

Research for Sustainable Societal and Industrial Development

The Research Council of Norway's Strategy for Sustainability,
2017–2020

About the Research Council of Norway

The Research Council of Norway is a national strategic and funding agency for research activities. The Council serves as the key advisor on research policy issues to the Norwegian Government, the government ministries, and other central institutions and groups involved in research and development (R&D). The Research Council also works to increase financial investment in, and raise the quality of, Norwegian R&D and to promote innovation in a collaborative effort between

the research community, trade and industry and the public administration. It is the task of the Research Council to identify Norway's research needs and recommend national priorities. The Council utilises targeted funding schemes to help to translate national research policy goals into action. The Research Council provides a central meeting place for those who fund, carry out and utilise research and works actively to promote the internationalisation of Norwegian research.

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Preface

Our ability to create a more sustainable society and business sector is contingent on the acquisition of new knowledge. The Research Council has a critical role to play in generating the knowledge Norway needs and supporting the research and academic communities who are to produce and develop it. These efforts will require international cooperation, collaboration between industries and public stakeholders, and between researchers and experts from different fields.

This strategy is a follow-up to the main strategy *Research for Innovation and Sustainability (2015–2020)*, and shows the actions that the Research Council will take to realise its role as part of the broader Norwegian effort to achieve the UN Sustainable Development Goals, both nationally and globally.

Lysaker, August 2017



A handwritten signature in black ink, which appears to read "John-Arne Røttingen". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

John-Arne Røttingen
Chief Executive



Knowledge to meet sustainability challenges

The Research Council of Norway's main strategy, *Research for Innovation and Sustainability 2015–2020*, highlights national and global societal challenges and points out that development in many areas is unsustainable. The objective is to strengthen research that promotes sustainable solutions in society and industry.

The World Commission on Environment and Development introduced the term “sustainable development” in 1987, defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This conceptual framework recognised that economic growth without limits did not give adequate consideration to the need for social equity and environmental protection, and could thus threaten

the future of coming generations. This is just as important today as it was then. It is clear that sustainable development that safeguards fundamental, valuable aspects of our societies is not yet in place.

Sustainability is a broad concept that has many facets and approaches – depending on the point of departure. The United Nations Sustainable Development Goals provide a means of operationalising sustainability in relation to 17 different target areas. These represent some of the key global challenges facing the world today. The UN points out there is a need for a broad-based, common global work plan to eradicate poverty and hunger, promote universal access to health and education, fight inequality, reduce environmental degradation and stop climate change

by 2030. The UN acknowledges that it is essential to invest in new knowledge and technology to reach these goals, and stresses the importance of dealing with these challenges across different institutions, subject fields, thematic areas and sectors. 2030 is rapidly approaching. Goal 17 therefore calls for new incentives to increase implementation capacity and establish new partnerships to reach the established objectives – at the national and global level alike.

This strategy for sustainability presents the Research Council's plans for following up the Sustainable Development Agenda and helping to achieve the UN Sustainable Development Goals. A key element in this context is the framework that the Research Council will establish to develop research

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17 Sustainable Development Goals

The UN Sustainable Development Goals consist of 17 goals and 169 targets. The goals are intended to establish a common global direction for governments, the private sector and civil society. Countries across the world have taken active part in defining these goals, and more than eight million people have provided input to the process.

Sustainable development involves meeting the needs of people living today without compromising the ability of future generations to meet their own needs. The goals reflect the three core elements of sustainable development: economic growth, social inclusion and environmental protection.



and innovation to meet the challenges. These efforts have their point of departure in Norway's national advantages and the understanding that Norwegian knowledge in these areas can help to develop national institutions and a private sector capable of coping with sustainability challenges in other countries as well. We also recognise that sustainability challenges are global by nature, and do not stop at national borders.

Thus, Norway will need not only more international cooperation, but also an ongoing knowledge flow in from other countries in order to find solutions to challenges at the national level as well.

This strategy is based on clearly defined objectives for the Research Council's activities and identifies a number of strategic action points and priorities for reaching these.

Our ambition is to highlight the role that research and innovation can play in achieving the Sustainable Development Goals, and to show how the Research Council will incorporate sustainability perspectives into its activities as well as the implications this will have in various areas.





Enhancing sustainability requires a joint effort

All countries are involved

The Sustainable Development Goals represent a global work plan. The UN explicitly states that all countries must help in the effort to achieve the goals, at the national and global level alike. In Goal 17, the UN stresses the need to strengthen implementation instruments and revitalise the global partnership for sustainable development. This means that Norway, too, must orient segments of its research activity towards the global challenges the UN has specified. It is crucial to promote involvement, cooperation, sharing of data and infrastructure, and ensure open access to research results if we are to create better conditions for research in other countries.

Broad participation essential to achieving the Sustainable Development Goals

The UN Sustainable Development Goals involve multi-faceted, highly complex problems that call for new actions and modus operandi. This entails new forms of co-production, learning and sharing of insight and knowledge across subject fields, thematic areas and institutions. New steps must be taken to facilitate cooperation and cultivate more integrated solutions to deal with the challenges. Sustainability efforts thus place new demands on the proficiency and capacity of the research and innovation system, and on the Research Council itself.

Norway has an excellent starting point

Norway has an excellent basis for contributing actively to the international research activities sought by the UN. We have a well-developed research and educational system, we have leading knowledge environments in areas that are important in a sustainability context, and we have good research infrastructure and high participation in international research collaboration. Additionally, we have a well-developed public sector and an internationally-oriented business sector with high expertise in key areas where enhanced focus on sustainability can lead to potential for value creation. Thus, Norway is well positioned to take active ownership of the global challenges the UN has drawn up.

New direction in the framework for and performance of research

Research-based knowledge and technology development will play a critical role in achieving the UN Sustainable Development Goals. This means in turn that the Sustainable Development Goals set the framework for how research is to be targeted. New knowledge must be generated and we must implement what we have learned. Achieving our goals will therefore also depend on new understanding of behaviour and how best to encourage the application of sustainable solutions in society at large, in the business sector

and by individuals. Sustainability-related challenges are dynamic, and are evolving all the time. There is an ongoing need for updated knowledge about what the most important challenges are at any given time.

Sustainability challenges also place demands on the way in which research is performed. The UN points among other things to the need to increase knowledge-sharing and open access to research findings, to involve users and civil society, to follow established standards for ethics in research, and to ensure that research projects do not have any unnecessary impacts on the climate or the environment.

