

## PROGRAMME 'APPLIED RESEARCH'

### DESCRIPTION OF THE CALL AREAS POLNOR 2019 CALL

#### Introduction

Scientific cooperation between Poland and Norway in frame of the Norway and EEA grants has already build a long and successful history in both countries. The current Programme 'Applied Research' follows in the footsteps of the Polish-Norwegian Research Fund (2007-2011) and its successor, the Polish-Norwegian Research Programme (2012-2017). We would like to use the momentum already created and build upon the achievements of previous editions of the cooperation.

Until now, thanks to the Norway grants, scientists from both countries had an opportunity to cooperate in research in areas important to both Poland and Norway. A great deal of knowledge was gained, experiences were shared, data and methodologies compared and validated against one another.

This time we would like to aim even further, and create a programme that will not only increase our knowledge and understanding of the world, but also contribute to economic growth and prosperity. With this in mind, the Programme 'Applied Research' welcomes enterprises to participate in our POLNOR 2019 Call.

We also want to offer best scientists and entrepreneurs from Poland and Norway a chance to excel not only in their country research environment, but to participate fully in the European research area and in particular in the upcoming Horizon Europe Programme, which will be the biggest research and innovation framework programme in the next financial perspective of the EU. With this in mind, while putting together description of call areas for the POLNOR 2019 Call, we took inspiration from thematic areas included in the recently presented proposal for Horizon Europe. In particular we looked at Pillar II – 'Global challenges and industrial competitiveness', which reflects best the priorities of the Programme 'Applied Research'. However, please note that the original cluster 'Inclusive and secure society' was limited to the less broader area. The aim was to focus on the social and economic development matters, which are the most in-line with the applied nature of the call. Additionally, answering the stakeholders feedback received during the Programme consultation the special demand-based area laying upon the interest of Polish and Norwegian industries has been included.

Please be aware that research and innovation activities carried out under the Programme shall have an exclusive focus on civil applications.

Without further introduction – we present below the POLNOR 2019 Call areas.



## Description of the call areas

### Welfare, health and care

A healthy population is vital for a stable, sustainable and inclusive society, and improvements in health are crucial in reducing poverty, in fostering social progress and prosperity, and in increasing economic growth. The research and innovation activities of this global challenge will develop the knowledge base, build the research and innovation capacity and develop the solutions needed for a more effective promotion of health and the prevention, treatment and cure of diseases. Improving health outcomes will in turn result in increased life expectancy, healthy active lives and productivity of working age people, and sustainability of health and care systems.

Submitted proposals should refer to at least one of the following topics:

- **Health throughout the Life Course**  
People in vulnerable stages of life (birth, infancy, childhood, adolescence, pregnancy, mature and late adulthood), including people with disabilities or injuries, have specific health needs that require better understanding and tailored solutions. This will allow reducing related health inequalities and improving health outcomes to the benefit of active and healthy ageing throughout the life course, in particular through a healthy start of life reducing the risk of mental and physical diseases later in life.
- **Environmental and Social Health Determinants**  
Improved understanding of health drivers and risk factors determined by the social, economic and physical environment in people's everyday life and at the workplace, including the health impact of digitalisation, pollution, climate change and other environmental issues, will contribute to identify and mitigate health risks and threats; to reduce death and illness from exposure to chemicals and environmental pollution; to support environmental-friendly, healthy, resilient and sustainable living and working environments; to promote healthy lifestyles and consumption behaviour; and to develop an equitable, inclusive and trusted society.
- **Non-Communicable and Rare Diseases**  
Non-communicable diseases (NCDs), including rare diseases, pose a major health and societal challenge and call for more effective approaches in prevention, treatment and cure, including personalised medicine approaches.
- **Infectious Diseases**  
Protecting people against cross-border health threats is a major challenge for public health, calling for effective international cooperation at regional and global level. This will involve prevention, preparedness, early detection, treatment and cure of infectious diseases, and also tackling antimicrobial resistance (AMR) following a 'One Health approach'.
- **Tools, Technologies and Digital Solutions for Health and Care**  
Health technologies and tools are vital for public health and contributed to a large extent to the important improvements achieved in the quality of life, health and care of people, in the partner countries. It is thus a key strategic challenge to design, develop, deliver and implement suitable, trustable, safe, and cost-effective tools and technologies for health and care, taking due account of the needs of people with disabilities and the aging society. These include artificial intelligence and other digital technologies, offering significant improvements over existing ones, as well as stimulating a competitive and sustainable health-related industry that creates high-value jobs.



