Skisser med relevans innenfor

Transport og Maritim

Tabell: Oversikt over skisser med relevans for området **Transport og Maritim**

Prosjekt-nummer	Prosjekttittel	Søkerinstitusjon	Prosjektleder	Estimert søkt beløp fra NFR
314856	Det digitale havrom / The Digital Ocean Space	NTNU (Runde Miljøsenter SINTEF Ålesund Statens Vegvesen Kystverket Ålesund Kunnskapspark)	Hans-Petter Hildre	59 000 000
316348	Quantifying User Behaviour In Techno-social Systems (QUBITS)	IFE	Sashidharan Komandur	
316431	Hydrogen Links Research Infrastructure	SINTEF ENERGI AS (NTNU)	Petter Nekså	48 400 000
316449	National Infrastructure for Multiphase Flows - 2020	IFE (SINTEF, UiO, NTNU)	Karin Hald	23 000 000
316451	The USN I-Merse Extended Reality Laboratory	USN	Rigmor C. Baraas	56 250 000
316462	Mobile Clean Laboratories for cruises and field works to study Biogeochemical processes of trace elements & microbiology in marine systems.	NTNU (NIVA, UiB, HI, SINTEF Ocean, NORCE)	Murat Van Ardelan	27 570 000
316465	Center for Characterisation of Ultrasonic Devices	USN (TBD)	Lars Hoff	17 000 000
316483	Online Road Safety Measure Research and Decision Support System	TØI (Statens Vegvesen)	Alena Høye	7 000 000
316491	GeoCloud Research	NGI (NTNU, NGU)	Kristoffer Skjolden Skau	20 000 000
316493	Norwegian Marine Data Centre - Interoperable Infrastructure	HI (NERSC, NP, NIVA, MET, NORCE)	Helge Sagen	46 000 000
316499	COASTWATCH - the Norwegian coastal observing system of systems	HI (MET, UiB, NORCE, NIVA, APN, NERSC, NVE, RMS, UiO, NINA)	Frode Bendiksen Vikebø	115 000 000
316513	Coastal and Offshore Geotechnical Structures Testing Centre (COGSTEC)	NGI (NTNU)	Kristoffer Skjolden Skau	40 000 000
316515	National Test Centre for Large Industrial Sprays	USN	Joachim Lundberg	5 000 000
316518	Offshore Boundary Layer Observatory (OBLO) – Phase II	UiB (METCENTRE, MET, NORCE, NTNU, UiS)	Joachim Reuder	82 100 000
316519	WestLab - A Living Lab/Simulation ecosystem for autonomous maritime safety	HVL	Margareta Lützhöft	41 000 000
316523	ForskAir - Airborne infrastructure	ANDØYA SPACE CENTER AS (UiB, UiO, NMBU, UiT, MET)	Stine-Marie Andreassen	75 000 000

316526	Smart Mobility	**NTNU** (NORD Unviersitet, SINTEF, Trøndelag County council, Stjørdal municipality)	Frank Lindseth	50 000 000
316528	NAMO: Norwegian Arctic Multi-disciplinary Ocean Observing System	**NERSC** (NPI, HI, UiB, FFI)	Hanne Sagen	90 000 000
316538	Norwegian Marine Robotics Facility II: Autonomous Underwater Vehicle (AUV)	**UiB** (FFI)	Rolf-Birger Pedersen	73 000 000
316540	Norwegian technology platform for industrial macroalgae cultivation and utilization (MACROTECH)	**SINTEF OCEAN AS** (NTNU, SINTEF Industri)	Aleksander Handå	170 000 000
316549	Norweigan Telemetry Network	**NORCE** (NTNU, NMBU, NINA, UiB)	Robert Lennox	133 400 000
316552	Fiber & Steel ropes testing	**NORCE** (UiA, MIL)	Ellen Marie Nordgård-Hansen	35 000 000
316554	Marine fish detection, fish behaviour observations and seabed Investigations package 2021-2025	**UiT** (HI, NPI, SINTEF Ocean, Fiskeridirektoratet)	Roger B. Larsen	16 250 000
316560	Endring og oppgradering av SINTEF Oceans mobile anlegg for prosessering av marine råstoffer.	**SINTEF OCEAN AS**	Bendik Toldnes	9 181 500
316571	Geosystem 3D Seismic Imaging (G3) Upgrade	**UiT** (UiB, NGU, P-Cable 3D Seismic AS, VBPR AS, Geomar, NOC, BGS, Ifremer, ECORD, IODP)	Stefan Bünz	13 000 000
316572	Hydrogen Safety Laboratory	**UiB** (USN, UiS)	Trygve Skjold	27 263 000
316576	Floating solar energy test centre	**SINTEF OCEAN AS** (NTNU, IFE)	Øyvind Hellan	85 000 000
316589	SIOS Infrastructure Development for Earth System Science	**SIOS SVALBARD AS** (NERSC, NIVA, MET, NPI, NORCE, UiT, UNIS, UiO)	Heikki Lihavainen	155 958 778
316600	Mandatory draft for infrastrucutre application Center for Land-based Aquaculture, CLA	**NORD UNIVERSITET** (LetSea, SINTEF Ocean and NCE Aquaculture)	Mette Sørensen	32 500 000
316607	Infrastructure for a sustainable ocean economy and conservation of the ocean genome	**NORCE** (UiS, UiB, HI, UiA, SINTEF Ocean, NIVA, DNV GL, RevOcean, MBARI, IFREMER, DTU Aqua, Bremnes Seashore, Skretting AS)	Thierry Baussant	17 188 660
316612	PreMechatronics Lab	**UiA**	Kjell G. Robbersmyr	38 300 000

Project number: 314856
Title: Det digitale havrom / The Digital Ocean Space
Applicant (partners): NTNU (Runde Miljøsenter SINTEF Ålesund Statens Vegvesen Kystverket Ålesund Kunnskapspark)
Project Manager: Hans-Petter Hildre

Short summary:
Det Digital Ocean Space is an arena for the full-scale testing, design and innovation within: ● maritime technologies and operations; ● navigation and ship traffic control technology and methods; ● the impact of the ocean on infrastructure along the coast; ● technology for harvesting and cultivation of bio resources; ● environmental ocean observation technology and methods.

The goal for The Digital Ocean Space is to link development of numerical models and simulations with full scale testing in the ocean.

The Digital Ocean Space (DOS) will be an important infrastructure stimulating innovation and entrepreneurship. The innovation and research potential supported by this infrastructure address the innovation and development of ocean-based industries. The location for the areas provides an integrated, full-scale opportunity for interdisciplinary research, education and development. It will consist of a wellplanned grid of installations, monitoring positions, measurements units and mobile sensor platforms that constitute a dynamic infrastructure for the qualification of technology related to maritime and marine activities. infrastructure constitute a holistic research infrastructure framework. Close collaboration with existing ocean and coastal facilities and actors with a complementary infrastructure and research focus will make an important asset to the national and European capacity pool.

