's "big data" with their proprietary data. The system will implement complementary analytics methods (e.g., predictive analytics using approaches from advanced statistics, data science, and machine learning) to existing and new data sources to enhance the travel industry statistics' reliability, transparency, and trustworthiness.

Prosjektnummer: 347217

INFRASTRUKTUR-arbeidstittel: Offshore Boundary Layer Observatory (OBLO) – Phase II

Vertsinstitusjon: Geophysical Institute (GFI), University of Bergen (UiB)

Sammendrag:

Offshore wind energy is nationally and internationally seen as the most important sustainable future energy resource and Norway is globally one of the countries with the highest offshore wind energy potential. The appropriate characterization of the relevant environmental conditions in the

atmospheric boundary layer (up to about 300 m for state-of-the-art wind turbines) and the oceanic mixed are of uttermost importance for the design, construction and efficient operation of offshore wind farms. Corresponding measurements are up to date very sparse and involve high logistic efforts and deployment costs, as well as scientific and technical expertise in planning and execution that usually overshoot the capacity of single academic or industrial actors. Therefore, we propose OBLO-II as a national initiative of central Norwegian partners with a research focus on offshore wind energy, to provide an internationally unique measurement infrastructure for offshore wind energy research. With that we can ensure that Norwegian universities, research institutions and industry have access to a wide range of tools for future successful offshore wind energy research beyond the current state-of-the-art and to a high international standard. The OBLO-II infrastructure application is partially an upgrade partially an extension of the existing OBLO infrastructure project, funded by the Research Council of Norway between 2010-2019 under project number 227777. The main components will be an upgraded instrument park of mobile instrumentation, including multiple wind lidar systems, two met-ocean buoys for a flexible and fast deployment of the instrumentation offshore on demand, and two meteorological towers at the coast for in-situ measurements of the approaching offshore wind field. The consortium will also offer expertise and consultancy with respect to the design, planning and execution of measurement campaigns and ensure high impact of the infrastructure by providing open access to highly required offshore data sets based on the FAIR principles. Beyond offshore wind energy research, the OBLO-II infrastructure will also serve a wide range of other relevant applications, including basic atmospheric and oceanic boundary layer research, structural engineering, aviation safety, and weather and climate research.

Prosjektnummer: 347218

INFRASTRUKTUR-arbeidstittel: Ultra-high-resolution Earth Environmental and Climatic Archive Laboratory (EarthArchive)

Vertsinstitusjon: Insitutt for geovitenskap, Universitet i Bergen

Sammendrag:

Sediments serve as natural repositories that encompass valuable information about historical Earth-system processes. They offer crucial insights into past climate patterns, environmental fluctuations, rates of change, and the extent of natural variations. Nonetheless, the full potential of these archives still needs to be explored, and current research endeavours are focused on developing innovative tools to expand the instrumental record by utilising proxy archives. In this proposal, we propose an extension of existing national infrastructures, explicitly aiming to harness the potential inherent in geological archives. We envision the establishment of an Earth Environmental and Climatic Archive laboratory (EarthArchive), operating at an ultra-high resolution. EarthArchive will provide an excellent platform for investigating Earth's surface and studying climate-induced processes in the biosphere, cryosphere, and lithosphere. This ambitious endeavour will involve a strategic amalgamation of existing and novel infrastructures and installing cutting-edge equipment for sediment cores' physical, geochemical, and biological analysis. The establishment of EarthArchive will create a shared platform that revolutionises the analysis and interpretation of paleoclimate and paleoecological archives. It will offer a flexible and modular workflow encompassing all stages of analysis, ranging from site selection and sediment collection to state-of-the-art sample analysis, data visualisation, and comprehensive interpretation. Housed within the prestigious Bjerknes Centre for Climate Research

at the University of Bergen, EarthActive will emerge as a highly competitive national and international facility, attracting a diverse user base. Incorporating high-quality paleoclimate data into Earthsystem models will provide ample opportunities for innovative insights. The conceptualisation, novel methodologies, and expanded knowledge base resulting from EarthActive will catalyse a paradigm shift in our comprehension of the resilience and vulnerability of the Earth system to significant changes. Furthermore, this initiative will solidify Norway's leadership role in paleoclimate and paleoecological research. EarthActive will serve as a resource for national academic institutions and extend its services and collaborative opportunities to industry partners and international associates.