Time is of the essence

The UN Sustainable Development Goals are to be achieved by 2030. There is an urgent need to expand understanding and design solutions, and a global knowledge effort is called for to strengthen international cooperation. At the same time, the Sustainable Development Goals represent concrete opportunities for value creation for the Norwegian business sector. The short time perspective makes it essential to incorporate sustainability perspectives as quickly as possible into renewal activities for the Norwegian public sector as well.



National targets and indicators

The Government refers to the UN Sustainable Development Goals in a number of white papers and strategies. The white paper “Long-term Perspectives on the Norwegian Economy 2017” emphasises that sustainable development requires ensuring that future growth takes place within the framework set by environmental and climate change-related challenges. Strategies to promote sustainable development, also known as green growth, must be based on economic decision-making that safeguards environmental considerations so that there is balance between the benefits and detriments of using resources. (Meld. St. 29 (2016-2017) Long-term Perspectives on the Norwegian Economy 2017, white paper from the Ministry of Finance)

Norway’s ambitious environmental targets include targets that Norwegian ecosystems will achieve good status and deliver ecosystem services, that Norway will reduce its global greenhouse gas emissions by 40 per cent by 2030, and will eliminate releases of substances that are hazardous to health or the environment. All sectors of industry and society must contribute to achieving these targets. Each target has associated indicators to show whether we are making satisfactory progress. (<http://www.environment.no/goals/>)

In June 2016, the Government submitted its first report to the UN on follow-up of the Sustainable Development Goals, presenting the challenges that Norway will be addressing. (Norway’s follow-up of Agenda 2030 and the Sustainable Development Goals)

Objective and targets

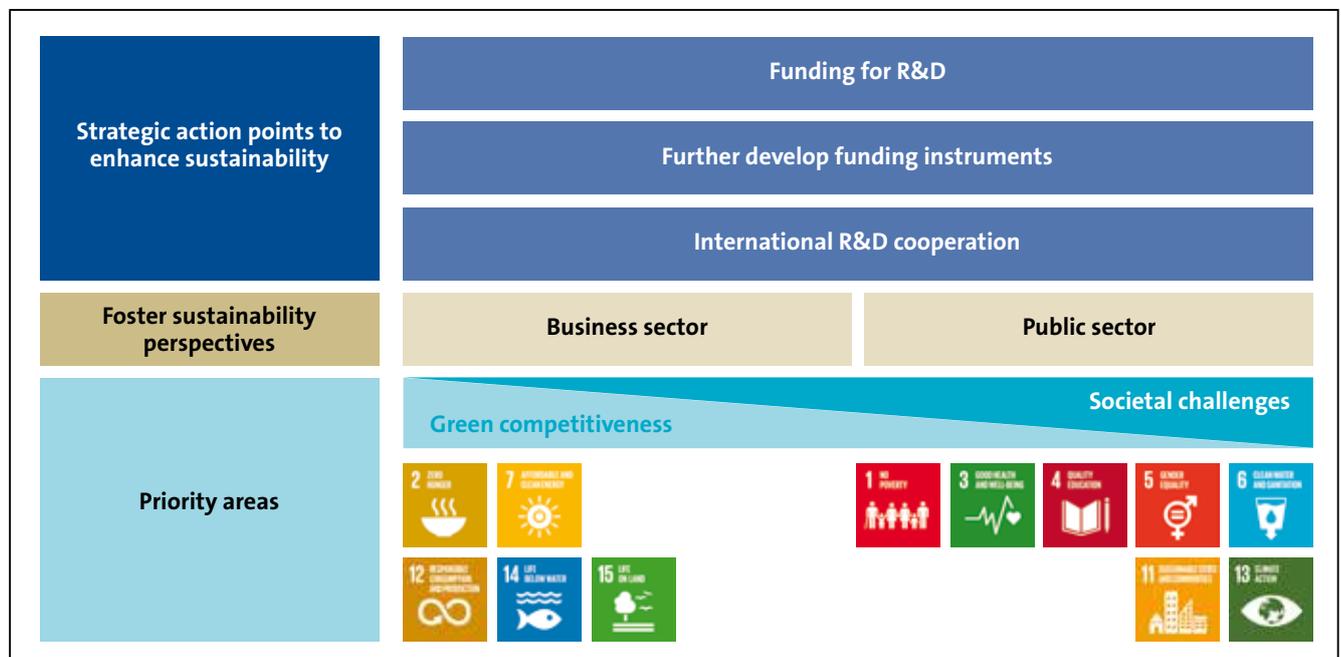
The objective of the Research Council's strategy for sustainability is to help to promote knowledge and solutions that will:

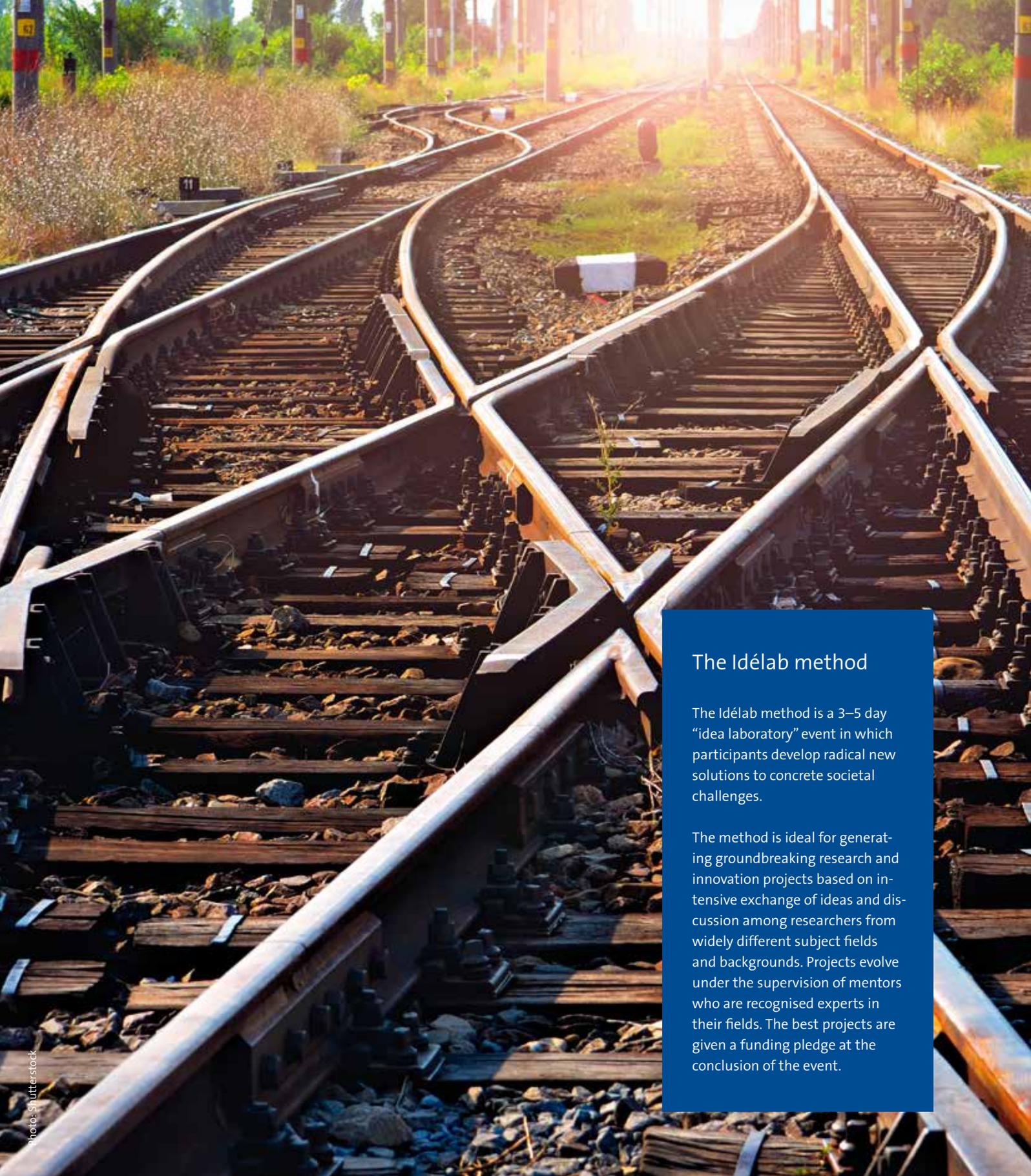
- > resolve national and global challenges relating to sustainability in society;
- > facilitate industrial development that enhances sustainability and increases green competitiveness.

The Research Council will employ three main strategic action points in its activities to follow up sustainability perspectives in its core activities: Funding for R&D, development of funding instruments and international R&D cooperation. In addition it will be crucial to encourage activities that promote sustainability in the Norwegian public and private sectors.

Furthermore, the Research Council will strengthen and target its efforts in areas related to the UN Sustainable Development Goals where Norway has special advantages and potential, and where research and innovation will be particularly important for solving sustainability-related challenges in Norway and at the global level.

Schematic representation of the Research Council of Norway's sustainability strategy





The Idélab method

The Idélab method is a 3–5 day “idea laboratory” event in which participants develop radical new solutions to concrete societal challenges.

The method is ideal for generating groundbreaking research and innovation projects based on intensive exchange of ideas and discussion among researchers from widely different subject fields and backgrounds. Projects evolve under the supervision of mentors who are recognised experts in their fields. The best projects are given a funding pledge at the conclusion of the event.

Main strategic action points

Give priority to sustainability when funding R&D activities

Research and innovation are essential to produce the knowledge and solutions needed to deal with the challenges that the Sustainable Development Goals are intended to meet. To ensure that the research financed by the Research Council will promote sustainable development, it is important that the Council incorporates this into its guiding documents, calls for proposals and the selection of projects for funding.

The Research Council will work to:

- › Include a focus on the sustainability dimension in its analyses, advisory services and guiding documents, including work programmes.
- › Attach importance to including sustainability perspectives in calls for proposals where this is relevant.
- › Require grant applicants to describe how their projects will lead to sustainability gains when this is relevant.
- › Incorporate sustainability as an element of the assessment criteria for grant proposals in relevant areas.

Further develop funding instruments targeted towards sustainability challenges

The multi-faceted, highly complex sustainability challenges dictate new requirements for involvement of all subject fields, collabo-

ration between stakeholders in the research and innovation system, and cooperation with civil society. But time is of the essence. It is necessary to accelerate the development of knowledge and solutions so these may be implemented in various areas. The challenges also call for new, higher-risk breakthrough research and technology development. In addition, there is a need for research on the kinds of measures that will encourage society and individuals to choose sustainable solutions to a larger extent.

The Research Council will work to:

- › Strengthen existing and test out new mechanisms for promoting cooperation and more integrated solutions to sustainability-related challenges across research programmes and initiatives, subject fields, thematic areas and sectors.
- › Further develop instruments that encourage rapid deployment to the private and public sectors of research results that will enhance sustainability.
- › Further develop concepts for high-risk, breakthrough research in areas that are particularly critical to achieving lasting sustainability gains.
- › Encourage relevant research on policy instruments that will promote markets for sustainable solutions, including public procurements, regulatory activities and incentives.

Strengthen sustainability perspectives in international R&D cooperation

Norway has a responsibility to contribute to the global knowledge pool that forms the basis for sound policy design, both at home and in global cooperation on the Sustainable Development Goals. We must develop mechanisms that support the flow of knowledge between countries with a view towards expanding capacity in science, technology and innovation in societies that are less developed than our own.

The Research Council will work to:

- › Emphasise sustainability perspectives in its strategic input to international research arenas.
- › Give priority to international arenas that focus on global challenges and are oriented towards research that fosters sustainability.
- › Ensure that international calls for proposals incorporate sustainability issues.
- › Prioritise research cooperation that includes developing countries in order to promote capacity-building and technology transfer.



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Industrial development that fosters sustainability and green competitiveness

The business sector has a crucial role to play in the efforts to deal with sustainability-related challenges. The Research Council will therefore attach importance to encouraging Norwegian companies to identify and take advantage of the many opportunities that achieving greater sustainability in trade and industry will entail.