The aim of the infrastructure is to strengthen the leading position of advanced Norwegian design and technology as well as to lead in the development of new technologies such as autonomy. This is an important contribution in the conversion from an oil-based maritime industry into new ocean industries. The infrastructure will also contribute to digitization and a more research-based industry in a maritime cluster, which today is largely based on experience rather than theoretical knowledge. This will contribute to bridge the gap between business and academia. Validation of theoretical models and real data feedback will lead to new knowledge and support industrial innovation including design, operation, and service.

We want to instrument a unique marine area between Runde and Godøya and into Storfjorden including the World Heritage site Geirangerfjord. The area is in many ways a diverse miniature of the enormous ocean space Norway has control over, including exposed and more sheltered areas. The area is approved for testing of autonomous ships, as an arena for testing of energy from waves and currents, as an area for testing of fishery equipment at the seabed and has, as the only place in Norway, seabed maps with an accuracy of 1 × 1 metre.

The area is thus ideal test arena and innovation for technology in the ocean space, see Figure 1. It is home to fisheries and to important spawning areas for herring, haddock and cod. The area is a focal point for shipping traffic, including the approach of large cruise ships to the fjords. The Norwegian Coastal Administration (Kystverket) is developing full radar coverage for monitoring the area.

The maritime cluster in Møre in the northern corner of western Norway is recognized as one of the world's most complete maritime business clusters and a competitive hub in marine technology and

operations. The cluster consists of advanced shipyards, shipping companies, design enterprises, equipment suppliers, and research and educational institutions.

Project number: 316348
Title: Quantifying User Behaviour In Techno-social Systems (QUBITS)
Applicant (partners): IFE
Project Manager: Sashidharan Komandur

Short summary:
a) Detailed design of control room for the boat There are three primary players involved in the assessment of this design; travelers, other boats (manned) and the remote onshore operator. The interface will primarily be about the interaction between these players.

b) Detailed design of the autonomous bus control room There are three primary actors involved in the assessment of this design; travelers, other cars (manned) and the bus operator.

c) Investigate the possibility of a common control room. The main aspect to be considered is the coordination between the external operators (should there be a team of remote operators)

d) Detailed design of the autonomous bus Cognitive and physical ergonomics of the passengers will be an important consideration

e) Detailed design of boat and main deck (except hull design and maritime architecture) Cognitive and physical ergonomics of passengers will be an important consideration

f) Investigate transitional scenarios (unmanned to manned) for the boat and conditions that require it. Operational necessities and maritime regulations can both determine transition scenarios

g) Examine transition scenarios (unmanned to manned) for the bus and conditions that require it. Operational necessities and the Road Traffic Act can both determine transition scenarios

h) Investigate requirements for situational understanding of the human operators involved in the operation of the autonomous boat It is essential that the human operators involved know enough (quantity and quality of information and time when information is available) about the maritime operation and at the same time the amount of information is not too high i) Investigate the requirements for situational understanding of the human operators involved in the operation of the autonomous bus It is essential that the human operators involved know enough (quantity and quality of information and time for when information is available) about the maritime operation while not increasing the amount of information

Project number: 316431
Title: Hydrogen Links Research Infrastructure
Applicant (partners): SINTEF ENERGI AS (NTNU)
Project Manager: Petter Nekså

Short summary:
The Hydrogen Linksresearch infrastructure (RI) will enable research on topics that are necessary for efficient use of hydrogen as an energy carrier, and thereby accelerate the transition towards a low carbon society. The elements of the research infrastructure will cover gaps in the national and international R&D environment, especially related to storage, transport and use of liquefied

hydrogen (LH2); as well as large-scale end-use of hydrogen for power generation in gas turbines. The knowledge Hydrogen Links will bring forward is essential for utilisation of hydrogen, especially in energy intensive areas, such as utilising hydrogen as fuel for the maritime sector and in order to decarbonise offshore power production. Hydrogen Linkswill contribute to maintaining value creation in important sectors for Norway as well as supporting value creation through new product developments and industries supplying national and global markets.

Project number: 316449
Title: National Infrastructure for Multiphase Flows - 2020
Applicant (partners): IFE (SINTEF, UiO, NTNU)
Project Manager: Karin Hald

Short summary:
Currently, IFE, SINTEF, NTNU and UiO have ten different laboratories for research in multiphase flow. The laboratories perform experiments for both industrial and academic partners and are among the best in the world in their focus areas, with a capacity for multiple different measurement methods.

To ensure that the laboratories can continue to deliver up-to-date experimental data to national and international research environments, the partners will apply together for infrastructure funding for upgrade, maintenance, operation and expansion of existing process equipment and instrumentation.

The application will also include funding to establish an extensive searchable database for large amounts of multiphase data which have been collected over decades. Such a database will be an important tool for improving simulator tools and models and will have great commercial value. It may also contribute to increased understanding of central challenges in fluid mechanics.

Project number: 316451
Title: The USN I-Merse Extended Reality Laboratory
Applicant (partners): USN
Project Manager: Rigmor C. Baraas

Short summary:
The I-MERSE Extended Reality (XR) Lab aims to be a leading national and international research infrastructure providing virtual reality, mixed reality, and augmented reality platform for research and innovation. It will be an enabling technology lab, in line with visions stated in the Long-term Plan for Research and Higher Education of technologies that may be applied broadly across various sectors and industries, which in the process address major societal challenges and strengthen Norwegian industries. Currently, Norway has limited capacity for XR as an enabling technology. Existing labs are limited to virtual reality capabilities with some mixed reality equipment. The most common equipment are headgears with limited or no simulators and other XR facilities and environments. This is a crucial weakness since, according to the Norwegian Roadmap for Research Infrastructure, Norway is in an “international technology race” and that this race cannot be won without a robust national infrastructure to support the necessary enabling technology, which, in this case, is XR technology.

The I-MERSE XR Lab intends to be this national infrastructure by being the first high-capacity XR Lab in Norway that can address a wide range of complex XR applications, allowing it to be a test bed for external academic and industry partners in private and public sectors. The lab will contain what

existing labs lack, i.e., high capacity facilities for XR simulation and environments. With versatility of facilities, the I-MERSE XR Lab is able to support research, development and innovation addressing physical, physiological, psychological and sociological health-related challenges, transforming learning experience as well as learning outcomes in training and re-training of professionals, advancing the development of human-centred design solutions in business, government, education and society at large.

The interdisciplinary research centre, USN I-Merse, will be the core team responsible for the I-MERSE XR Lab, with expertise in XR research to develop a scientific community of outstanding quality within the fields of vision science, maritime safety and operations, pedagogy and education, marketing and ethics.

