

## **BIONÆR**

**Research Programme on Sustainable Innovation in Food  
and Bio-based Industries**

**Preliminary work programme  
2012-2022**

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# The BIONÆR programme – preliminary work programme

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## 1 Summary

## 2 Background

This work programme lays down the framework for the Research Programme on Sustainable Innovation in Food and Bio-based Industries (BIONÆR). The overall thematic area of the programme encompasses agriculture, forestry and nature-based value chains as well as seafood and marine biomass, from the time raw materials are taken out of the sea until they reach the consumer. New areas of focus under the programme are primarily linked to the concept of the bioeconomy and to achieving closed-loop systems. This represents a new approach to thematic areas included under the now-concluded Food Programme and Research Programme on Nature-based Industry (NATUROGNAERING).<sup>1</sup>

The BIONÆR programme is designed to encourage research and innovation that promote Norway as a more bio-based society.<sup>2</sup> The underlying framework conditions established for bio-based value chains in Norway affect a wider range of these activities than is the case for other industries. The regulations and support schemes put in place entail that the government administration has a more active role vis-à-vis the industry players. The authorities also take active part in determining where to target research activities in the bio-based industries. This is in part due to the industry's need for fundamental knowledge that is not industry-financed, and in part to the public sector's need for knowledge to support its development of the regulatory framework and exercise of authority.

Thus, the bio-based industrial sector encompasses a wide range of value chains that are based on different conditions and include some intrinsic conflicts of interest. Many industry organisations take an active role vis-à-vis the Research Council of Norway, participating extensively in the design of research initiatives. This will naturally influence the way in which the Research Council's initiative on bio-based industry is organised. It is clear that the BIONÆR programme will need to seek out the involvement of, and engage in dialogue with, trade and industry and the public authorities, and suitable work forms will be developed to facilitate this.

A foresight analysis was conducted under the Food Programme in 2008-2009 in cooperation with representatives of trade and industry, the research community and special interest organisations. The results of this process form an important part of the foundation for the BIONÆR programme. Among other things, the foresight study pointed out that the importance of cooperation and task-sharing between Norwegian and international research communities is growing. Activities under the BIONÆR programme

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<sup>1</sup> The project portfolios of these two programmes have been incorporated into the BIONÆR programme and will be continued.

<sup>2</sup> Innovations are new or significantly improved goods, services, processes, organisational forms or marketing models that are introduced to enhance value creation and/or for the benefit of society. (Innovation Strategy for the Research Council of Norway; based on the OECD's definition of innovation, in the Oslo Manual: Oslo Manual – Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition (2005))

will be carried out in conformance with the Research Council of Norway's Strategy on International Cooperation and Innovation Strategy. The *international strategy* provides clear guidelines for achieving coordinated initiatives by integrating international activities into corresponding national activities. The *innovation strategy* attaches importance to the participation of Norwegian companies in research activities and to ensuring that the findings generated are of benefit to trade and industry and the public sector alike.

## 2.1 Strategic perspectives

### *Bioeconomy*

The emergence of the concept of the *bioeconomy* forms the strategic backdrop for the launching of the BIONÆR programme. The growing awareness of global challenges to society (such as adequate access to food, emissions reductions and adaptation to climate change, sustainable management of natural resources, bioenergy and bio-based products, and employment and competitiveness), brings to the fore the need for research and innovation to support a more bio-based society. The BIONÆR programme is designed to enable Norwegian bio-based industry to advance and contribute in this global context to a knowledge-based bioeconomy.

The BIONÆR programme will seek a clear role among the many instruments designed to foster the development of the bioeconomy. The Research Council has established a number of initiatives of relevance to the bioeconomy in recent years. These address food production, aquaculture and fisheries, agriculture, forestry, the environment, energy and biotechnology, among other areas. Other public agencies within the research and innovation system, such as Innovation Norway and industry funds, have funding schemes targeting bio-based industries as well.