Prosjektnummer: 347219

INFRASTRUKTUR-arbeidstittel: Norwegian allogeneic iPS cell biobank and clinical trials utilizing iPS cells – developing future regenerative medicine therapeutics

Vertsinstitusjon: Oslo University Hospital

Sammendrag:

The goal of the proposed infrastructure is straightforward and twofold:

- 1) To generate a **biobank of human induced pluripotent stem (iPS) cells** derived from a small but specific set of ethnic Norwegian donors, which covers the cell transplantation needs of a large proportion (about 70% initially) of the Norwegian population for future regenerative medicine treatments. This will create a **national resource** of substantial longevity and applicability.
- 2) To utilize this biobank in a **proof-of-principle clinical study** to treat a specific disease - age-related macular degeneration - with iPS cell-derived retinal pigment epithelium. This will be done in collaboration with the Department of Ophthalmology at Ullevål Hospital, which has already performed extensive preclinical studies together within an international network leading up to clinical trials.

The first part of the goal, generating the iPS cell biobank, is without any doubt highly feasible. It is based on existing infrastructures and >10 years of expertise in the areas of iPS cell production and GMP clinical cell production at University of Oslo and Oslo University Hospital, as will be described below. It has also received seed funding of about 5 mill NOK during 2021-2023 from a private donation, which has facilitated the first steps in establishing the iPS cell biobank and associated infrastructure (including regulatory, legal and ethical elements, donor identification, storage infrastructure and GMP-compliant protocols for the first steps in iPS cell generation. The second aim involves a specific clinical trial, following directly from the lead of highly reputable international groups spearheaded by clinicians in Oslo, whose preliminary preclinical results are promising. Thus, the feasibility of the project overall is very high.

Prosjektnummer: 347220

INFRASTRUKTUR-arbeidstittel: Norwegian Centre for Nanoscale X-ray Tomography (NEXT)

Vertsinstitusjon: Faculty of Dentistry, University of Oslo

Sammendrag:

X-ray imaging is a field in tremendous development and distinguishes itself by its non-destructive applications in virtually all the natural and life sciences, and industry, and there is a rapidly growing number of X-ray computed tomography (CT) instruments nationwide. NEXT has extensive X-ray imaging infrastructure, with complementary instruments covering life science, via environmental, planetary science and geosciences, to material science. Coordinating and strengthening of the national X-ray imaging and microscopy capabilities by optimal use of the expensive infrastructure, alignment of investments and knowledge sharing, is of huge importance to the climate, environment, energy, health and Norwegian industry. NEXT aims to fill this role through upgrades of existing infrastructure and by maximizing quality and cross-fertilization across disciplines. The proposed investments within X-ray CT and imaging are extensions to this existing infrastructure, planned to provide an optimal portfolio of methodologies in a united national perspective, by introducing and refining X-ray imaging techniques, and actively support and educate users from a wide range of science disciplines through and synchrotron facilities. In addition to a shrinking gap between the imaging and diffraction communities and the need for researchers to move effortlessly between these artificial boundaries, Norway also has large commitments towards international large-scale infrastructure like ESRF and the upcoming neutron source European Spallation Source (ESS) in Sweden. Consequently, it is an explicit ambition of NEXT to contribute to knowledge-sharing and competence-building for both the entire Norwegian X-ray community and the much smaller subset of neutron users, through courses, workshops, seminars, advanced training and experiment preparations, and secondments. The Oslo hub will include member institutions of Oslo Science City (UiO (faculty of Dentistry, USIT and Natural history museum), NGI, Norsk Regnesentral and NMBU, and will feature state-of-the-art high-resolution imaging (UiO, NGI), a walk-in CT scanner to host large mechanical testing equipment (NGI), and infrastructure for remote data analysis and processing (VDI). The Trondheim hub includes NTNU, Norway's leading research unit in X-ray physics and imaging, and SINTEF, a European leading research institutes and the largest independent research organization in Scandinavia, has Pore Imaging Laboratory (PIL) under ECCSEL-ERIC that functions as a prominent national and European research facility in CCS research. The Tromsø hub includes Institute for Clinical Dentistry and The Arctic University Museum of Norway at UiT. These hubs operate as open-access facilities with large and increasing external user demand. NEXT will operate as a national competence cent, ensuring that Norway stays abreast with the latest developments in X-ray imaging. The national competence centre aims to give Norwegian industry a competitive edge and aims to secure that the national X-ray imaging resources are exploited in the best possible way to maximize the advantage to society.