The UN Sustainable Development Goals open up a wide array of market opportunities for Norwegian trade and industry. Norway has a competent, well-organised business sector that is well equipped to contribute constructively to efforts to achieve the Sustainable Development Goals, and to take full advantage of the potential for value creation inherent in the global societal challenges. This will involve strengthening green competitiveness and incorporating sustainability as a strategic competitive advantage for Norwegian companies, both in industries where Norway has natural advantages and many opportunities, and in areas where the country has specific problems to solve. The ability of the business sector to translate research into innovation and sustainable value creation will be a key factor for success.

The development and application of new technology will be essential for fulfilling many of the ambitions for enhanced sustainability put forth by the UN and others. The development and utilisation of digital technologies and infrastructures will offer new paths for achieving many of the Sustainable Development Goals. The enabling technologies ICT, biotechnology, nanotechnology and advanced production processes have already made important contributions in a number of areas, including renewable energy, electrification of transport, the bioeconomy, smart and resilient communities and buildings, health, education and welfare. It will remain important to ensure that technological development is carried out within a responsible societal framework to prevent undesirable impacts on society in both the short and the long term.

Accelerated development pathway – the PILOT-E scheme

The PILOT-E scheme is designed to streamline and accelerate the development of low-emission energy technology along the entire pathway from research to market. The scheme is a joint funding instrument employed by the Research Council, Innovation Norway and Enova. PILOT-E funding announcements are targeted towards areas where the Norwegian authorities can guide the development of early markets through large-scale public procurement, regulation, etc.

The PILOT-E scheme helps to strengthen Norway's green competitiveness by creating a "fast lane" for companies or clusters of companies seeking to develop low-emission technologies that can rapidly reduce greenhouse gas emissions.

The Research Council will work to:

- › Encourage Norwegian companies to take advantage of the competitive market opportunities that sustainability perspectives create. Support the industries' own roadmaps for green competitiveness with a focus on those sectors with the greatest potential to reduce their environmental footprint, such as the processing and petroleum industries.
 - › Develop funding instruments that promote green innovation and sustainable value creation in the business sector, including instruments that facilitate accelerated development pathways, such as the PILOT-E scheme.
- › Stress the importance of Responsible Research and Innovation (RRI).
 - › Increase the focus on breakthrough research to develop new technologies and solutions that lead to lasting sustainability gains.
 - › Include sustainability perspectives in calls for proposals targeted towards trade and industry, and/or incorporate sustainability as an element of the assessment criteria for grant proposals.
 - › Encourage universities, university colleges and research institutes to develop expertise on sustainability that is of relevance for, and can be made accessible to, the business sector.

Responsible Research and Innovation

Responsible Research and Innovation (RRI) is a policy concept that is gaining increasing significance in Norway and abroad. RRI involves ensuring that research is conducted in a societally responsible way, and that adequate importance is attached to how research and technology development can contribute to solving the grand societal challenges.

Focusing on sustainability will make the Norwegian aquaculture industry more competitive.

Photo.: Johan Wildhagen



60 biggest market opportunities related to delivering the Global Goals

	Food and Agriculture	Cities	Energy and Materials	Health and Well-Being
1	Reducing food waste in value chain	Affordable housing	Circular models – automotive	Risk pooling
2	Forest ecosystem services	Energy efficiency – buildings	Expansion of renewables	Remote patient monitoring
3	Low-income food markets	Electric and hybrid vehicles	Circular models – appliances	Telehealth
4	Reducing consumer food waste	Public transport in urban areas	Circular models – electronics	Advanced genomics
5	Product reformulation	Car sharing	Energy efficiency – non-energy intensive industries	Activity services
6	Technology in large-scale farms	Road safety equipment	Energy storage systems	Detection of counterfeit drugs
7	Dietary switch	Autonomous vehicles	Resource recovery	Tobacco control
8	Sustainable aquaculture	ICE vehicle fuel efficiency	End-use steel efficiency	Weight management programs
9	Technology in smallholder farms	Building resilient cities	Energy efficiency – energy intensive industries	Better disease management
10	Micro-irrigation	Municipal water leakage	Carbon capture and storage	Electronic medical records
11	Restoring degraded land	Cultural tourism	Energy access	Better maternal and child health
12	Reducing packaging waste	Smart metering	Green chemicals	Healthcare training
13	Cattle intensification	Water and sanitation infrastructure	Additive manufacturing	Low-cost surgery
14	Urban agriculture	Office sharing	Local content in extractives	
15		Timber buildings	Shared infrastructure	
16		Durable and modular buildings	Mine rehabilitation	
17			Grid interconnection	

Sustainable Development Goals offer major value creation potential

The report *Better Business Better World* from the Business & Sustainable Development Commission (January 2017) points out that the UN Sustainable Development Goals will create market opportunities worth at least USD 12 thousand billion in the following areas:

- > Food and Agriculture
- > Cities
- > Energy and Materials
- > Health and Well-being

The total benefit for society may be up to three times higher.



Sustainability in public sector renewal efforts

The public sector plays an important role in the efforts to restructure society in a more sustainable direction, e.g. through governance and organisation, innovative procurements, service development and management tasks.

Sustainable societal development must be built on a robust, efficient public sector that is subject to open, inclusive, democratic governance. This is essential for ensuring the legitimacy of societal institutions. It is also vital that the public and private sectors are able to work together constructively. When the public sector commissions businesses to develop green, sustainable solutions, services and products, it also paves the way for a market encompassing customers from other sectors, not least internationally. Well-functioning, knowledge-based societal organisation and governance is critical for preventing conflict, redressing unacceptable inequities and safeguarding societal safety and security.

The Research Council will work to:

- › Increase the focus on sustainability perspectives in projects that promote competence-building in the public sector and enhance the knowledge base for public planning and decision-making processes.
- › Initiate research activity that integrates a sustainability dimension and that will strengthen expertise on sustainable solutions and choices in the public sector.
- › Incorporate sustainability as an element of the assessment criteria for grant proposals from the public sector in areas where this is relevant.
- › Help to expand the knowledge base to enable public planning and decision-making processes to lead to greater sustainability gains.
- › Expand the ways in which research can contribute to sustainable innovation and development in the public sector.
- › Promote development of concepts and methods for public procurements that lead to more sustainable solutions in the public sector.
- › Encourage constructive collaboration between the public sector, civil society, the business sector and the research community.



Priority knowledge areas for sustainable development

The Research Council will strengthen and target its activities towards areas of particular relevance to the UN Sustainable Development Goals in which Norway has special advantages and potential, and where research and innovation will play a pivotal role in resolving sustainability-related challenges in Norway and globally.