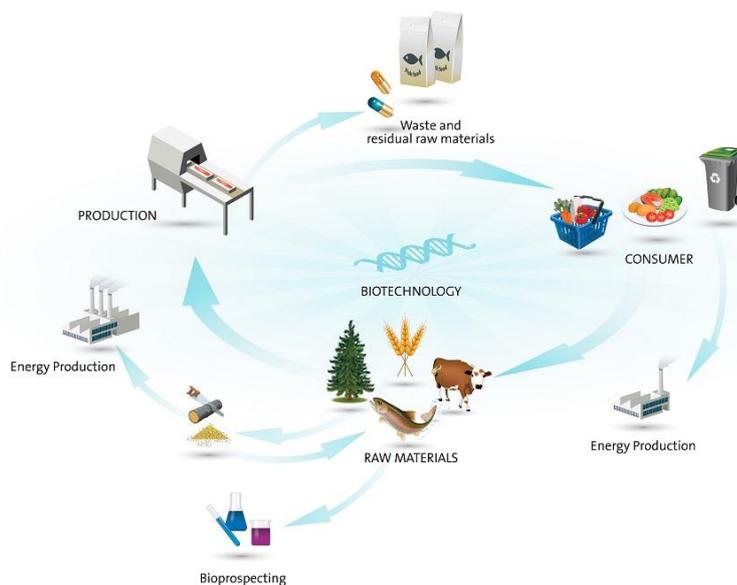
The term bioeconomy refers to sustainable land-use and the production and conversion of biomass into a host of food, health and fibre products, industrial products, and energy. Renewable biomass includes all biological resources (agricultural, forest-based and animal-based, including fish) which are either products in their own right or raw materials for other products or processes.

The EU, the OECD and a number of individual countries have drawn up strategies for the bioeconomy in recent years.<sup>3</sup> The bioeconomy concept is an underlying principle of Horizon 2020 – the upcoming EU Eighth Framework Programme for Research and Innovation – and several Joint Programming Initiatives (JPIs) address grand challenges relating to the bioeconomy.<sup>4</sup>

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<sup>3</sup> EU (2010): “The European Bioeconomy in 2030: Delivering Sustainable Growth by Addressing the Grand Societal Challenges”; OECD (2009): “The Bioeconomy to 2030: Designing a Policy Agenda”; Germany: “Innovation Bio-economy” (Bio-economy Council Report 2010); Denmark (2009): “Agreement on Green Growth”; Finland (2009): “Using Natural Resources Intelligently”; Ireland (2009): “Developing the Green Economy in Ireland”.

<sup>4</sup> Agriculture, Food Security and Climate Change (FACCE-JPI); Healthy and Productive Seas and Oceans (JPI Oceans); A Healthy Diet for a Healthy Life (JPI HDHL).



*This diagram illustrates the bioeconomy web.*

The bioeconomy is future-oriented and links together the primary industries and associated new and established value chains. In the bioeconomy, value chains are interconnected and individual sectors are part of a larger whole. Cooperation across sectors is vital. The overall focus is to achieve closed loops with effective, sustainable use of biological resources, while maximising value creation and making a positive impact on society. There are tremendous opportunities for developing new forms of production for various types of biomass, new biomass-based products and services, as well as new ways of utilising waste and residual raw materials as resources. New technologies are emerging that will help to realise these opportunities to a greater degree than previously possible.

In Norway, both the agriculture sector and the fisheries and aquaculture sector have industry funds based on a levy. Together these funds have some NOK 300 million at their disposal, including the basic funding received by the Norwegian Institute of Food, Fisheries and Aquaculture Research (Nofima). The funds finance research activities aimed at achieving common industry goals. The overall objective is to ensure that the various public support schemes complement one another in order to provide integrated funding opportunities. Given the size and influence of these industry funds, it is crucial that the BIONÆR programme administration engages in productive dialogue and cooperates closely with them to ensure strategic coordination.