Project number: 316462
Title: Mobile Clean Laboratories for cruises and field works to study Biogeochemical processes of trace elements & microbiology in marine systems
Applicant (partners): NTNU (NIVA, UiB, HI, SINTEF Ocean, NORCE)
Project Manager: Murat Van Ardelan

Short summary:
Why do we need TraceClean mobile Labs: Biogeochemical cycles of trace elements and their isotopes in marine systems and their roles in marine ecology and molecular mechanisms are growing sub-discipline in marine science as well as climate-related processes. Even though various Norwegian research institutes conduct research on the biogeochemistry of trace elements in marine systems, we are still behind the developments in this field. With a focus on field infrastructure, Especially regarding field infrastructures, Norwegian research communities studying trace elements still do not have access to these essential infrastructures. "Better than Patterson's.";

Concentration of bio-essential and toxic trace elements in seawater are extremely low. In order to determine bio-essential and toxic trace elements in seawater, atmosphere, and sediments as precise and accurate as possible, “clean techniques” are essential. Clair C. Patterson pioneered the concept of "trace element clean" laboratories for environmental analyses at the California Institute of Technology. He recognized that measurements of environmental lead concentrations were often erroneously high because of the inadvertent introduction of contaminant lead to the samples (Patterson and Settle, 1976). Currently, we have clean lab facilities in our labs; however, during the cruise and fieldwork every time, we have to build a "clean bobble" to keep the working environment trace clean. Building "clean bobble" is an extremely time and energy-consuming process and also has a high risk of contamination. The clean technique includes all the steps from sampling to analysis. Thus, sampling and immediate manipulation of samples from sea, atmosphere, and sediment should be done in trace element clean laboratories during research cruises and field work. Here we proposed to establish a trace element mobile laboratory research infrastructure to facilitate trace element sampling and experimentation. The establishment phase of the project will fabricate three lab containers that will be built using standard 20 foot shipping containers (20 ft (6.06 m) long, 8 ft (2.44 m) wide, and 8 ft 6in (2.6 m tall) that are flexible with regards to both mobility by lorries and attachment to research vessel decks and land-based laboratory loading docks. The interior will be outfitted with non-metallic trace element clean materials and positive-pressure HEPA-filtered source air, as well as HEPA laminar flow work benches (ISO 4 and 5, i.e., <= 104 and 105 particles 0.1 µm in diameter m-3).

Project number: 316465
Title: Center for Characterisation of Ultrasonic Devices
Applicant (partners): USN (TBD)
Project Manager: Lars Hoff

Short summary:
The aim of this infrastructure is to strengthen Norway's position within research and development of advanced piezoelectric and ultrasonic devices. Norway has world-leading research groups within physical acoustics and ultrasound technology, supporting a high-tech industry making products based on this technology. The infrastructure we apply for is associated with the NFR appointed SFI Centre for Innovative Ultrasound Solutions (CIUS) and it is complementary to and will benefit from the infrastructure project Norwegian Infrastructure for Micro- and Nanofabrication (NorFab). The need for this infrastructure is acknowledged in the latest version of Norsk veikart for forskningsinfrastruktur (published 28 April 2020), where ultrasound technology and piezoelectric materials are identified as areas for new investments. The new infrastructure will give access to reliable and accurate electro-acoustic data for materials used in ultrasonic devices by establishing documented and well-maintained measurement systems and procedures. Such data are essential when developing and optimizing novel devices. The infrastructure also provides characterisation methods for research into novel materials and material structures, such as composite structures, acoustic meta-materials, and lead-free piezoceramics. Such materials will be central in developing next-generation ultrasound devices. The use of this infrastructure is not limited to ultrasound transducer development, as it will be of use in research into other types of piezoelectric sensor and actuators devices and in research on RF filters based on ultrasonic waves, e.g. SAW and FBAR.

The infrastructure will improve research quality by providing accurate and reliable data for design and optimisation of novel ultrasonic devices. It will free up time for researchers allowing them to concentrate on the core of their research, and it will allow companies to design and fabricate more optimal devices in shorter time, reducing costly trial-and-error iterations. Access to such methods will make us an even more attractive partner in international research programs.

A variety of ultrasound measurement equipment has been built in Norwegian research institutions over the years. These were often developed ad-hoc for a specific task and are poorly documented and maintained. In the time leading up to submitting the final application, we seek to identify existing equipment at other institutions. We invite other research groups with similar needs and interests to take contact so we can coordinate our efforts.

Project number: 316483
Title: Online Road Safety Measure Research and Decision Support System
Applicant (partners): TØI (Statens Vegvesen)
Project Manager: Alena Høye

Short summary:
In the proposed project we will develop an "Online Road Safety Measure Research and Decision Support System". This is a tool for conducting systematic reviews and meta-analysis of road safety studies and for publishing the results. It will build on the current Norwegian online version of the Handbook of Road Safety Measures which contains results from systematic reviews and metaanalyses of over 150 road safety measures and has been supported by the Norwegian Public

Roads Administration and the Ministry of Transport. The developed system will allow efficient continuous updating of the Handbook, improve the transparency and accessibility of the results, both nationally and internationally, and it will facilitate their application for practical and research purposes.

The system will consist of three parts: A database, an analysis tool, and a publication tool. These will be developed in close cooperation with the Norwegian Public Roads Administration to ensure the practical applicability and usefulness in decision processes.

Project number: 316491
Title: GeoCloud Research
Applicant (partners): NGI (NTNU, NGU)
Project Manager: Kristoffer Skjolden Skau

Short summary:
The field of Geotechnical engineering is fundamentally based on empirical data from field investigations and lab testing. Even though NGI, NTNU, NGU and other institutions 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 NTNU and 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.

Project number: 316493
Title: Norwegian Marine Data Centre - Interoperable Infrastructure
Applicant (partners): HI (NERSC, NP, NIVA, MET, NORCE)
Project Manager: Helge Sagen

Short summary:
“Seamless access to marine data” is the vision of the national research infrastructure Norwegian Marine Data Centre (NMDC) established in 2011. Marine research is by nature multi-disciplinary, combining physical, geological, chemical, and biological knowledge and data. High quality and efficient marine research require easy and rapid access to marine data across institutions and disciplines. Since the inception of NMDC, the volume, velocity and veracity of data captured by new

sensors and observing networks have grown exponentially. In the same period, a need has emerged to support reproduceable science and provide a strong foundation for decision-making in public and private sector. To meet the new demands, NMDC will extend its capacity to operationalise the flow of measurements from the ever-increasing number and variety of instruments to quality-controlled datasets, following best practices for marine data and the widely accepted FAIR principles for data management.

Through the proposed extension, the NMDC infrastructure aims to give seamless access to marine data by delivering 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 providers with that of data managers. Documenting and storing marine data in a sustained infrastructure will contribute to uncovering information hidden in previously inaccessible historical datasets, allowing scientists, marine operators and decision-makers to analyse long time series of important ocean variables. NMDC will continue to mobilize data that was previously unavailable, in close collaboration with marine data providers to make their valuable datasets publicly available in a form that allows reuse in science, business and society. To increase the use and uptake of NMDC, an open call mechanism will be established where external parties can bid for funds to develop an application utilising NMDC datasets and services. These applications, which can also utilise data from other data infrastructures such as EOSC and SeaDataNet, will showcase how the marine community can benefit from a FAIR compliant national data infrastructure for marine data.