Prosjektnummer: 347221

INFRASTRUKTUR-arbeidstittel: Digital Health Atlas for Norway WHO Digital Health Atlas: Norwegian participation in the global digital health research infrastructure

Vertsinstitusjon: SINTEF Digital

Sammendrag:

Digital health is widely implemented in Norway, and unknown number of digital health solutions are used every day by citizens, health professionals and other digital health stakeholders. Norway has also been a pioneer in digital health research, with several research environments being established for several decades now, that actively research on digital health. An important tool for digital health is digital health solutions registries or repositories. This type of electronic research infrastructure is useful for providing good overviews and insights of digital health solutions that are being developed, piloted, and implemented. The Norwegian Centre for E-health Research has been central in the early development of the international electronic research infrastructure for digital health solutions maintained by the World Health Organisation (WHO), called Digital Health Atlas (DHA). DHA is still overseen by the WHO, and it is declared a global public good. SINTEF, through a project funded by the European Commission, has done research on the importance of digital health registries, and has contributed with a large amount of data from African countries to the DHA. DHA is used by digital health stakeholders in many countries, but the use from Norwegian stakeholders is limited (only 1 solution registered, no active country administrators). The aim of this pre-project is to explore the interest and the needs of Norwegian stakeholders, such as researchers, policymakers, health care institutions, digital health industry, health professionals, and citizens, for a digital health solutions registry. From the other side, in dialog with the WHO, we will explore the technical possibilities of the DHA platform, and together we will estimate the cost and the time for accommodating the needs of the Norwegian stakeholders. For the data that are not relevant for DHA, or are critical or sensitive and need to be stored in Norway, we will explore the possibility and the costs for a separate secure cloud infrastructure. We expect that in one year after the start of the pre-project we will be ready to submit a proposal for a digital health research infrastructure.

Prosjektnummer: 347222

INFRASTRUKTUR-arbeidstittel: NORTEM IIb

Vertsinstitusjon: SINTEF

Sammendrag:

The Norwegian Centre for Transmission Electron Microscopy (NORTEM) is a national infrastructure jointly organized by the *three partners* NTNU, UiO and SINTEF. It serves academia and industry by providing high level materials research in terms of education, access, and research project deliverables. The first NORTEM project, granted by RCN in 2011, established laboratories in *two nodes* (Oslo and Trondheim) in the second half of 2013. By 2016, NORTEM had become a successful, highly utilized, and internationally recognized national infrastructure, offering access to various TEM techniques. In 2022 funding was secured for NORTEM II, but a 30% cut from the original proposal,

combined with inflation and a low exchange rate, has made it impossible to fulfill all goals set in the NORTEM II proposal. Despite these significant obstacles, NORTEM II is currently in the tender process, striving to overcome these limitations and continue its mission.