## **2.2 Scientific perspectives**

The scientific perspectives for the BIONÆR programme reflect the overarching vision of realising the bioeconomy and solving global challenges. While the production of food and other bio-based products will always have some impact on the environment, consumers and society at large will increasingly demand that these activities leave a lighter environmental footprint in the form of negative climate impacts and environmentally harmful emissions and instead promote sustainability. It is imperative to incorporate a sustainability perspective in all knowledge-building for bio-based industry and in management of land use, primary production and processing. The emergence of new types of bio raw materials will open up new opportunities for processing these materials, which in turn will require knowledge development based on new technologies. More effective utilisation of our overall bioresources may be achieved by cross-utilisation of

raw materials and goods among different (bio-based) value chains.<sup>5</sup> Current ways of thinking must shift away from the notion of a linear value chain, which ultimately leads to waste, and towards the vision of full utilisation of bio raw materials in closed-loop systems, with maximum value creation as part of the outcome.

The scope of the BIONÆR programme encompasses the following thematic priority areas:

**a) Land use, agriculture and forestry, and new biomass**

The bio-based industries must work to achieve more productive, resource efficient and environmentally sound biomass production. This applies to agriculture, forestry and other types of biomass production as well as land use and management of bio-based natural resources. The use of more and more land for industrial activities and biomass production is putting growing pressure on land use management. Forest and other uncultivated land resources and cultural landscapes must be utilised in a manner that balances commercial interests and conservation of resources and biodiversity. Norway has considerable unutilised forestry resources and the capacity to turn out products of higher value. Forests also comprise a positive contribution in climate accounts.

Maintaining sustainable, climate-appropriate agricultural activities throughout the country is an overall political objective. In order to produce sufficient quantities of food, feed and other bio raw materials, production systems must be optimised and must integrate agronomical and environmental perspectives. Healthy, well-adapted animals and plant materials are crucial to profitable, low environmental impact industry. In future and existing biomass production, residual raw materials must be optimally utilised along the entire value chain for food, feed, bio-based products and energy. Bioenergy production can help to achieve full utilisation of bioresources and thus a closed-loop system.

**b) Food**

Consumer awareness surrounding food and the meal experience is growing, and adequate access to safe, high-quality food is critical. A better diet and healthy food products can save society significant sums over time, as well as improve consumers' day-to-day lives.

Creating a sustainable, innovative and competitive food industry with low production costs and high product quality requires knowledge about consumer preferences, effective processes, technologies, food analysis methods, product tracing methods and more. Reducing loss, extending shelf life and improving utilisation of all residual raw materials from food production and consumption in the entire production cycle will help to enhance profitability and lessen negative impacts on the climate and the environment.

Norway has abundant marine resources and a special responsibility for producing safe seafood of high quality. Exploiting the potential for processing Norwegian seafood raw materials will help the country to realise the vision "Norway: the world's leading seafood nation."

Appropriate framework conditions within trade and industrial policy are essential to the Norwegian food industry. Norway exports seafood to over 150 countries, while agriculture-based food products are primarily sold on the domestic market. There are many challenges here that can only be met by actively expanding the knowledge pool.

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<sup>5</sup> Cross-utilisation involves the use of resources from one industry/value chain in another area of industry.

### c) Wood

Wood is an environment-friendly product, as it binds CO<sub>2</sub> and does not require very energy-intensive processing. Norway has considerable capacity for production and application of wood products of higher value. There are knowledge-related challenges associated with wood-based products and value chains, from forest to market. The industry now has many opportunities to promote the use of wood rather than its substitutes in the markets for new construction, restoration and furniture/interior decor. There is a need to develop knowledge that will enhance innovation, value creation and market orientation along the entire wood value chain.