Project number: 316499
Title: COASTWATCH - the Norwegian coastal observing system of systems
Applicant (partners): HI (MET, UiB, NORCE, NIVA, APN, NERSC, NVE, RMS, UiO, NINA)
Project Manager: Frode Bendiksen Vikebø

Short summary:
Research and development associated with environmental monitoring, climate change, marine pollution, blue growth and ecosystem management greatly benefit from accurate descriptions of the physical, chemical and biological state of the ocean. The strongest currents and overall highest variability are found on the continental shelf and along the shelf break, while the complex geometry of the coastline leads to the creation of smallscale circulation features important for nearshore spreading and dispersion. Hence, the coastal regions and the shelf seas are particularly challenging to resolve in numerical models and observe in a representative way. However, increasing levels of activities at the interface between fjords and the coastal sea place a clear demand on the accuracy in predictions of e.g. marine ecosystem connectivity and pollutant exchange. Establishing a consistent research infrastructure enabling a coherent approach through combined coastal observations and ocean modelling is therefore imperative to secure a sustainable pursuit of the goals of the Norwegian government and international obligations, such as the UN Sustainability Development Goals (SDGs).

As a consequence, we propose an integrated coastal observing system COASTWATCH at key sites along the Norwegian coast as a much-needed infrastructure supporting research and knowledge-based management as well as Norway's contribution in the European integrated and multidisciplinary coastal observing system – JERICO (currently applying to enter the ESFRI roadmap).

In order to adequately address the complex coupled processes inherent of coastal regions and delivering essential ocean variables, our infrastructure will implement a multiplatform-multi-sensor approach integrating observations from fixed platforms, HF radar systems, coastal gliders, ships of opportunity, surface AUVs and a framework for testing and utilizing other observation sources such as satellite-based remote sensing, connected into into Supersites of high societal relevance. This will provide Norwegian and international researchers and managers a permanent source of near real-time information of physical, biogeochemical and biological state of coastal and shelf regions, supporting an ecosystem approach for analytical studies of stressors and impacts. Furthermore, the infrastructure will represent a hub for easy integration of all observation sources in the area (e.g. salmon farms, national monitoring programs) and a model-based extrapolation beyond the key sites to the entire coast through data assimilation and data-driven machine-learning. We will stimulate technology development to better observe the biogeochemical processes and facilitate cross-disciplinary research on coastal processes and assessment of the combined climate change and human impacts.

Project number: 316513
Title: Coastal and Offshore Geotechnical Structures Testing Centre (COGSTEC)
Applicant (partners): NGI (NTNU)
Project Manager: Kristoffer Skjolden Skau

Short summary:
Future research and technology development in Norway and in Europe will have a strong focus on safely utilizing ocean and coastal space. Oceans and coasts will be an arena to produce food, harvest energy, support transport infrastructure, and to address housing and other industry needs.

Sustainable development and the green shift require different structure types, which must be safe for people and the environment, and economically viable. To achieve this requires a transformation of the seabed engineering technology that underpins this infrastructure. The proposed Coastal and Offshore Geotechnical Structures Testing Centre (COGSTEC, Figure 1) will unlock the necessary innovation, through new insights, technology development and rapid prototyping. COGSTEC will allow researchers and designers to simulate and verify whole life soil, ice and infrastructure behaviour, and inspire innovation.

COGSTEC is timely, since engineering testing is being transformed by new advances in sensing, control, imaging and robotics, as well as hybrid physical-numerical simulations. COGSTEC will form a national platform that will harness these technologies, across facilities from the scale of a soil and ice element in the laboratory to a large-scale structure in the field. This will achieve a major advancement in the accuracy and realism of physical testing in civil and offshore engineering.

COGSTEC complements the Ocean Space Centre and in combination they will provide a complete infrastructure for determination of loads, structural response and soil reactions. COGSTEC will be available for use by the industry and academia, accelerating industry-driven innovation and research (and complements EnergiX and MAROFF) and will boost the collaboration across Norwegian academia and industry.

Project number: 316515
Title: National Test Centre for Large Industrial Sprays
Applicant (partners): USN
Project Manager: Joachim Lundberg

Short summary:
Numerous of industrial processes involve sprays. One of the most common types of spray is the water sprinkler spray used to extinguish fires. Even though this sprays have been used for several decades, the working principles are not fully explained. This is due to the complexity of the spray phenomena. Some parameters are determined routinely, including shape of the spray and total mass but detailed droplet size- and velocity distribution demand scientific equipment with aligned optical arrangements. Droplet size affects extinguishing/spray properties, make this a crucial element. Other usage areas include spray (diesel) combustion, pressure washing, dust removal (washing towers), spray drying and artificial snow. Especially, in the case of industrial sprays factors such as dust, high humidity or high temperatures create challenging environments for measurement setup. Instead of measuring in-situ the measurements can be replicated in a lab. Currently there is no permanent and established research infrastructure that is able to recreate and analyse the complex behaviour of the industrial sprays. Until now, test rigs involving advanced optical equipment combined with lasers for illumination have been reconfigured for each test requiring weeks of reworking to reach perfect alignment.

Driving factors behind the National Test Centre for Large Industrial Sprays include both challenges faced by industry and advancement in basic research, for example, in the areas of spray behaviour, complex model development, quantitative risk assessments and validation of numerical simulations. Innovation in technology often base the design on numerical predictions like computational fluid dynamics (CFD). To predict spray behaviour without proper measurements can affect the accuracy of the output. The Test Centre is designed to give physically correct description of the flow behaviour of spray phenomena, which can be used for input to numerical simulations.

The process safety and combustion research group in the University of South-Eastern Norway have developed experience and carry out spray research in a controlled environment. The group aims through the National Test Centre for Large Industrial Sprays, to create a national research infrastructure, building on a preliminary design developed for projects with Equinor ASA, Wärtilä Moss AS and MSG Production AS. The expanded design and capabilities will enable various spray and liquid types (including combustible fluids) to be handle and investigated opening up research and innovation, for example, in the oil and gas, land based industry and maritime sector (e.g. LNG shipment).

Project number: 316518
Title: Offshore Boundary Layer Observatory (OBLO) – Phase II
Applicant (partners): UiB (METCENTRE, MET, NORCE, NTNU, UiS)
Project Manager: Joachim Reuder

Short summary:
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 layer (down to ca. 100 m for floating support structures of the Spar type) are of uttermost importance for the design, construction and 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 an upgrade and 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, a met-ocean buoy for a flexible and fast deployment of the instrumentation offshore on demand, meteorological masts at the coast for in-situ measurements of the approaching offshore wind field, and a world-wide unique wind-tunnel facility. 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.