## Norway grants

- Health Care Systems

Health systems are a key asset of the modern social systems. It is a main priority to render health systems accessible, cost-effective, resilient, sustainable and trusted as well as to reduce inequalities, including by unleashing the potential of data-driven and digital innovation for better health and person-centred care.

### Digital and industry

Industry provides a substantial amount of jobs and of private and public sector R&D investments and generates much of the partner countries exports. A new wave of innovation, involving a merging of physical and digital technologies, will trigger huge opportunities for industry and improve the quality of life. Digitisation is a major driver - as it continues at a rapid pace across all sectors, investment in priority areas ranging from artificial intelligence to next generation internet, high performance computing, photonics and nano-electronics, becomes essential for the strength of our economy and the sustainability of our society. Key enabling technologies underpin the blending of the digital and the physical worlds, central to this new global wave of innovation.

Submitted proposals should refer to at least one of the following topics:

- Manufacturing Technologies

Manufacturing is a key driver of employment and prosperity, responsible for a large part of jobs and export in the partner countries. The key challenge for manufacturing is to remain competitive at a global level with smarter and more customised products of high added value, produced at much lower energy costs. Creative and cultural inputs will be vital to help generate added value.

- Key Digital Technologies

Maintaining and autonomously developing strong design and production capacities in essential digital technologies such as micro- and nano-electronics, photonics, software and systems, and their integration as well as advanced materials for these applications will be essential for a competitive economy.

- Advanced Materials

Advanced materials and associated processes make up a large part of industry base in the partner countries and form the root of nearly all value chains through the transformation of raw materials. To remain competitive and meet citizens' needs for sustainable, safe and advanced materials, the industry needs to improve the recyclability of materials, reduce the carbon and environmental footprint, and drive cross-sectoral industrial innovation by supporting new applications in all industry sectors.

- Artificial Intelligence and Robotics

Making any object and device intelligent is one of the megatrends. Researchers and innovators developing Artificial Intelligence (AI) and offering applications in Robotics and other areas will be key drivers of future economic and productivity growth. Many sectors including health, manufacturing, construction, and farming will use and further develop this key enabling technology. Developments must ensure the safety of AI-based applications, assess the risks and mitigate its potential for malicious use and unintended discrimination such as gender or racial bias.



## Norway grants

- **Next Generation Internet**

The Internet has become a key enabler of the digital transformation of all sectors of our economy and society. Investing in technologies and software for the Next Generation Internet will improve partner countries' industrial competitiveness in the global economy and will require large-scale cooperation across stakeholders.
- **Advanced Computing and Big Data**

High Performance Computing and Big Data have become indispensable in the new global data economy, where to out-compute is to out-compete. High Performance Computing and Big Data analytics are critical to support policy making, scientific leadership, innovation and industrial competitiveness, and to maintain national sovereignty.
- **Circular Industries**

Europe is at the forefront of the global transition towards a circular economy. Polish and Norwegian industries should become circular industries: the value of resources, materials and products should be maintained much longer compared to today, even opening up new value chains. The objective is to develop affordable breakthrough innovations and deploy a combination of advanced technologies and processes so as to extract maximum value from all resources.
- **Low-Carbon and Clean Industries**

Industrial sectors, including energy-intensive industries, contribute millions of jobs and their competitiveness is key for the prosperity of our societies. However, they account for 20% of the global greenhouse gas emissions and have a high environmental impact (particularly in terms of air, water and soil pollutants). Breakthrough technologies to achieve significant reductions in greenhouse gases and pollutants, often combined with the technologies for circular industry above, will lead to strong industrial value chains, revolutionise manufacturing capacities and improve the global competitiveness of industry; and at the same time make key contributions to our targets for climate action and environmental quality.
- **Space**

Space systems and services reduce costs and improve efficiency, offer solutions to societal challenges, increase societal resilience and foster a competitive and sustainable economy. Norway grants support will be instrumental in helping to realise these benefits and impacts. The Programme will support synergies between space and key enabling technologies (big data, advanced manufacturing, robotics and artificial intelligence); foster a thriving and entrepreneurial and competitive space sector; and help secure non-dependence in accessing and using space in a safe and secure manner.