The NORTEM vision is to maintain *'A world-class TEM Centre providing access to expertise and state-of-the-art infrastructure for fundamental and applied research within the physical sciences in Norway'*. To embody this vision and meet the needs of NORTEM, additional investments in NORTEM II are required. This outline describes the additional requirements and the plans for NORTEM after the investments in 2024, covering a five-years period from 2025 to 2029. Sustained investments are crucial to ensure that Norway remains internationally competitive in the field of materials research. By continuous funding, NORTEM can stay at the forefront of technological advancements in TEM, offering cutting-edge analytical capabilities and access to state-of-the-art facilities. These investments will enable NORTEM to incorporate new developments, such as in-operando techniques, multidimensional data acquisition, and advanced spectral analysis, allowing for detailed studies on the structure, chemistry, and electro-optical properties of advanced functional materials. With continuous support NORTEM will be able to give access to a unique national and world-class TEM infrastructure with state-of-the-art facilities and expertise.

Prosjektnummer: 347223

INFRASTRUKTUR-arbeidstittel: NorARTnet – Norwegian Artistic Real-Time Network

Vertsinstitusjon: Sikt – Norwegian Agency for Shared Services in Education and Research

Sammendrag:

NorARTnet – Norwegian Artistic Real-Time Network is a low-latency digital network for telematic and artistic research using the national research and education network, Uninett, to transmit time-sensitive data between institutions in higher education and relevant creative and cultural venues. The infrastructure aims to support and enable real-time collaboration and research for various disciplines within artistic research, but also humanities, cognitive sciences, engineering, and computer science. Artistic research embraces more than 10 different fields of art and is currently part of the research activity in 11 Norwegian HE institutions. NorARTnet gathers previous initiatives and proposals for research infrastructure, with the aim to build on already established practices, experiences, and tested solutions for digital transmission. The network is technology and protocol agnostic, aiming to support various transmission methods, but with an emphasis on low-latency solutions like LoLa, Ultragrid, Dante, and Jacktrip.

Keeping the network logically separate from existing networks ensures security while enabling flexibility, experimentation, and innovation for collaborating parties.

The infrastructure will consist of network architecture enabling connectivity between specific locations and simplified connectivity, equipment for fast data exchange at connected locations, and a social component of the users, researchers and artists distributed across the network.

Having a permanent distributed network of sites enables researchers and the artistic research community to access both equipment and fellow collaborators at other locations. This reduces the

need and cost for travelling and enables research in a hybrid environment while keeping quality and real-time interaction intact. NorARTNet has a cross-sectoral relevance for museums, creative and entertainment industries, as well as the cultural sector, and we envision that the partnerships set out with this outline will expand as the network grows and increase collaboration between artistic research communities, strengthening the position of artistic and academic research within a European context.

Prosjektnummer: 347224

INFRASTRUKTUR-arbeidstittel: Illu - science and art hub

Vertsinstitusjon: Department of Earth Sciences, University of Bergen

Sammendrag:

By establishing “Illu – science and art hub” we wish to extend and enhance the engagement between the Norwegian and international research communities with the indigenous people, local communities, and organizations of Avannaata Kommunia, western Greenland. Illu will provide a base for research collaboration as well as a meeting place for scientists, artists, and the public.

The location of Illu is the village of Ilulissat, which is the location of the UNESCO world heritage site “Ilulissat Icefjord” and currently the hot spot for research into climate change in Greenland. In addition to the growing interest by scientists, this region of Greenland is also the fastest developing area for tourism and fisheries with its rich ecosystem and spectacular setting in Disko Bay with massive icebergs calving into the ocean at Sermeq Kujalleq (Jakobshavn Glacier).

Most international scientists in the Arctic fly-in and -out with their data and research results, without engaging with, or contributing to the local communities and without co-creating new knowledge. Breaking with this practice, Illu will engage with the people of Greenland, in close collaboration with local partners in Ilulissat, recognizing the great value of the in-depth knowledge of climate and the environment embodied by the local population, and together build a new understanding of the physical changes and societal impacts of Arctic climate change.