Project number: 316519
Title: WestLab - A Living Lab/Simulation ecosystem for autonomous maritime safety
Applicant (partners): HVL
Project Manager: Margareta Lützhöft

Short summary:
Suggested to be distributed across Norway, and to be managed from Haugesund, WestLab is a primarily digital infrastructure enabling whole-ship and whole-fleet assessment in-context. It will utilize digital models, or digitally interfaced mechanical models, of key ship systems in combination with full-mission simulators and virtual shore control facilities, to enable the design, testing and validation of novel, increasingly autonomous maritime systems and transport operations. WestLab is aimed at providing a benefit to the entire Norwegian maritime cluster, and to be a proving ground for advances in technology, operations and socio-technical integration.

Project number: 316523
Title: ForskAir - Airborne infrastructure
Applicant (partners): ANDØYA SPACE CENTER AS (UiB, UiO, NMBU, UiT, MET)
Project Manager: Stine-Marie Andreassen

Short summary:
The “ForskAir” consortium, applies to establish an airborne research infrastructure, which comprises different manned and unmanned platforms. The type of airborne platforms and instruments are determined by user requirements. The platforms provide research, monitoring and testing:

- from the air, e.g. terrestrial features seen from the air on ground, or towards space

- of the air using in-situ or remote sensing technologies e.g. for trace gases and pollutants, dynamics and exchange processes

- in the air, using airborne platforms to test, qualify and certify industrial products, which require the ambient conditions of an airborne platform

The ForskAir proposal aims to provide an infrastructure, which incorporates a set of advanced services to Nordic universities, agencies and industrial clients. ForskAir is expected to generate unique opportunities for Nordic institutions and aims to stimulate in particular Arctic research, atmosphere and climate research, the use of airborne platforms within various kinds of field research as well as a better understanding of human factors in the cockpit. ForskAir will encourage multidisciplinary approaches and new solutions for the preparedness sector. On a European scale, airborne research infrastructures are already existing in e.g. Great Britain, France, Germany and Romania. These infrastructures use large aircrafts, suited for comprehensive campaigns with several institutions. Norwegian and Nordic research groups request a versatile infrastructure, applicable for a broad spectrum of science fields, for more individual flight planning and the Arctic expertise.

Project number: 316526
Title: Smart Mobility
Applicant (partners): NTNU (NORD Unviersitet, SINTEF, Trøndelag County council, Stjørdal municipality)
Project Manager: Frank Lindseth

Short summary:
The infrastructure Smart Mobility aims to become an innovative and forward-looking testing arena and research centre for regional, national and international players in the future car and transport system. The key focus areas and associated infrastructure will be concerned with R&D in modern vehicle technology using alternative fuel (such as electricity), intelligent transport systems (ITS), traffic safety, new charging technologies (such as inductive charging), automated driving processes and fully autonomous driving (self-driving). The infrastructure aims to become the world's first test laboratory that can offer "four seasons" testing opportunities on the same day. The infrastructure will contribute in achieving goals within transport safety, increased efficiency and sustainability, and big data analysis.

Project number: 316528
Title: "NAMO: Norwegian Arctic Multi-disciplinary Ocean Observing System"
Applicant (partners): NERSC (NPI, HI, UiB, FFI)
Project Manager: Hanne Sagen

Short summary:
The overarching aim of NAMO is to improve and fill gaps in the Arctic Ocean observation system, and 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. NAMO will implement and operate a multidisciplinary network of bottom anchored moorings in the western Eurasian Basin. The network of moorings will integrate sea ice and ocean point measurements (physical and biogeochemical) with a multipurpose acoustic network for basin wide underwater geo-positioning, acoustic tomography and passive acoustics. The NAMO system will be

part of a coordinated Pan-Arctic acoustic network in collaboration with US partners and complement existing ocean mooring systems in the Arctic. The acoustic network includes passive acoustics to monitor vocalizing marine life, acoustic impact of human activities, and geophysical hazards (e.g. earthquakes, landslides, tsunamis). In addition to the fixed moorings, NAMO will include icetethered platforms (Drifting Ice-Based Observatories) 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. Furthermore, NAMO will provide competence building in ocean engineering with focus on Arctic observing and geopositioning technologies, including sensors, platforms, logistics and data management. NAMO data will be made available through the Norwegian Marine Data Centre (NMDC) and Norwegian Polar Data Centre infrastructure.

Project number: 316538
Title: Norwegian Marine Robotics Facility II: Autonomous Underwater Vehicle (AUV)
Applicant (partners): UiB (FFI)
Project Manager: Rolf-Birger Pedersen

Short summary:
Cutting-edge, international marine research relies on the access to a multitude of high-technology equipment that includes remotely operated vehicles (ROVs), and autonomous underwater vehicles (AUVs). Funding for a ROV was granted in 2013 and it is now timely to develop an AUV that is specifically dedicated for marine research and to challenges in marine management. The AUV will be fitted for operations over a range of ocean and coastal vessels - including the new polar research vessel. The infrastructure project is aiming to develop an AUV capable of imaging the seabed in unprecedented resolution, and detecting a wide-range of oceanographic parameters, beyond the present state-of the-art. The AUV will also be capable of diving to 6000 m depth, and it will have a range of close to 600 km. This opens new opportunities for marine research and management, and it will be an important step towards ship-independent marine monitoring. The AUV will be scalable and modular and capable of carrying a unique set of acoustic, optical, physical and geochemical sensor packages. We anticipate that the infrastructure will contribute significantly to national and international R&D framework, by delivering unique data for the following basic and applied marine research areas: 1) deep-sea geodynamics and hydrothermal activity, 2) marine mineral resources; 3) under ice and polar research, 4) marine geohazards, 5) ocean circulation, ocean mixing processes, air-sea interaction and ecosystem dynamics; 6) seabed fluid flow and future climate; 7) CO2 capture and storage; 8) pelagic ecosystems and their resources, and 9) benthic ecosystems and environmental change. By linking excellent R&D groups across institutional, disciplinary and sector boundaries, we expect that the project will lead to new synergies and to marine technology development.