### d) New bio-based products

New bio-based products may be developed by refining or processing all types of biomass. Today bio-based components compete on the market with chemically-produced and petroleum-based substances. There is considerable potential for value creation in the processing of marine residual raw materials. Packaging based on biological materials is a product group with significant growth potential.

### e) Services

There are many opportunities for developing new services relating to food and fibre production. Services may also be developed based on the cultural landscape, collective goods, identity and quality of life. These include, for example, services related to tourism (fishing and hunting tourism, rural tourism, culinary traditions and tourism, nature guiding, etc.), hunting and competition animals and pets, recreation, health and care, and training and education. There is a need for knowledge for strategic development, competence-building, processes, products and services.

## 3 Objectives of the programme

The scope of the BIONÆR programme encompasses:

- agriculture, forestry and nature-based value chains;
- seafood, from the time the raw materials are taken out of the sea until they reach the consumer.

Primary objective:

**The BIONÆR programme will promote research and innovation that enhances value creation in Norway's bio-based industries.**

In keeping with this, the programme will:

1. Strengthen and develop
  - knowledge and expertise in selected areas to promote sustainable bio-based industry in Norway;<sup>6</sup>
  - research-based innovation in bio-based companies and bioresource management.

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<sup>6</sup> The term sustainability is an economic, social, and ecological concept. (EU: "The European Bioeconomy in 2030")

2. Implement innovative work forms that involve players in the research community, trade and industry, the public administration and special interest organisations.
3. Use coordination and dissemination activities to enhance the benefits of knowledge and expertise gained by the industry and public administration.
4. Participate in international cooperation in order to strengthen knowledge-building and innovation in priority areas.

#### **4 Cross-cutting perspectives, work forms and instruments**

The BIONÆR programme is an industry-oriented programme designed to further develop existing industries and facilitate the establishment of new industrial activities in Norway. This entails a focus on the resource base, raw materials production, processing and consumption associated with agriculture and nature-based value chains and seafood. Research activities under the BIONÆR programme will be also targeted towards production and utilisation of types of biomass on which little or no research has been conducted, such as on algae, microbial products and residual raw materials.

Importance will also be attached to generating knowledge for use in resource management and policy development. Boosting innovation and value creation will in many cases require changes in the regulatory framework and other framework conditions as well as adjustment of incentives. Creating conditions conducive to commercialisation of research-based knowledge is essential.

The following cross-cutting perspectives will apply to all research activities under the BIONÆR programme:

- Sustainable production and consumption, emissions reductions and adaptation to climate change;
- Improved resource efficiency in new and existing biomass production and full utilisation of all biological resources in closed-loop systems. Focus on reducing food loss and discard and on using residual raw materials as a resource;
- Further refinement of existing and development of new types of value-creating cross-utilisation between resource streams;
- Further refinement of existing and development of new processes, products and services;
- Enhanced value creation and competitiveness in the bio-based industries, with a focus on market orientation and innovation in all segments of the various value chains.

Thematic priority areas under the programme (content to be further developed):

- a) Land use, agriculture, forestry and new biomass
- b) Food
- c) Wood

- d) New bio-based products
- e) Services

#### **4.1 Work forms**

Research activities must be adapted to accommodate complex social challenges and the rapid pace of social change. In addition to delving deeper into research questions dealing with specific industry challenges, research activities must cope with various areas of interface with society at large. The interaction between research, technology and society brings into question the traditional view that there must be a clear division between research and politics. The role of research will no longer be limited to helping to solve already identified societal problems. On the contrary, research and technology will have a more direct impact on social development.

It is clear that interdisciplinarity and cooperation will be crucial to developing the knowledge needed to realise the bioeconomy. Efforts will have to be made to facilitate new constellations and forms of interaction within the research community and between the research community and industries/companies, the public authorities and consumers. This will call for new approaches to leadership and management of research and innovation processes as well as experimentation with new ways of working, new meeting places and new networks.