Prosjektnummer: 347225

INFRASTRUKTUR-arbeidstittel: National Laboratories for an Energy Efficient Industry-
EnergyLab 2030

Vertsinstitusjon: SINTEF Energi AS

Sammendrag:

EnergyLab 2030 is an extension of the previously granted HighEFF_{Lab}, whose purpose is to provide the advanced research facilities required to contribute to increase energy efficiency and electrification of the process industry and strengthening the role of industry as a flexibility provider in future renewable power markets. In line with HighEFF_{Lab}, the extension will be a joint national laboratory between the various departments at SINTEF and NTNU. The facilities will be located at the Varmeteknisk Laboratory (VATL) at NTNU Gløshaugen campus, Flerfasestrømning Laboratory and SINTEF Energy lab all located in Trondheim, ensuring close collaboration between students and

researchers coupled to the university and enabling the education of future experts in energy efficiency. Similarly, the research infrastructure (RI) will be easily accessible for all relevant industry including the partners in FME HighEFF and the forthcoming FME cEFF, covering renowned international research groups and beyond that the Norwegian industry sectors: metal and materials; oil, gas and energy; food and chemical, shipping as well as novel industries such as battery factories and data centres. In addition to building up RI's with focus on increased utilisation of industrial waste heat, digitalisation of the laboratories and data management for further value creation will be an important task.

EnergyLab 2030 includes 6 main RIs supported by the necessary upgrades in the local infrastructure and facilitation for digitalisation, and includes: RI1) Carnot Laboratory, RI2) Natural Refrigerants Laboratory, RI3) Expander & Ejector Test Laboratory, RI4) Heat Exchanger Laboratory, RI5) Computing /Process Simulation Laboratory, RI6) Calibration /Portable Laboratory and RI7) Local Infrastructure

Prosjektnummer: 347226

INFRASTRUKTUR-arbeidstittel: Biobank Norway 5 – a national data infrastructure

Vertsinstitusjon: NTNU

Sammendrag:

Biobank Norway 5 builds upon a well-established and mature national biobank research infrastructure that comprises of 12 partners (NTNU, UiO, UiB, UiT Norges arktiske universitet, Helse Sør-Øst, Helse Vest, Helse Midt, Helse Nord, OUS, Kreftregisteret, Folkehelseinstituttet and Direktoratet for e-helse).

The partners in Biobank Norway have established a wide range of biobank infrastructure activities since the initiation in 2010. Over the years, partners in Biobank Norway have been instrumental in large-scale digitization of bio-samples to biodata. Among them are the genotyping of DNA samples from more than 400 000 individual biobank donors. In Biobank Norway 4, we are bringing together a cross-disciplinary team of experts combining and harmonize these individual genotyped samples into a combined Norwegian data resource. A critical prerequisite is a unified solution for simultaneously access to phenotypic data from various registries, medical records, and population studies.

Utilization of the combined data assets from these sources is, however, currently challenging by unpredictable data delivery times from registries and hospitals, low visibility of potential data enrichment opportunities for the research communities, and complex analytical approaches in today's trusted research environments. Together, this limits the overall use of this highly exciting and high-potential Norwegian data resource in national and international research and industrial collaborations.

In Biobank Norway 5, we will specifically address these data-driven challenges utilizing our cross-disciplinary team of experts to develop and expand our infrastructure to **(1)** visualize available metadata on Norwegian biobank samples (NOR-REG); enhance activation of **(2)** national registry data and **(3)** secondary use of clinical data for reliable and low-latency biobank data enrichments; **(4)** establish biobank-tailored Trusted Research Environments (TRE) for researchers and industry

collaborators to trustworthy and efficiently utilize the full data resource (NOR-GEN); and **(5)** address current regulatory and ethical constraints in the complex and ever-changing landscape of large-scale biobanking and data acquisition.

The proposed innovations hold the potential to low-latency access to enrich data also in fields outside of biobanking, supported by our close and continuous collaboration with other national infrastructures.