Priority knowledge areas

Areas promoting industrial development that fosters sustainability and green competitiveness

- > Clean, safe and productive oceans and seas
- > A sustainable bioeconomy
- > Clean energy – green competitiveness
- > The circular economy

Areas promoting societal development that fosters sustainability

- > Reduced climate change and effective adaptation measures
- > Abundant biodiversity, preservation of ecosystem services and lower environmental impacts
- > Sustainable cities, regions and transport systems
- > Education that ensures future competency and redresses social inequity

- > Equal access to health and health services
- > Reduced poverty and inequality

Knowledge needs and action points in the priority areas will be discussed in further detail in the paragraphs below in light of the relevant UN Goals. The action points are primarily targeted towards measures that the Research Council itself can implement.

Sustainable industrial development



Clean, safe and productive oceans and seas

Growth in the ocean industries must take place through green restructuring that will promote sustainable conservation and use of the oceans. This will require knowledge

about how marine ecosystems are affected by climate, pollution and industrial activities, as well as further mapping of the ocean space. Norway must help to develop the knowledge base for better ocean management that provides a basis for sustainable, co-existing marine industries in Norway and globally

The UN points out that seafood plays a key role in food security and improved nutrition. A growing need for seafood must be

addressed through balanced harvesting through the entire food web, not least through fish farming. This will require knowledge for sustainable harvesting, production and distribution systems for safe, healthy seafood, and for sustainable solutions to environmental problems related to parasites, discharges and escapes to sea from aquaculture. A bioeconomy approach using marine organisms in pharmaceutical and chemical products and wider use of residual raw materials in existing and new

value chains will promote more sustainable use of marine resources.

In the maritime sector, Norwegian industrial and R&D environments play a key role in reducing emissions of greenhouse gases and release of other harmful substances from ships to air and sea. More knowledge is needed on accident prevention and security policy considerations in this context.

The oceans are essential for energy production. The wide range of knowledge on which the petroleum industry is based can be applied to the development

of offshore wind power, seabed mineral extraction, and new industrial activities across different sectors.

Technology and competence-building in the marine and maritime industries are needed to develop the business sector and resource management regimes in countries with limited research capacity. Norwegian research groups must be encouraged to participate more actively in knowledge development for sustainable management of marine bioresources in developing countries.

The Research Council will work to:

- Increase the focus on research that can help to make the national and global production of seafood more sustainable.
- Further expand research for the development of climate and environment-friendly technology for the shipping, petroleum and other offshore industries.
- Facilitate social science-based and interdisciplinary research on sustainable management of ocean resources at the national and global levels.
- Encourage transfer of technology and knowledge between the ocean-based industries to help to find solutions that enhance sustainability.

The bioeconomy encompasses both new and established markets, and food production will always be an essential component.



Photo: Shutterstock

Photo: Borregaard



>>> A well-developed bioeconomy paves the way for green growth and a low-emission society which focuses on efficient resource life cycles.

Borregaard's biorefinery in Sarpsborg is an example of one of the world's most advanced bioeconomic technology solutions.



A sustainable bioeconomy

The bioeconomy encompasses many different markets, ranging from well-established ones such as those for food, paper, and other wood-based products, to qualitatively new products and alternatives to replace petroleum-based products. The bioeconomy is part of the green transition and the circular economy. A well-developed bioeconomy paves the way for green growth and a low-emission society which focuses on efficient resource life cycles. Expanding the bioeconomy will require knowledge that extends across boundaries between sectors and facilitates industrial symbioses where the residual raw materials from one industry are used as a resource in another.

The world needs reliable access to nutritious food to alleviate hunger and poverty. Achieving this entails among other things targets to reduce global food waste by half by 2030. At the same time, resources must be used more efficiently and the distribution of resources and means of production

must be improved. Achieving the UN Goals means developing a global food system that safeguards the climate, protects the environment, facilitates health and promotes equitable distribution.

All use of biological resources leaves an environmental footprint. There is a need to learn more about how to develop the bioeconomy within an optimal sustainable framework, with the least possible impacts for the environment, climate and ecosystems. Wider understanding of sustainable harvesting and use of natural resources must be developed alongside technology and innovations that broaden the basis for today's bio-based industry.

The challenges here call for new knowledge to increase sustainable production of safe, healthy food nationally and globally. The links between food production and nutrition must be more fully understood. More understanding is also needed about increased production and use of feed from

local bioresources as a means of ensuring the most efficient use of resources. Knowledge and innovation will also lead to bio-based solutions that can replace environmentally detrimental input factors and open the door to green industrial development and new jobs.

The Research Council will work to:

- > Increase the focus on research that promotes an integrated, sustainable food system, with an emphasis on increased production of safe, health food and reduced waste in the food value chains.
- > Facilitate research and technology development on and for bioresources to reduce overall greenhouse gas emissions.
- > Strengthen knowledge and technology development for efficient, sustainable utilisation of national bioresources across sectors, with an emphasis on resources in sustainable resource life cycle systems.
- > Further expand global R&D cooperation that delivers knowledge, solutions and innovation for sustainable development of the bioeconomy.



Photo: Øyvind Hagen/StatOilHydro

Hywind off the coast of Karmøy in western Norway is the world's first floating MW-class wind turbine.



Clean energy – green competitiveness

Energy consumption is the dominant source of global greenhouse gas emissions. Achieving the established climate targets requires rapid action to implement the transition to sustainable energy consumption and develop low-emission technology. This is a priority on the political agenda. At the 2015 United Nations Climate Change Conference in Paris, Norway and 21 other countries together with the European Union signed the *Mission Innovation* agreement to double their energy R&D investment to

accelerate the development of clean energy technology. Dynamic, targeted research efforts are called for to reduce greenhouse gas emissions and provide access to clean, reasonable energy for the 1.2 billion people in the world who still do not have it.

Clean energy is one of the fastest growing global markets. Accelerated efforts to develop new energy technology therefore also represent major opportunities for industrial development. In order to meet its obligations to reduce greenhouse gas

emissions, Norway must take immediate steps to reduce emissions from transport, industrial activity and the extraction of oil and gas. Strong national investment in climate mitigation activities and development of low-emission technology in keeping with the Mission Innovation agreement open up opportunities for green competitiveness and increased exports for dynamic Norwegian industries, as well as for knowledge and competence-building for world-leading research environments.