##### *Dialogue arenas*

In keeping with ongoing advances in the thematic priority areas and pertinent research policy, the BIONÆR programme will facilitate new work forms. *Permanent fora for dialogue* between industry players, industry organisations, the research community and the relevant authorities will be established. In addition, more *ad-hoc workshops and seminars* addressing specific challenges and research questions will be held. The use of various foresight methods to explore and develop alternative perspectives and paths as a basis for priority-setting for the programme will also be of relevance here.

The above-mentioned dialogue arenas will provide the BIONÆR programme with input for determining priority thematic areas for annual funding announcements for long-term competence-building. The arenas will also provide input on how to allocate programme funding in the next few years. The arenas will be established in cooperation with the industry funds and representatives of relevant programmes at the Research Council.

It will be made transparent to all stakeholders how dialogue, cooperation and strategic activities will be developed under the BIONÆR programme. The programme board and administration will take the final decisions regarding the composition and structure of the permanent dialogue arenas in consultation with the industry funds.

#### **4.2 Instruments employed by the programme**

##### *Long-term competence-building*

Solving the challenges identified in this work programme will call for knowledge-building across competencies and new competence configurations. Innovative projects and knowledge-building to promote the bioeconomy will have to incorporate integrated and multidisciplinary approaches. Long-term research under the BIONÆR programme will primarily be funded in the form of large-scale interdisciplinary projects. Such

projects will allow researchers to address topics such as primary production, innovation, value creation, market orientation, climate-related issues and consumer issues in a variety of combinations.

Large-scale interdisciplinary projects also offer the opportunity to incorporate both industry-oriented research and strategic basic research. Such projects can also better address and integrate the differing knowledge needs of trade and industry and the public administration. Such projects will have to be organised in a manner that promotes effective information flow within the project itself as well as active dialogue with users.

The need to establish various types of networks between large-scale interdisciplinary projects and smaller-scale, more targeted projects addressing the same topics will be assessed during the programme period.

With regard to narrower research questions, these may be incorporated into large-scale projects under the BIONÆR programme or studied in international collaborative projects. Support for such research may also be sought from other funding sources, such as the Research Council's funding scheme for independent basic research projects (FRIPRO) and the regional research funds. In special cases, the BIONÆR programme may issue separate funding announcements for projects of smaller scope and somewhat shorter duration.

#### ***User-driven research***

The BIONÆR programme will continue the activities of the Food Programme and the NATUROGNAERING programme to promote user-driven research. The funding instrument Innovation Projects for the Industrial Sector (IPN) will be used to encourage companies in all segments of bioeconomy value chains to step up their research efforts. To be eligible for funding, IPN Projects will have to address topics within the overall thematic area of the BIONÆR programme; normally there will be no other thematic limitations.

## **5 Coordination with other related instruments at the Research Council**

The Research Council is focusing on research related to the bioeconomy across a broad spectrum. The BIONÆR programme will be a key component in this, but other thematic programmes and programmes on generic technologies will have important roles to play as well. Close, systematic cooperation and seamless coordination between these programmes will be a high priority and success criterion. Joint measures to promote dialogue with users and joint strategic planning and funding announcements are relevant measures in this context.

Within the area of *seafood*, strategic, ongoing cooperation with the research programmes Aquaculture – An Industry in Growth (HAVBRUK) and the Oceans and Coastal Areas (HAVKYST) will be crucial, particularly for realising the vision “Norway: the world's leading seafood nation”. In the area of *food and health*, the Research Programme on Public Health (FOLKEHELSE) and the Research Programme on Environmental Exposures and Health Outcomes (MILPAAHEL) will be important partners in cooperation.

The BIONÆR programme will cooperate with the programme Clean Energy for the Future (RENERGI) on research relating to the bioenergy value chain.