### Food and natural resources

Human activities are exerting increasing pressure on soils, seas and oceans, water, air, biodiversity and other natural resources. Meeting the goals of sustainable development, guaranteeing the production and consumption of safe and healthy food, promoting sustainable practices in agriculture, aquaculture, fisheries and forestry, ensuring access to clean water, soil and air for all, cleaning up the seas and oceans, preserving and restoring the planet's vital natural systems and environment requires that we harness the potential of research and innovation. This creates new opportunities for a sustainable, resilient,



## Norway grants

innovative and responsible economy, boosting resource efficiency, productivity and competitiveness, and generating jobs and growth.

Submitted proposals should refer to at least one of the following topics:

- **Environmental Observation**  
The capacity to observe the environment underpins research and innovation for the sustainable use and monitoring of food and natural resources. Improved spatio-temporal coverage and sampling intervals at reduced cost, as well as big data access and integration from multiple sources provide new ways to monitor, understand and predict the Earth system. There is a need for a wider deployment, exploitation and update of new technologies and continued research and innovation to address gaps in Earth Observation (EO) on land and sea and in the atmosphere, collaborating in particular through the Global Earth Observation System of Systems (GEOSS) and its European component EuroGEOSS.
- **Biodiversity and Natural Capital**  
Improved understanding of biodiversity and ecosystems, the multiple services they provide and planetary 'boundaries' as well as solutions harnessing nature's power and complexity is needed to address societal challenges and enhance sustainability. Due account must be taken throughout whole value chains of potential upstream impacts. International cooperation and contribution to international efforts and initiatives, are essential to achieve the objectives in this area. There is a need to better understand the governance of the transition to sustainability in the economic, social and natural system, from the local to the global level.
- **Agriculture, Forestry and Rural Areas**  
Resilient and sustainable farming and forestry systems provide economic, environmental and social benefits in a changing context for primary production. In addition to contributing to food and nutrition security, they feed into dynamic value chains, manage land and natural resources as well as deliver a range of vital public goods including carbon sequestration, biodiversity preservation, pollination and public health. Integrated approaches are needed to promote the multiple functions of agro- and forest (eco)systems taking into account the changing context for primary production, notably in relation to climate and environment, resource availability, demography and consumption patterns. It is also necessary to address the spatial and socio-economic dimension of agriculture and forestry activities and mobilise the potential of rural areas.
- **Sea and Oceans**  
Seas and oceans' natural capital and ecosystem services offer significant socio-economic and welfare benefits. This potential is at risk because of the severe pressure from human and natural stressors such as pollution, overfishing, climate change, sea-level rise and extreme weather events. To prevent seas and oceans from reaching a point of no return, it is necessary to strengthen our knowledge and understanding in order to sustainably manage, protect and restore marine and coastal ecosystems and prevent marine pollution, in a context of an improved and responsible ocean governance framework. This will also include research to sustainably unlock the vast and unexploited economic potential of seas and oceans aiming at producing more food without increasing pressures on them, and also contribute to alleviate pressure on land, freshwater and ocean resources.
- **Food Systems**



## Norway grants

The combined effects of population growth, resource scarcity and overexploitation, environmental degradation, climate change and migration create unprecedented challenges which require food system transformation. Current food production and consumption are largely unsustainable while we are confronted with the double burden of malnutrition, characterised by the coexistence of undernutrition and obesity. Future food systems need to deliver sufficient safe, healthy and quality food for all, underpinned by resource efficiency, sustainability (including the reduction of GHG emissions, pollution and waste production), linking land and sea, reducing food waste, enhancing food production from the seas and oceans and encompassing the entire 'food value chain' from producers to consumers - and back again. This needs to go hand in hand with development of the food safety system of the future and the design, development and delivery of tools, technologies and digital solutions that provide significant benefits for consumers and improve the competitiveness and sustainability of the food value chain. Furthermore, there is a need to foster behavioural changes in food consumption and production patterns as well as to engage primary producers, industry (including SMEs), retailers, food service sectors, consumers, and public services.