Clean energy is one of the fastest growing global markets.



Photo: Shutterstock

Aluminium is a material that can be recycled almost infinitely without losing any of its properties.



The Research Council will work to:

- > Accelerate the development of Norwegian energy technology in keeping with the *Mission Innovation* agreement.
- > Target activities towards areas where Norway needs solutions to reduce its energy consumption emissions, such as transport, industrial activity and the offshore industry.
- > Encourage the Norwegian business sector to develop low-emission technology for global markets.
- > Design funding instruments that promote breakthrough research and innovation, such as *New Energy Concepts*.
- > Decrease the time from research to commercialisation for new energy solutions by employing more instruments like the PILOT-E scheme, in which the public research and innovation agencies commit to participation in a coordinated pathway with the business sector.
- > Increase efforts to utilise Norwegian energy-related solutions and knowledge for global development.

The circular economy

Public administrations, manufacturers and users of products and services all have a responsibility to help to achieve the UN targets to reduce waste generation substantially through regulation, recycling and reuse. Sustainable production entails reducing resource use, degradation and pollution, and will benefit both the environment and the economy.

Norway has longstanding traditions in resource management and the refinement of natural resources as the basis for value creation and employment. Wise management of petroleum resources has laid the foundation for the development of the Norwegian welfare society, but encroaching environmental problems and dwindling resources are posing new challenges. New knowledge about circular resource management is needed across the various sectors.

A circular economy involves recycling of resources, reduction of waste, better and more efficient use of resources, longer

product service life, and recirculation of materials in new products. The point is for the resources to stay in the economy when the product is discarded.

Value creation in a circular economy requires that products are designed and produced so that they can subsequently be broken down for recycling and reuse of the materials. This calls for insight into material use, material quality and deterioration, product design, production, fractionation, product lifetimes, waste, material inspection, reuse, user behaviour and rights, political steering and regulation, and the roles and responsibilities of the various stakeholders.

The Research Council will work to:

- > Facilitate research for recycling, repair and improvement of products, services and processes.
- > Facilitate research and technology development for circular resource management.





Photo: Shutterstock

The Arctic areas are particularly vulnerable to climate change.

Sustainable societal development



Reduced climate change and effective adaptation measures

Climate change is one of the greatest global challenges. The world is growing warmer, sea levels are rising, ocean acidification is increasing, glaciers and sea ice are melting, the permafrost is thawing, precipitation patterns are changing and

extreme weather events are becoming more frequent. The polar regions offer early warning of coming climate changes, and we are observing major, rapid changes there that will in turn affect the climate of the planet as a whole. The ramifications of climate change are enormous for society and the environment alike, and the poorest countries are especially vulnerable. The Paris Agreement has set a target of less than 2 °C, and preferably a 1.5 °C increase in the global average temperature.

To reach the targets, we need more knowledge about how to transform today's society into a low-emission, climate-resilient society. The design of adequate solutions and measures will require greater understanding of how the climate is expected to continue to change and what this entails in relation to access to food and water; public health; economic winners and losers; refugee flows; conflicts; damage to infrastructure, buildings and natural landscapes; and loss of biodiversity.



To reach the targets, we need more knowledge about how to transform today's society into a low-emission, climate-resilient society.

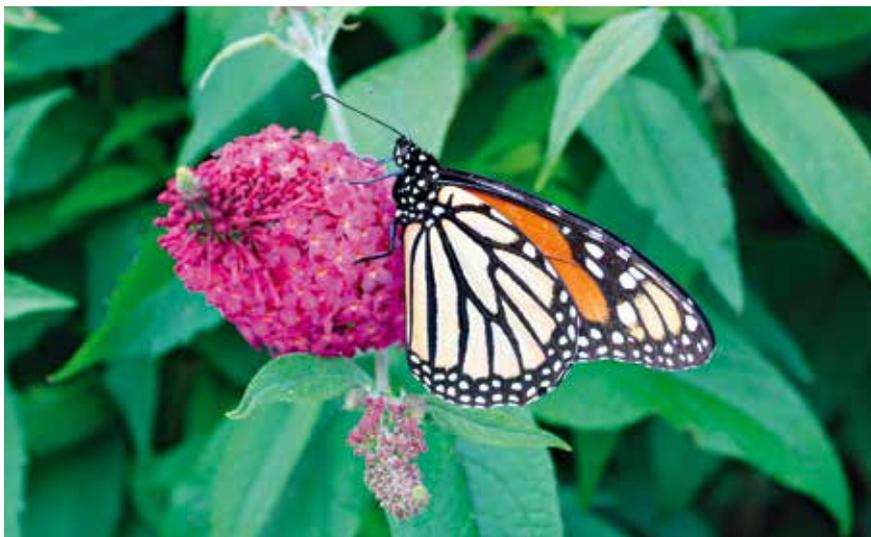


Photo: Shutterstock

Biodiversity, an important resource for the future, is under threat from changes in the environment.



Abundant biodiversity, preservation of ecosystem services and lower environmental impacts

According to the UN, changes in the state of the environment are of critical importance for ecosystems. The loss of biodiversity and disruption of ecosystems are among the greatest challenges facing the world today. While much of this is due to changes in land use, pollution, harvesting, alien species and climate change are also part of the problem. Society must be restructured towards greener forms of development and value creation with more efficient use and recycling of resources.

A decisive factor in this context is better knowledge about the environment and the state of the environment on land and in the oceans. New knowledge is required to preserve biodiversity and cultural environments, to safeguard the positive benefits of a sound environment for health and quality of life, and to diminish health risks from pollution and hazardous substances. There is also a need for new knowledge that can promote societal development and an industrial sector that adequately

incorporate considerations relating to the natural environment and nature's tolerance thresholds.

The Research Council must help to generate knowledge about cumulative environmental effects, and create a framework for greater cooperation between environmental and innovation programmes.

The Research Council will work to:

- Encourage environmental research to focus more widely on the connections between biodiversity, ecosystem services, land use, pollution and environment-related quality of life.
- Increase the focus on interactive environmental effects, valuation of environmental goods, and solutions for sustainable use.
- Facilitate increased cooperation between industry, the public administration and the research community to promote environmentally sustainable development.
- Enable Norwegian knowledge and innovation environments to interact internationally on global environmental issues.