Prosjektnummer: 347227

INFRASTRUKTUR-arbeidstittel: **Advanced Research Infrastructure for Hydrogen and Fuel Cell Technologies**

Vertsinstitusjon: **UIT the Arctic University of Norway**

Sammendrag:

This application is for the establishment of an Advanced Research Infrastructure for Hydrogen and Fuel Cell Technologies. Norway is investing heavily in high power maritime and long haul land transport fuel cells. There are no test stations in Norway that can test full stacks larger than 20kW. Currently, there are at least 3 different Norwegian players with full stacks of 80-150kW. There is HAV with a Powercell stack, Corvus with a Toyota stack, and TECO 2030 with a self-produced stack. There is a great lack of access to test stations that can test 80-150 kW in Europe and in the world. Such facilities do not exist in Norway. We expect that research needs will arise where it becomes necessary to analyse full stacks, which needs to be carried out by an independent research infrastructure involving academic and industrial actors in this sector. The research centre will focus on testing of large scale fuel cells, development of new materials and designs of fuel cell stacks and analysis of fuel cell stack degradation effects, especially with a maritime operational profile

Prosjektnummer: 347228

INFRASTRUKTUR-arbeidstittel: **SeaBee2 – Norwegian infrastructure for drone-based research, mapping, and monitoring in the coastal zone**

Vertsinstitusjon: **Norwegian Institute for Water Research (NIVA)**

Sammendrag:

The Norwegian and global coastal zones host a wide range of ecosystems that are essential to human well-being, supply food and resources, and contribute to climate regulations. To achieve sustainable economic and ecological development in the coastal zone, cost-effective solutions to study, map and monitor these regions are critical. Uncrewed Aerial Vehicles (UAVs), Uncrewed Surface Vehicles (USVs), and Remotely Operated Vehicles (ROVs), hereafter referred to as drones, have proven their abilities and advantages relative to traditional methods, to provide high quality data, products and answers. **This proposal seeks to expand and develop the current drone infrastructure, SeaBee. It aims to further advance and expand the applications and solutions using flying, surface, and underwater drones for research, monitoring and mapping of natural habitats, animal populations, and anthropogenic impacts in the coastal zone.** The current SeaBee Research Infrastructure (2020-2025) has created novel solutions and tools for coastal research and monitoring. Combined with

sophisticated sensor payloads, artificial intelligence (AI) for data analysis, and a cloud-based data handling and sharing solution, SeaBee is at the forefront of national and international infrastructures for coastal research and at the heart of providing data for sustainable coastal management. SeaBee2 will broaden the current infrastructure by expanding the operational range, enhancing sensor payload capabilities, advancing AI analysis solutions, extending automated data processing, and elevating online access and visualization of drone-data products. This way SeaBee2 will tackle a range of new questions related to coastal decision-making. Key users of the infrastructure are Norwegian universities, research institutions, governmental agencies, NGOs, industries, and sectors involved in coastal management and planning, ecosystem restoration, aquaculture, wind park developments, carbon accounting, and more.

Prosjektnummer: 347229

INFRASTRUKTUR-arbeidstittel: Agder coastal observatories for studies of marine ecosystems under multiple stressors

Vertsinstitusjon: University of Agder

Sammendrag:

Norwegian coastal and marine ecosystems are being continuously challenged by multiple stressors. Monitoring the coastal area using ocean observatories fitted with physical, chemical and biological sensors allow for a continuous retrieval of data related to the environment and the ongoing changes of the coastal ecosystems. The Agder region is expected to experience increased levels of activities due to the development of ocean wind farms in the southern part of the North Sea. In this project, we will identify challenges and opportunities resulting from increased use of the Agder coast and the North Sea. We will develop and establish an array of moored ocean observatories from inner and outer parts of Agder fjords, from the Skagerrak and the North Sea regions. The data obtained will be relevant for the management of Norwegian coastal ecosystems as they will contribute to an improved understanding of these systems and their resilience in response to multiple stressors such as climate-related changes and increased human use.