The Programme for User-driven Research-based Innovation (BIA) provides funding to research projects in areas that are not covered by the Research Council's industry-oriented thematic programmes. The BIONÆR programme will cooperate with the BIA programme on an ongoing basis to draw up a clear delineation in the area of primary production and processing of biological resources. The programmes Norwegian Environmental Research towards 2015 (MILJO2015) and Climate Change and Impacts in Norway (NORKLIMA) are responsible for multi- and interdisciplinary research on climate and the environment at a more general level. These programmes share an important area of interface with the BIONÆR programme on environmental and climate-related research questions dealing with bio-based closed-loop systems. The programmes will engage in ongoing dialogue and issue joint funding announcements on overlapping research questions.

The BIONÆR programme seeks to cooperate closely and systematically with the programmes on new, generic technologies. The research on biotechnology conducted under the Research Programme on Biotechnology for Value Creation (BIOTEK2021) will be of greatest relevance for the BIONÆR programme. The programme will assess potential areas of cooperation with the Programme on Nanotechnology, Nanoscience, Microtechnology and Advanced Materials (NANO2021) and the Research Programme on Core Competence and Value Creation in ICT (VERDIKT) as well.

## **6 Coordination with Innovation Norway and the industry funds**

It is essential that the BIONÆR programme and other public funding schemes targeting the bioeconomy complement rather than compete with each other. Cooperation has been established between the BIONÆR programme and Innovation Norway, more specifically with the wood-based innovation programme and the marine value creation programme. Cooperation in other areas will be established as well. Dialogue and relevant cooperation will be established between the BIONÆR programme and the regional research funds and the SkatteFUNN scheme (a tax deduction scheme for R&D activity in Norwegian companies).

There are two major industry funds in the area of food: the Foundation for Research Levy on Agricultural Products/the Agricultural Agreement Research Fund and the Fishery and Aquaculture Industry Research Fund (FHF). In the area of forestry, three funds – the Forest Research and Development Fund, the Forestry Development Fund and the forestry industry's value creation fund (Skogbrukets verdiskapingsfond) – have a total of roughly NOK 13 million at their disposal annually. The funds are of major significance to their respective industries. An effort will be made under the BIONÆR programme to enhance cooperation and coordination with all of the funds to ensure optimal task-sharing and integrated activities to the benefit of the industries.

Common strategic processes will be established with the Foundation for Research Levy on Agricultural Products/the Agricultural Agreement Research Fund. Dialogue meetings with representatives of industry and the research community will be organised to obtain input with regard to prioritising of research topics. Representatives of the Foundation for Research Levy on Agricultural Products/the Agricultural Agreement Research Fund and the BIONÆR programme will discuss and clarify areas of focus and task distribution,

both in terms of thematic areas and in terms of funding instruments, in order to avoid overlap and provide integrated funding opportunities.

The FHF has established advisory expert groups in the fund's priority areas. The system works extremely well, and efforts will be continued under the BIONÆR programme to collaborate with the groups to ensure productive dialogue on marine industry.

## **7 International cooperation**

Active international cooperation and effective distribution of tasks at the national and international levels are crucial to creating a thriving bioeconomy that can effectively address the grand societal challenges. The BIONÆR programme will actively promote international cooperation, particularly when it will improve the quality of knowledge-building or stimulate more or better innovation in the business sector. International collaborative activities under the BIONÆR programme will be in keeping with the Research Council of Norway's Strategy on International Cooperation.

Norway is a participant in several European Joint Programming Initiatives (JPIs) of relevance to the BIONÆR programme, in particular Agriculture, Food Security and Climate Change (FACCE-JPI), Healthy and Productive Seas and Oceans (JPI Oceans), and A Healthy Diet for a Healthy Life (JPI HDHL). The BIONÆR programme administration will coordinate its activities with the Research Council administration on these JPIs in order to ensure effective task-sharing and pursuit of the appropriate initiatives.