The Research Council will work to:

- Promote more integrated climate research with an emphasis on how different sectors, industries and spheres of society can reduce emissions and adapt to climate changes.
- Facilitate constructive cooperation between the research community, industry and the public administration to ensure that new knowledge and new sustainable solutions achieve rapid societal outcomes.
- Encourage Norwegian research groups to participate actively in the global knowledge effort for sustainable development.
- Generate new knowledge on the interaction between changes in the climate, natural surroundings, culture and society in poor countries, and the impact of climate adaptation on measures to improve economic and social conditions.



Cities in growth face many challenges, but also provide many opportunities for creating sustainable solutions.



Sustainable cities, regions and transport systems

Urbanisation is one of the strongest megatrends in the world today, and is a component of several of the sustainability goals. Tomorrow's cities will need new knowledge to make them inclusive, resilient, adaptable and sustainable. Cities generate innovation and growth and provide many people with the opportunity to advance their lives, economically and socially. At the same time, cities throughout the world are characterised by substantial and often increasing social contrasts.

The challenges that cities face extend across multiple subject fields and sectors, and it is important to view the various knowledge and policy spheres in a unified perspective. There is a need for integrated, cohesive research and innovation on the

factors that form the foundation for sustainable cities. All stakeholders involved in finding solutions must be open to new methods and new partners.

Knowledge is needed to develop adequate housing and basic services; promote sustainable, safe and accessible transport for all; encourage participation and inclusion; safeguard cultural and natural heritage; ensure resilience to disasters; facilitate waste management; protect the environment; and design green and public spaces. Public transport and urban planning efforts must be linked together more directly. New technology, new business models and new services can lead to sustainable mobility solutions.

The development of knowledge at the national and international level will be

closely intertwined, and ideas involving nature-based solutions, living laboratories and smart cities/smart transport systems will thus be of relevance.

The Research Council will work to:

- > Create a foundation for more cross-cutting knowledge about sustainable cities and urban regions by encouraging cooperation between a wide range of sectors and stakeholders.
- > Develop knowledge for safe, inclusive, environment-friendly, climate-resilient, attractive, dynamic cities and urban regions.
- > Develop knowledge for sustainable mobility solutions in and around cities.
- > Further expand global R&D cooperation targeted towards achieving the UN's goals for future cities.



Education that ensures future competency and redresses social inequity

Obtaining an education is the foundation for ensuring the individual's place in working life, and education is a key element of national and global sustainable development. International enrolment rates in schools for children and adolescents have risen dramatically. Nonetheless, millions of children, especially in low-income countries, still do not have access to formal education. This particularly applies to girls. Providing education for children and adolescents in countries and regions grappling with conflict or war is particularly difficult. More knowledge is needed on how to improve learning opportunities and learning outcomes for people in the poorest countries.

Educational systems must be targeted towards society's competency needs and give the next generation the qualifications required to participate in a working life and society based on sustainability principles. Efforts must be made to redress societal inequity and reduce drop-out rates. Education and training must provide children and adolescents with the knowledge, skills and attitudes they will need to take care of our common planet for coming generations.

The Research Council will work to:

- > Expand knowledge to further develop the educational system to fulfil the competency needs of a working life based on sustainable economic growth.
- > Promote research and innovation that will lead to good educational programmes for people in the poorest countries.
- > Promote research that prevents drop-out, enhances learning outcomes and facilitates good learning environments.



Equal access to health and health services

A universally accessible, high-quality health system is essential in the context of individuals, sound economies, labour resources and the pressures on the entire chain of health and welfare services. The foundation for good health is laid early in life, and research is needed on all causes of ill health as well as on measures to promote good somatic and mental health for children and adolescents. A sustainable health and welfare system with universal participation must reduce the inhabitants' need for services by implementing health-promoting and preventative efforts from an early stage.

Health issues in the poorest countries constitute a large proportion of the world's total health problems. These involve diseases and health challenges that have often been neglected, and hit those who are weakest the hardest. Non-communicable diseases are on the rise in poor countries, while communicable diseases are spreading to new areas and populations throughout the world. Research that can promote

permanent improvements in health and reduction of health inequality is an important tool in the battle against poverty.

People's travel habits have changed as a result of globalisation, increasing the risk of spread of disease across long distances. An international health services market and a globalised food market further heighten the risk that antibiotic-resistant bacteria can reach across national borders.

The Research Council will work to:

- > Promote research on global health challenges.
- > Pave the way for more research on anti-microbial resistance.
- > Encourage research on interconnected health and welfare services that can promote permanent improvements in health and reduce health inequality.
- > Encourage research on health-promoting and preventative measures, especially with regard to children and adolescents.
- > Facilitate good cooperation between the public sector, civil society, industry and research environments to develop new, resource-efficient solutions for society.



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Much of the world's population still lacks adequate access to health services and education.



Reduced poverty and inequality

More than 800 million people still live in extreme poverty. There is great inequality between countries and within individual countries as well. Much of the world's population still lacks adequate access to health services and education. War and conflict often cause social structures to collapse, impoverishing the people and forcing them to leave their homes and flee. Conflicts, together with natural disasters due to climate change, have led to enormous poverty and need that evolve into major humanitarian crises. The poorest countries and the poorest segments of the population are the ones most seriously afflicted.

The humanitarian challenges have contributed to large-scale migration flows. Global

migration will in all likelihood continue to rise if we do not succeed in eradicating poverty, reducing inequality and improving the integration of marginalised groups. Sustainable development in the South will therefore be critical for reducing the pressure on societies in other parts of the world. Research is essential for finding constructive solutions to humanitarian challenges in the countries of origin, and for dealing with the challenges related to migration in the recipient countries.

Inequality is increasing in wealthy countries as well, generating more widespread feelings of alienation and diminishing confidence in societal institutions. This has raised conflict levels dramatically, and undermined democracy in previously well-functioning countries. Measures to

promote participation in working life, income safeguards, an adequate educational system and good health and welfare services are particularly important for realising successful integration and combating alienation and marginalisation.

The Research Council will work to:

- > Encourage research and innovation to eradicate poverty and promote greater equality.
- > Encourage research that generates new knowledge about peace and conflict.
- > Facilitate research on the effects of climate change and ecological disasters on the poorest countries, and what kinds of adaptations are called for.
- > Encourage research on the causes of migration and how best to support migrants.