- Bio-based Innovation Systems

Bio-based innovation lays the foundations for the transition away from a fossil-based economy by encompassing the sustainable sourcing, industrial processing and conversion of biomass from land and sea into bio-based materials and products. It also capitalises on the potential of living resources, life sciences and industrial biotechnology for new discoveries, products and processes. Bio-based innovation, including technologies, can bring new economic activities and employment to regions and cities, contribute to revitalising rural and coastal economies and strengthen the circularity of the bioeconomy.

- Circular Systems

Circular production and consumption systems will provide benefits to the economy by reducing resource dependency and increasing the competitiveness of enterprises, and to partner countries' citizens by creating new job opportunities and reducing pressures on the environment and climate. Beyond industrial transformation, the transition to a low-emission, resource efficient and circular economy will also need a broader system shift that requires systemic eco-innovative solutions, new business models, markets and investments, enabling infrastructure, social innovation changes in consumer behaviour, and governance models stimulating multi-stakeholder collaboration to ensure that the intended system change achieves better economic, environmental and social outcomes.

## Energy, transport and climate

The intersection of research and innovation on climate, energy and transport will address in a highly integrated and effective way, one of the most important global challenges for the sustainability and future of our environment and way of life. A large use of fossil fuels is a pressing social and economic issue which must be tackled.

Submitted proposals should refer to at least one of the following topics:

- Climate Science and Solutions



## Norway grants

Effective implementation of the Paris Agreement has to be based on science, requiring continuously updating of our knowledge on the climate-earth system, as well as the mitigation and adaptations options available, allowing for a systemic and comprehensive picture of challenges and opportunities for the economy. On this basis, science-based solutions for a cost-effective transition to a low-carbon, climate-resilient and resource-efficient society will be developed.

- Energy Supply

Diverse climatic, geographical, environmental and socio-economic conditions in the partner countries as well as the need to ensure energy security and access to raw materials, dictate a broad portfolio of energy solutions, including of non-technical nature. As regards renewable energy technologies, costs need to decrease further, performance must improve, integration into the energy system must be improved and breakthrough technologies need to be developed. As regards fossil fuels, decarbonising their usage will be essential to meet the climate objectives.

- Energy Systems and Grids

The expected growth of variable electricity production and shift towards more electric heating, cooling and transport dictates the need for new approaches to manage energy grids. Next to decarbonisation, the goal is to ensure energy affordability, security and stability of supply, achieved through investments in innovative network infrastructure technologies and innovative system management. Energy storage in different forms will play a key role in providing services to the grid, also improving and reinforcing network capacities. Exploiting synergies between different networks (e.g. electricity grids, heating and cooling networks, gas networks, transport recharging and refuelling infrastructure, hydrogen, and telecom networks) and actors (e.g. industrial sites, data centres, self-producers) will be crucial for enabling the smart, integrated operation of the relevant infrastructures.

- Buildings and Industrial Facilities in Energy Transition

Buildings and industry installations play an increasingly active role in their interaction with the energy system. Therefore, they are crucial elements in the transition to renewable energy. Buildings are an important factor for quality of life of citizens. Integrating different technologies, appliances and systems and linking various energy uses, buildings as well as their inhabitants and users represent a very high potential for energy generation, storage and efficiency improvements. Industries, and especially those that are energy-intensive, could further improve energy efficiency, and favour the integration of renewable energy sources.

- Communities and Cities

It is estimated that by 2050, more than 80% of the EU's population will live in urban areas, consuming the lion's share of available resources, including energy, and being areas particularly vulnerable to the adverse meteorological change impacts worsen by climate change and natural disasters already now and increasingly in the future. A key challenge is to significantly increase the overall energy and resource efficiency as well as climate-resilience of cities in a holistic fashion, targeting the building stock, energy systems, mobility, climate change, as well as water, soil, air quality, waste and noise.

- Industrial Competitiveness in Transport



## Norway grants

The shift towards clean technologies, connectivity and automation will depend on the timely design and manufacture of aircraft, vehicles and vessels integrating different technologies and accelerating their introduction. Increasing comfort, efficiency, affordability, while minimising lifecycle impact on the environment, human health and on energy use remain objectives of paramount importance. Innovative, highly capable transport infrastructure is essential for the proper functioning of all transport modes in view of increased mobility demand and rapidly changing technology regimes. An integrated approach to infrastructure and vehicle/vessel/aircraft development deserves particular attention also in order to minimise energy and environmental impact.