Project number: 316540
Title: Norwegian technology platform for industrial macroalgae cultivation and utilization (MACROTECH)
Applicant (partners): SINTEF OCEAN AS (NTNU, SINTEF Industri)
Project Manager: Aleksander Handå

Short summary:
Cultivation of the oceans is required to meet demands for food, feed, materials, and energy for a growing global population. Norway, with one of the world's longest tempered and productive coastlines, can take a leading role. The Norwegian technology platform for industrial macroalgae cultivation and utilization (MACROTECH) will provide research groups and industry with 6 nodes to facilitate testing and development of enabling technologies in order to scale up the macroalgae value chain: 1) Land farms, 2) Sea farms, 3) Simulation and surveillance, 4) Vessels and logistics, 5) Preprocessing and storage and 6) Processing and products. With 10 years of RCN-funded research accomplished, Norway has created an interdisciplinary knowledge basis on macroalgae cultivation biology and technology, processing, and product development, to make significant steps towards industrial cultivation. The annual global production of macroalgae has exceeded 30 million tons and is mainly based on manual labor. The results of the RCN-funded knowledge platform MACROSEA (SINTEF-lead, www.macrosea.no) indicate that Norway has the potential to produce 70-220 tons of macroalgae per hectare. Mid-Norway alone has the possibility to cultivate in the order of 20 million tons (fresh weight), which in turn results in 2 million tons of dried raw materials. Large food and feed companies are ready to invest in macroalgae-based products, but neither product formulas nor the biomass supply chain exists at industrial scale. The RCN-funded knowledge platform Norwegian Seaweed Biorefinery Platform (NTNU-lead, www.seaweedplatform.no) will advance research on processing and product development to unlock this potential. MACROTECH will provide research infrastructure to enable the development of new and standardized technologies for upscaling and cost reduction along the macroalgae value chain. Integrating new macroalgae knowledge centres such as MACROTECH with research environments and industry will promote world-leading innovation clusters, advance research and accelerate industrial growth. Industrial scale production of macroalgae may be a major contributor to innovative and climate-friendly solutions, a green transition, and the movement towards a low-emissions society to fulfill the Paris Agreement. Investment in a research infrastructure is a prerequisite for success.

Project number: 316549
Title: Norweigan Telemetry Network
Applicant (partners): NORCE (NTNU, NMBU, NINA, UiB)
Project Manager: Robert Lennox

Short summary:
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. A Norwegian Telemetry Network would be an array of fixed infrastructure available to aquatic researchers in Norway to investigate the patterns and drivers of animal movement. This proposal details an ambitious plan to combine the capacity of some of the country's most active and experienced telemetry users to establish an infrastructure project that will have long-term benefits to industry, policy, science, and society in Norway.

Project number: 316552
Title: Fiber & Steel ropes testing
Applicant (partners): NORCE (UiA, MIL)
Project Manager: Ellen Marie Nordgård-Hansen

Short summary:
Currently, there is a trend for replacing traditional steel wire ropes with light-weight fiber ropes in several industries important for Norway, such as offshore oil and gas (lifting and mooring), deep sea mining (hoisting), and offshore wind power (mooring). NORCE and UiA have over the last years focused strongly on industrial research for condition monitoring and condition based maintenance. To establish reliable discard criteria and make good predictions about incipient failures and remaining useful life, measurements are combined with verifiable mathematical models for fault development. For modern materials like synthetic fiber ropes, a large knowledge gap exists, compared to the decades of test results and verified theories available for metal fatigue. The present proposal will focus on closing this gap using a systematic approach for the load cycle testing, combined with modern sensor technology and analytical methods. Establishing science-based discard criteria will benefit both the manufacturers and the end users, improving new designs and saving money while still operating within safe operational limits.

We therefore propose to extend the existing rope testing infrastructure in Agder with the world's most advanced kind of rope test fatigue machine. Most rope testing facilities, in Norway as well as abroad, perform fatigue testing until destruction, and may thereafter perform a repetition of the experiment using a reduced number of cycles and then inspect the rope visually or break the rope in a tension test. This is a slow and uncertain method, since the test must be repeated, each time performed with a different specimen.

Our idea is to establish an integrated rope testing assembly comprising: 1) a large machine for fatigue bending tests, where the rope goes over five sheaves in succession. 2) the machine will be instrumented with a range of technologies to collect different information during the test process related to load cycles, tension, elongation, temperature, and thermal & RGB images. 3) the assembly will be complimented with a High Processing unit for: a) deploying real-time data management tools (i.e. storage, access, categorization) and, b) hosting real-time analytics tools (e.g. analysis models

based on physical properties, multivariate analysis of the visual and thermal images1,, computer vision for condition monitoring2, AI models for life-time prediction3).

Project number: 316554
Title: Marine fish detection, fish behaviour observations and seabed Investigations package 2021-2025
Applicant (partners): UiT (HI, NPI, SINTEF Ocean, Fiskeridirektoratet)
Project Manager: Roger B. Larsen

Short summary:
It is our goal that the "Marine fish detection, fish behaviour observations and seabed Investigations package 2021-2025 (MARINVEST)" shall be of benefit for marine science and education in a broad perspective, i.e. enhancing our international position in marine science. UiT The Arctic University of Norway aims to provide state of the art infrastructure and electronic equipment for teaching and scientific purposes on board our research vessels. Apart from giving our own students and scientists good working conditions, UiT aims to offer national and international co-partners adequate technical resources for precise data-recording and observations in marine science. Despite the continuous upgrading of infrastructure at UiT, including our research vessels1, some of the basic electronics and associated software commonly used in education and the development of marine science needs to be upgraded. In particular hydroacoustic instruments used for the detection of marine organisms, biomass estimation of marine resources and trawl monitoring equipment must all be functional in order to meet high scientific requirements. The demand for improved and new scientific equipment is growing as new fields of interest for teaching and science emerge. An in-depth understanding of ecosystems and the growing interest for mesopelagic species, their locations and biomass assessments (and management) will demand improved technical instruments on our research vessels. An accurate positioning system for seabed operations and high precision instruments for close range study of life at large depths are requested by various research groups. Currently, the production and negative effects from plastic debris, micro-plastics and ghost fishing occurring as a result of lost and discarded fishing gears (LADFG) are the subject areas attracting obvious attention from students and many scientists. Studies on fish behaviour and locating lost equipment, lost fishing gears and various debris can be improved by the use of simple remote operated vehicles. UiT aims to equip our research vessels with state-of-the-art electronics in order to enhance teaching and improve knowledge-building in marine science. The equipment within the package we describe will be operated and maintained by UiT technicians.

Project number: 316560
Title: Endring og oppgradering av SINTEF Oceans mobile anlegg for prosessering av marine råstoffer
Applicant (partners): SINTEF OCEAN AS
Project Manager: Bendik Toldnes

Short summary:
Mobile Selab is a small but complete and flexible processing facility, where any kind of (rest) raw material can be processed into oil and protein concentrate in cooperation with SINTEF. Customers are mainly businesses from the fishing 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 optimize processes. After more than a decade of being sent out in the field to perform large scale processing tests, the infrastructure needs upgrading.

Project number: 316571
Title: Geosystem 3D Seismic Imaging (G3) Upgrade
Applicant (partners): UiT (UiB, NGU, P-Cable 3D Seismic AS, VBPR AS, Geomar, NOC, BGS, Ifremer, ECORD, IODP)
Project Manager: Stefan Bünz

Short summary:
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, Norwegian Geological Survey and P-Cable 3D AS (Project number 195379). The G3 infrastructure is hosted and maintained at the Arctic University of Norway. The G3 system includes a mobile compressor, deflector paravanes and a winch with a double drum. However, the central technology of the G3 infrastructure is the P-Cable high-resolution 3D seismic system (Planke and Berndt, 2003; Planke et al., 2004). The PCable technology is a 3D seismic acquisition principle co-developed in a cooperation between the Arctic University of Norway, VBPR AS, Geomar (GER) and NOC (UK) (Planke et al., 2009). Several prototype cable and connection solutions were tested over a period from 2001 to 2008. The development concluded with a fully integrated, digital system with cable solutions manufactured and delivered by Geometrics Inc. (USA). The infrastructure grant from NFR in 2009 allowed UiT to be the first institution in the world to purchase and operate a complete P-Cable 3D seismic system. Ten years later, the cable technology has significantly advanced providing much more flexible system setups, more robust connectors, improved digital communication, positioning control or troubleshooting options to name a few. Together with the wear and tear on the existing G3 system after 10 years of operation, we apply for an upgrade of the Geosystem 3D Seismic Imaging (G3) technology.