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Sammendrag

Behovet for økt bærekraft får stadig større oppmerksomhet i store deler av verden. Mange peker på at den globale utviklingen ikke bare truer klodens velferd, men også utfordrer grunnleggende og verdifulle trekk ved våre samfunn.

Vekt på bærekraft er ikke noe nytt. Brundtland-kommisjonen introduserte allerede i 1987 bærekraftig utvikling som en samfunnsutvikling som "imøtekommer dagens forbruksbehov uten å forringe mulighetene for kommende generasjoner til å få dekket sine". Det var en erkjennelse av at den økonomiske utviklingen ikke tok tilstrekkelig hensyn til sosiale og miljømessige forhold, og kunne være en trussel mot framtidige generasjoner.

Bærekraft er et vidt begrep som fanger ulike aspekt og tilnærminger – avhengig av ståsted. Vi velger å knytte begrepet opp mot FNs 17 bærekraftsmål. De kan sees på som en operasjonalisering av bærekraft langs dimensjonene miljø og klima, sosiale forhold og økonomisk utvikling (ofte vist til som "den triple bunnlinje"). Disse områdene representerer noen av de mest sentrale globale samfunnsutfordringer verden står overfor. FN peker på behovet for en bred, felles global arbeidsplan for å utrydde fattigdom og sult, skape bedre helse og bedre utdanning for alle, bekjempe ulikhet og stoppe miljø- og klimaendringene innen 2030. FN erkjenner at det er nødvendig å investere i ny kunnskap og ny teknologi for å nå målene, og understreker betydningen av at utfordringene må møtes på tvers av ulike institusjoner, fag, temaer og sektorer.

Tiden fram til 2030 er kort. Det haster med å utvikle nødvendig kunnskap og løsninger gjennom en global kunnskapsdugnad. Økt gjennomføringsevne og nye partnerskap trengs for å nå målene – nasjonalt og globalt.

Norge har gode forutsetninger for å bidra. Vi har et velutviklet forsknings- og utdanningssystem, vi har ledende kunnskapsmiljøer på områder som er viktige for bærekraft og vi har god forskningsinfrastruktur og høy deltakelse i internasjonalt forskningsamarbeid. Videre har vi en velutviklet offentlig sektor og et internasjonalt orientert næringsliv med høy kompetanse på viktige områder hvor vekt på bærekraft vil gi store verdiskapingsmuligheter. Norge er med andre ord godt posisjonert til å ta et aktivt eierskap til de globale utfordringene som FN trekker opp.

Forskningsrådet er myndighetenes sentrale rådgiver i forskningspolitiske spørsmål og fordeler årlig vel ni milliarder kroner til forskning og innovasjon. Forskningsrådets strategi for bærekraft tar utgangspunkt i hovedstrategien "Forskning for innovasjon og bærekraft". Strategien synliggjør hvilken rolle forskning og innovasjon har i å nå bærekraftsmålene, hvordan vi følger opp bærekraft i våre satsinger, og hvilke implikasjoner dette har på ulike områder.

Bærekraftsutfordringene er globale og må møtes med forskning og innovasjon som utvikles i et globalt samspill der kunnskap deles mellom fag, institusjoner, sektorer og ikke minst land.

Målet med Forskningsrådets bærekraftsstrategi er å bidra til å utvikle kunnskap og løsninger for å:

- > møte nasjonale og globale samfunnsutfordringer knyttet til bærekraft
- > bidra til næringsutvikling som gir økt bærekraft og grønn konkurransekraft

Strategien legger premisser for Forskningsrådets arbeid med bærekraft langs flere dimensjoner. Vi skal:

- > prioritere bærekraft i finansiering av FoU
- > videreutvikle virkemidler som treffer bærekraftsutfordringene
- > styrke bærekraftperspektivet i internasjonalt FoU samarbeid.

Næringslivet og offentlig sektor har nøkkelroller i arbeidet med å møte bærekraftsutfordringene. Forskningsrådet vil derfor legge vekt på å mobilisere norske bedrifter og norsk offentlig sektor til å identifisere og utnytte de mulighetene som målene om økt bærekraft i samfunn og næring representerer.

For å møte bærekraftsutfordringene i Norge og globalt vil Forskningsrådet styrke forsknings- og innovasjonsinnsatsen innenfor prioriterte kunnskapsområder. Dette er områdene som er særlig relevante for FN-målene, og der Norge har fortrinn og muligheter med tanke på verdiskaping for norsk næringsliv og fornyelse av norsk offentlig sektor.

Områder som bidrar til næringsutvikling som støtter opp om bærekraft og grønn konkurransekraft

- > Rene, trygge og produktive hav
- > Bærekraftig bioøkonomi
- > Ren energi – grønn konkurransekraft
- > Sirkulær økonomi

Områder som bidrar til samfunnsutvikling som støtter opp om bærekraft

- > Reduserte klimaendringer og gode tilpasningstiltak
- > Rikt naturmangfold, bevaring av økosystemtjenester og redusert miljøpåvirkning
- > Bærekraftige byer, regioner og transportsystemer
- > Utdanning som sikrer framtidens kompetanse og motvirker ulikhet
- > Lik tilgang til helse og helsetjenester
- > Redusert fattigdom og ulikhet

Full versjon av *Forskningsrådets strategi for bærekraft: Forskning for bærekraftig samfunns- og næringsutvikling (2017–2020)* kan lastes ned fra www.forskningsradet.no/publikasjoner.

Attachment: The UN Sustainable Development Goals

Goal 1: End poverty in all its forms everywhere

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Goal 3: Ensure healthy lives and promote well-being for all at all ages

Goal 4: Ensure inclusive and quality education for all and promote lifelong learning

Goal 5: Achieve gender equality and empower all women and girls

Goal 6: Ensure access to water and sanitation for all

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all

Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation

Goal 10: Reduce inequality within and among countries

Goal 11: Make cities inclusive, safe, resilient and sustainable

Goal 12: Ensure sustainable consumption and production patterns

Goal 13: Take urgent action to combat climate change and its impacts

Goal 14: Conserve and sustainably use the oceans, seas and marine resources

Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss

Goal 16: Promote just, peaceful and inclusive societies

Goal 17: Revitalize the global partnership for sustainable development

(Source: United Nations, <http://www.un.org/sustainabledevelopment/>)





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