Prosjektnummer: 347230

INFRASTRUKTUR-arbeidstittel: National Infrastructure for Safety of Hydrogen (NISH)

Vertsinstitusjon: UIT

Sammendrag:

We identify that hazards and risks associated with land and marine vehicles/ vessels powered by hydrogen, as well as hazards associated with climatic conditions and technical design of hydrogen infrastructure, need further research and understanding and it would be ideal to study those hazards under the climatic conditions of the subarctic region. The proposed research infrastructure will be an integral and complementary part of the national hydrogen and fuel cell infrastructure. NHFC but with more focus on safety in hydrogen and fuel cell technologies. The major areas of safety to be investigated are based on current gaps in knowledge in which minor safety research is being implemented. Among others, the following areas of research will be investigated:

1. Hydrogen production, storage and utilisation

- Hazards associated with gaseous and liquid hydrogen production
- Liquefaction of hydrogen

2. Hydrogen for Marine and FCEVs

- Fuelling of ferries, fishing vessels and land vehicles
- Liquid hydrogen application
- Investigating the effect of different refuelling conditions on high pressure components
- Development of safe hydrogen refuelling design and protocols

3. Industrial applications

- Safety issues in Hydrogen direct reduction (H-DR) for fossil-free steelmaking, Reduction process at (LKAB). Assessment of associated risks and system safety analysis
- Performance analysis of hydrogen safety sensors – establishing rules and guidelines
- H2 embrittlement: Applicable to hydrogen transport in metallic pipes and cylinders
- Destructive and non-destructive testing of hydrogen tanks and high-pressure vessels; fire resistance and thermal protection of high-pressure gaseous storage.
- Performance testing of individual high pressure components

4. Academic and pedagogical research

- Analytical and numerical methods to improve hydrogen safety.
- Training of high responders, skilled workers and engineering students.

Prosjektnummer: **347232**

INFRASTRUKTUR-arbeidstittel: **ClinWIDI - Clinical Workflow Integrated Data Input Database - A Development and Proof of Concept Project**

Vertsinstitusjon: **Oslo University Hospital**

Sammendrag:

High-quality clinical data is essential in clinical trials as well as to patient safety and for quality control reasons. Current Electronic Patient Record (EPR) systems are mainly based on unstructured data in text documents without requirements for completeness in data input and without possibilities for trial inclusion and clinical decision support. During the patient pathway the same data is registered manually several times in different EPR documents, on whiteboards and in paper questionnaires before data is extracted manually for research and quality control. This extra workload leads to reluctance and eventually to incomplete and partly erroneous data in clinical trials, in quality control and even in treatment documentation. The quality of clinical trials depends largely on a high

inclusion rate and on data completeness. **The primary goal** of the ClinWIDI project is to facilitate investigator driven clinical research by integrating inclusion procedures and data input in the clinical workflow.

ClinWIDI will be developed as a cloud-based database which functions as an add-in to existing EPR systems. Standardized responsive electronic forms (eForms) accessible from any EPR system through Application Programming Interfaces (API) will allow workflow integrated data input by clinicians and the completion of electronic questionnaires (eSurvey) by patients. Standard text reports or structured data is returned for EPR documentation. ClinWIDI will store structured data for clinical use, for real time local quality control as well as for data transfer to national registries and research projects. Our aim is to design a user friendly and timesaving EPR tool sparing health care budgets. The system will be using open EHR archetypes for the different clinical items and templates for forms and form part modules. That will allow easy adaption of forms for other diagnoses and for ongoing trials. Further, forms and surveys will be available in different languages, opening for collaboration with other countries and for inclusion of minorities in clinical trials. The idea is to open for electronic consent for patient both to participation in clinical trials and in quality registries. The system will allow for large scale, low budget, registry based interventional trials open for both electronic clinical decision support and enable international collaborations independent of EPR solutions used at each hospital or country. The South-Eastern Norway Regional Health Authority (HSØ) is currently in the process of acquiring a new registry tool. The procurement process will be completed within the next 2-3 month and this project will be conducted together with the provider of the new registry tool (decision on provider pending). Other health regions have the intention to implement the same register tool as, which is why this project will enable nationwide collaboration. Further, ClinWIDI will enable large scale pragmatic intervention trials and registry based randomized controlled trials.