Project number: 316572
Title: Hydrogen Safety Laboratory
Applicant (partners): UiB (USN, UiS)
Project Manager: Trygve Skjold

Short summary:
The vision for the Hydrogen Safety Laboratory (HySALA) project is to establish state-of-the-art laboratory facilities that will allow researchers to investigate safety-critical properties and phenomena involving hydrogen and hydrogen-based fuels, as well as to test and verify the performance of equipment, solutions and models for fire and explosion protection under conditions, and at spatial scales, that resemble actual industrial applications. The foreseen research activities will be highly relevant for a wide range of practical applications, ranging from energy production to safety and security in industry and society. The infrastructure will support internationally cutting-edge research in areas that are of critical importance to Norway as an energy nation: efficient, sustainable and safe conversion, transport, storage and use of hydrogen and hydrogen-based fuels.

The HySALA facility includes two installations that complement each other with respect to spatial scale and applications. The first installation is a state-of-the-art laboratory facility that will allow

researchers to investigate physical and chemical phenomena related to ignition and combustion phenomena in hydrogen-airmixtures. This facility will include two small explosion chambers and a unique wind tunnel for investigating safety-critical phenomena related to ignition and flame propagation in established flow fields, with or without congestion. The second installation will be a large-scale explosion chamber, dimensioned to withstand detonations and constant volume deflagrations.

The infrastructure will be unique for Norway and Europe, and will allow researchers to develop, verify and validate strategies and solutions for explosion protection of industrial facilities, such as electrolysers, hydrogen refuelling stations, fuel preparation rooms and fuel cell rooms in ships, etc. The ambition is to establish unique installations that can be operational on short notice, be flexible and easy to operate, and produce state-of-theart results. The infrastructure will be available for researchers that complete mandatory (site-specific) safety training, with differentiated pricing for industry and academia, sponsors vs. regular users, etc. As such, the HySALA facility will facilitate high-quality research, including national and international cooperation.

Project number: 316576
Title: Floating solar energy test centre
Applicant (partners): SINTEF OCEAN AS (NTNU, IFE)
Project Manager: Øyvind Hellan

Short summary:
Floating solar energy (FPV) is in rapid development, with close to 2 GWp of capacity deployed based on existing technological solutions. FPV represents a niche in which Norwegian industry has natural advantages through a strong technology base in solar cell technology, materials technology in general, offshore structures, marine operations and power grids. There is a growing Norwegian industry, with companies such as Ocean Sun, Moss Maritime, Sunlit Sea, Current Solar, Equinor and Glint Solar developing new, improved technologies and solutions for FPV. Several large Norwegian energy companies are also considering investments in the technology in their projects, including Statkraft, Hydro and Scatec Solar. To support this emerging industry in its innovation process, there is a need for an industrial scale test area to test full scale operations of FPV systems. Such test sites will complement the use of numerical models and laboratory experiments with scaled models, allowing for more costeffective development of new mooring, floater, mounting and interconnect solutions and demonstrate the performance and resilience of the FPV power plants.

SINTEF, NTNU and IFE wish to establish a test centre for FPV with two nodes: one for sheltered environmental conditions in the Grenland area and one for exposed marine environment on the Trøndelag coast. The objective is to establish an infrastructure that puts Norwegian industry, Norwegian research and education in a unique position internationally. The infrastructure will provide important information on the properties of floating solar energy systems but will also be adapted to support experiments and development of other types of ocean renewable energy. It will provide both design and operational experience for product development and will help to demonstrate and qualify technology and installations for an international market.

The aim is to combine innovation and concept development with theory, method development, laboratory studies and full-scale data collection and measurement. This, in a wide range of scientific fields, i.e. (1) performance and reliability of solar modules in marine environments, (2) impact on the

marine ecosystem of structures covering large sea surfaces, (3) development of next generation marine structures (lightweight, massively modular structures) and (4) control system and digitization of marine and maritime structures (digital twin). Full-scale test installations like this form a central element in the plans for the upcoming Ocean Space Center and will also support the SFI Blues (next generation of marine structures), FME SUSOLTECH and other national research programmes.

The initiative is supported by the Norwegian Solar Energy Cluster and their member companies, including Equinor, Scatec Solar, Ocean Sun, Moss Maritime.

Project number: 316589
Title: SIOS Infrastructure Development for Earth System Science
Applicant (partners): SIOS SVALBARD AS (NERSC, NIVA, MET, NPI, NORCE, UiT, UNIS, UiO)
Project Manager: Heikki Lihavainen

Short summary:
SIOS coordinates the majority of science infrastructure on and around Svalbard. The suggested new infrastructure will provide coordinated data input to Earth System Science on both long and short timescales under the SIOS umbrella. Current infrastructure gaps are defined in the context of SIOS Core Data and highlighted in SESS reports. SIOS includes infrastructure collecting physical, chemical and biological data from the lithosphere of the Earth through the water column, land surface, cryosphere, atmosphere to the boundaries of space. This multitude of scientific disciplines leads to a diverse ensemble of infrastructure needs. This application covers major infrastructure needs of Norwegian SIOS members closely coordinated with international SIOS partners. The suggested infrastructure is to have a real-time data transfer where possible to enhance the opportunity to utilise data in operational forecasting models and monitoring efforts. Thematically the application covers:

1. 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.
2. Development of a local radar and optical technology to make Svalbard a leading spot to acquire information of the middle to upper atmosphere.
3. Develop Svalbard Rock Vault enabling scientific utilisation of available and new rock cores from Svalbard, to provide basic data for improving our understanding of long-term climatic variations as recorded in the geological record.

Emphasis is made to make essential data FAIR and available in real time in order to facilitate operational use of data, which will have local and regional benefits (SIOS Data Management System, NorDataNet). Relevant system components will incorporate appropriate use of remote sensing, for validation and extension of the spatial coverage and to reduce the environmental footprint. The proposed infrastructure will, as part of the SIOS collaboration, establish Svalbard as a leading Cal/Val reference site for high Arctic Earth observation. In particular the extended availability of ground truthing instrumentation on Svalbard in general and specifically around Longyearbyen and Ny Ålesund is essential. This way the SIOS observation network will serve as a reference site and laboratory for observing and understanding the larger trends in 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 and extended collaboration with Barentsburg. We will work very closely with local authorities and other institutions ensuring essential societal use of the SIOS observations, thus

directly impacting societal ability to handle the changing climate. SIOS InfraESS is a continuation to the InfraNOR programme and they are complementing and contributing to integrating SIOS towards a holistic observing system. The total cost of the infrastructure is indicated to be 179 million NOK (156 million NOK from RCN) over the 5-year period.