- **Clean Transport and Mobility**  
Reaching air quality, climate, and energy goals, as well as noise reduction, will require rethinking the whole mobility system including users, vehicles, fuels and infrastructures. It will also require the deployment of low-emission alternative energies and market uptake of zero-emission vehicles/vessels/aircrafts. In addition to the harmful effects of greenhouse gas emissions, transport contributes significantly to poor air quality and noise in Europe with negative consequences for the health of citizens. Building on progress with electrification and the use of fuel cells for cars, buses and light duty vehicles it is essential to accelerate research and innovation solutions for other sectors such as aviation, maritime and inland navigation and lorries.
- **Smart Mobility**  
Smart mobility will help to ensure the efficiency, safety and resilience of door-to-door mobility and all its components, in particular by using digital technologies, advanced satellite navigation, and artificial intelligence. New technologies will help to optimise the use and efficiency of transport infrastructure and networks, improving multi-modality and connectivity, optimising traffic management and enable innovative transport solutions and services, thus reducing congestion and negative environmental impacts, providing better mobility and logistics services for citizens and businesses.
- **Energy Storage**  
Massive, concentrated and decentralised storage solutions (comprising chemical, electrochemical, electrical, mechanical and thermal) for the energy system will increase efficiency, flexibility, technology independence and accessibility as well as the security of supply. Low-emission, decarbonised transport will require a growing share of electrical and/or other alternatively fuelled vehicles, with better-performing and cheaper, recyclable and reusable batteries, as well as local provision of synthetic/renewable fuels such as hydrogen and innovative solutions for on-site storage.

For detailed description of each call area mentioned above please refer to Annex I of the document 'Proposal for a decision of the European parliament and of the Council on establishing the specific programme implementing Horizon Europe – the framework Programme for Research and Innovation': <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018PC0436>.



## Social and economic development

Research and innovation have a significant potential to contribute to finding solutions to today's social and economic challenges. Knowledge is the key driver to sustainable growth and industrial competitiveness, investments (including foreign investments), social mobility and social innovation, and job creation. Submitted proposals should refer to at least one of the following topics:

- Mechanisms for building innovativeness and competitiveness, forward-looking policies and tools needed to better understand and boost the inclusive growth, productivity, human capital as well as innovative society;
- Interdependence between dynamics of economic growth and social inequalities, sustainable development of markets, emergence of new economic and business models as well as new financial technologies;
- New types of work, the role of work, tax and benefits systems, trends and changes in labour markets and income in contemporary societies, and their impacts on income distribution, non-discrimination including gender equality and social inclusion;
- The role of education, training (including active lifelong learning) and development of knowledge and competences in meeting the needs of changing markets (e.g. labour market) as well as in tackling socio-economic inequalities;
- Education and training systems to foster and make the best use of the digital transformation, also to manage the risks from global interconnectedness and technological innovations, especially emerging online risks, ethical concerns;
- Demographic challenges, supporting intergenerational solidarity, role of new technologies, social security and social investments policies in aging societies, challenges for various policies e.g. health and labour market policies posed by demographic changes;
- Human mobility, integration and migration policy challenges in the context of reducing social inequalities and building social capital;
- Modernisation of public institutions to meet citizens' expectation regarding service provision, transparency, accessibility, openness, accountability and user centricity; technological standards and digitalisation to strengthen the development of markets and enhance the effectiveness of public institutions;
- Efficiency of justice systems and improved access to justice based on judiciary independence and rule of law principles, with fair, efficient and transparent procedural methods both in civil and criminal matters. Support of legislative processes by economic analysis of law and use of ICT in lawmaking.

## Unmanned vehicles – demand-based area

The unmanned systems segment is a new, rapidly growing market. The unmanned vehicles are starting to play an important role in the crisis management, monitoring of safeguards of critical infrastructure and areas of special economic importance, as well as in combating the effects of natural and ecological



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disasters - essentially wherever man has been doing arduous and dangerous work for life and health.

Submitted proposals should refer to at least one of the following topics:

- Unmanned aerial vehicles (UAV);
- Unmanned ground vehicles (UGV);
- Unmanned surface vehicles (USV);
- Unmanned underwater vehicles (UUV);
- Subsystems, subassemblies and technologies for unmanned vehicles;
- Applications for industry.