The programme will employ instruments to support institution-to-institution collaboration in cases where creating ties between Norwegian research groups and institutions in selected countries will strengthen knowledge-building in Norway. The need to implement specific measures to promote participation in international cooperative efforts will be assessed on an ongoing basis. Funding to enable Norwegian players to position themselves in the competition for international funding is a relevant instrument in this context.

Importance will be attached to ensuring adequate focus on international cooperation in the programme's project portfolio. The focus and scope of this collaboration in the portfolio will be reviewed prior to the issue of each call for proposals and will be clearly expressed in the calls themselves. The programme's prime instrument for promoting international cooperation will be participation in joint calls for proposals across national boundaries; for example, joint calls under the ERA-NET scheme, joint Nordic calls (which are often issued under the auspices of the Nordic organisations NordForsk and the Nordic Innovation Centre), and bilateral calls under the auspices of the programme itself or as part of funding announcements issued from other parts of the Research Council. It may be relevant to provide mobility funding for individual researchers under the programme as well.

Already at start-up, the BIONÆR programme is participating in four *ERA-NETs*: WoodWisdom-Net on wood, forestry and wood-based materials; Sustainable Food Production and Consumption (SUSFOOD) (post-farmgate); CORE Organic II on organic food and farming; and Animal Health and Welfare (ANIHWA). The programme will also participate in the new ERA-NET on the value chain for fish which is currently being established. The programme will take active part in joint calls issued under new and existing ERA-NETs.

The BIONÆR programme will participate in *Nordic cooperation* under the Nordic Joint Committee for Agricultural Research and the Nordic Innovation Centre. The programme will seek to develop Nordic cooperation in areas of particular interest to the Nordic countries or in research areas where there is no longer critical mass in Norway.

The BIONÆR programme will be party to and take the initiative to issue *bilateral calls for proposals*. Importance will be attached to obtaining a good overview of the state-of-the-art as a basis for decision-making with regard to bilateral calls.

*The EU Seventh Framework Programme for Research and Technological Development (FP7)* and *Horizon 2020* will both be of major importance to the BIONÆR programme. Detailed information will be provided to users on developments under FP7 Theme 2: Food, Agriculture and Fisheries, and Biotechnology, whose aim is to help to implement the knowledge-based bioeconomy. An effort will be made to optimise task-sharing in terms of funding opportunities under the framework programmes as well as to build up Norwegian research groups of sufficient calibre to participate in the framework programmes.

## **8 Communication and dissemination activities**

It is generally recognised in Norway and in Europe that the application of research outcomes in industrial and social development does not necessarily match the investment in knowledge-building. Effectively utilising and disseminating research findings constitutes a major challenge. Communication and dissemination will therefore comprise core activities under the BIONÆR programme.

Relevant target groups for dissemination measures include:

- industry;
- the research community;
- the public administration and the authorities;
- special interest organisations and society at large;
- other activities under the Research Council and other public agencies in the research and innovation system;
- international partners in cooperation.

The programme will consider collaborating with consulting firms, professional forums and industry organisations to enhance the use of research results in industrial activities. The Research Council's role as a meeting place to promote effective communication and dissemination will be enhanced and strengthened. Network-building and development of dynamic forms of collaboration in connection with the establishment of larger-scale, more interdisciplinary projects will increase knowledge transfer as well.

## **9 Budget**

The BIONÆR programme's budget for 2012 is approximately NOK 210 million. Of this, the Ministry of Agriculture and Food is allocating roughly NOK 152 million (not certain yet), the Ministry of Fisheries and Coastal Affairs around NOK 36 million, the Ministry of Trade and Industry around NOK 10 million, the Ministry of Education and Research around NOK 10 million, and the Ministry of the Environment around NOK 2 million.

## **10 Organisation**

The programme board will be appointed by the Research Board of the Division for Innovation and will follow the mandate established for programme boards of policy-oriented programmes. The programme administration will be located in the Department for Knowledge-based Bioeconomy at the Research Council and will be responsible for the day-to-day tasks of the programme.