Project number: 316600
Title: Mandatory draft for infrastrucutre application Center for Land-based Aquaculture, CLA
Applicant (partners): NORD UNIVERSITET (LetSea, SINTEF Ocean and NCE Aquaculture)
Project Manager: Mette Sørensen

Short summary:
The planned infrastructure to be established by the Partners focus on three important pillars:

1. Research carried out on land-based research under controlled conditions in small units give results for a limited life cycle of the fish. The new infrastructure will offer research addressing post smolt production in seawater RAS covering the entire life cycle from tanks on land to ong growth and harvest in sea. This will give opportunities to study the biology, welfare and economy in new production systems of salmonids.

2. The infrastructure is planned with multiple smaller RAS units to enable replicates. Possibilities to study effect of treatments in replicates is currently not existing. The new facilities will allow research on optimal temperatures and salinities as well as effects of feed types and production on biofilter and water quality

3. The new facilities can also easily be reconstructed to cater for research on IMTA or to cater for research on circular bio economy, exploiting biological production in side streams from the system.

Project number: 316607
Title: Infrastructure for a sustainable ocean economy and conservation of the ocean genome
Applicant (partners): NORCE (UiS, UiB, IMR, UiA, SINTEF Ocean, NIVA, DNV GL, RevOcean, MBARI, IFREMER, DTU Aqua, Bremnes Seashore, Skretting AS)
Project Manager: Thierry Baussant

Short summary:
This research infrastructure will aim at 1) addressing the urgent need for increased ocean monitoring capacity using advanced genomic-based digital technologies and gene-sequencing monitoring tools to responding to the demand for sustainable ocean resources for the world and 2) mitigate the increasing cumulative impact of human activities indicated by ocean genome erosion on a variety of marine life i.e. biological diversity (or biodiversity).

The ocean genome, or the ensemble of genetic material present in all marine biodiversity, including both the genes and the information they encode (Blasiak et al., 2020), is the key to marine ecological population resilience and plasticity that drives adaptability to anomalous conditions such as climate change. It also sustains major commercial industries such as marine fisheries and aquaculture, but as well other growing needs of pharmaceuticals as currently exemplified with the worldwide COVID-19 situation. Yet, ocean genome is threatened by overexploitation, habitat loss and degradation, pollution, impacts from a changing climate, invasive species and other pressures, as well as their cumulative and interacting effects in the Anthropocene time. While Norway is gradually transitioning into a blue/green energy, the expansion of existing uses of the ocean and emerging new ones –

including offshore energy, ocean farming, and ocean mining –also requires a quick understanding of the consequences on the ocean genome to mitigate gradual erosion and loss of diversity, and a drastic loss of biodiversity in marine life with unknown consequences for marine life and ecosystems. The scarcity of quantitative data on biological baselines in many parts of the ocean—including the current status of organisms and ecosystems and their trends over time—undermines our ability to respond effectively to these threats to allow proactive responses, rather than the current reactive responses. According to a recent review (Duarte et al., 2020), the investment needed to rebuilding damaged marine life worldwide is estimated to billions of US dollar per year to extend protection actions but the economic return from this commitment will be considerable for the society and nations, not the least the genetic diversity of marine life. Rapid advances in sequencing technologies and bioinformatics have enabled exploration of the ocean genome. This is the future means to informing innovative approaches to conservation and a growing number of commercial biotechnology and industrial applications. Currently this requires manual labor combined with advanced instruments and lab processing tools. To address the near future challenges, less intervention and manual labor is required as new technologies and sensors will enable more granular data collection across a wider coverage area, so that we can move the laboratory from the ship into the environment itself and send data, not samples, back to centralized facilities.

For this research infrastructure, a significant increase of the capacity to monitor the ocean genome using a fleet of state-of-the-art technologies complementing to existing oceanographic monitoring efforts, is requested. While several instruments and automated sampling technologies to capture the ocean genome exist (see for example Ottensen et al., 2016), they remain in the prototype stage and mainly the MBARI Environmental Sample Processor (ESP) is currently available commercially, with a wider use and prospect in research and industry application (Scolin et al., 2018). Further development of MBARI's ESP offers one way to fully automate new DNA analytical procedures in situ, which could be used to create the equivalent of DNA "weather maps" that showing areas of high/low target abundance as well as changes in species assemblages over time and exploratory genome research.

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pollution, impacts from a changing climate, invasive species and other pressures, as well as their cumulative and interacting effects in the Anthropocene time. While Norway is gradually transitioning into a blue/green energy, the expansion of existing uses of the ocean and emerging new ones – including offshore energy, ocean farming, and ocean mining –also requires a quick understanding of the consequences on the ocean genome to mitigate gradual erosion and loss of diversity, and a drastic loss of biodiversity in marine life with unknown consequences for marine life and ecosystems. The scarcity of quantitative data on biological baselines in many parts of the ocean—including the current status of organisms and ecosystems and their trends over time—undermines our ability to respond effectively to these threats to allow proactive responses, rather than the current reactive responses. According to a recent review (Duarte et al., 2020), the investment needed to rebuilding damaged marine life worldwide is estimated to billions of US dollar per year to extend protection actions but the economic return from this commitment will be considerable for the society and nations, not the least the genetic diversity of marine life. Rapid advances in sequencing technologies and bioinformatics have enabled exploration of the ocean genome. This is the future means to informing innovative approaches to conservation and a growing number of commercial biotechnology and industrial applications. Currently this requires manual labor combined with advanced instruments and lab processing tools. To address the near future challenges, less intervention and manual labor is required as new technologies and sensors will enable more granular data collection across a wider coverage area, so that we can move the laboratory from the ship into the environment itself and send data, not samples, back to centralized facilities.

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Project number: 316612
Title: PreMechatronics Lab
Applicant (partners): UiA
Project Manager: Kjell G. Robbersmyr

Short summary:
Top Research Centre Mechatronics (TRCM) at University of Agder was established in 2019 and will develop the next generation mechatronics systems for selected fields to contribute to the competitiveness and sustainability of the industry. Today TRCM collaborates extensively with the world leading offshore oil drilling industry. The SFI offshore mechatronics is a leading research center in its field with close collaboration with the international offshore oil industry. Now we see a growing interest in other offshore industries like offshore wind energy, offshore mining, aquaculture, and marine harvesting. These industries meet challenges similar to what the oil industry has experienced regarding deploying, operating and maintaining offshore installations. We will use the expertise and experience from the oil industry to develop mechatronics concepts and technology for other offshore applications.