
ACTIONS FOR SUSTAINABLE BIOECONOMY IN THE WEST NORDIC REGION

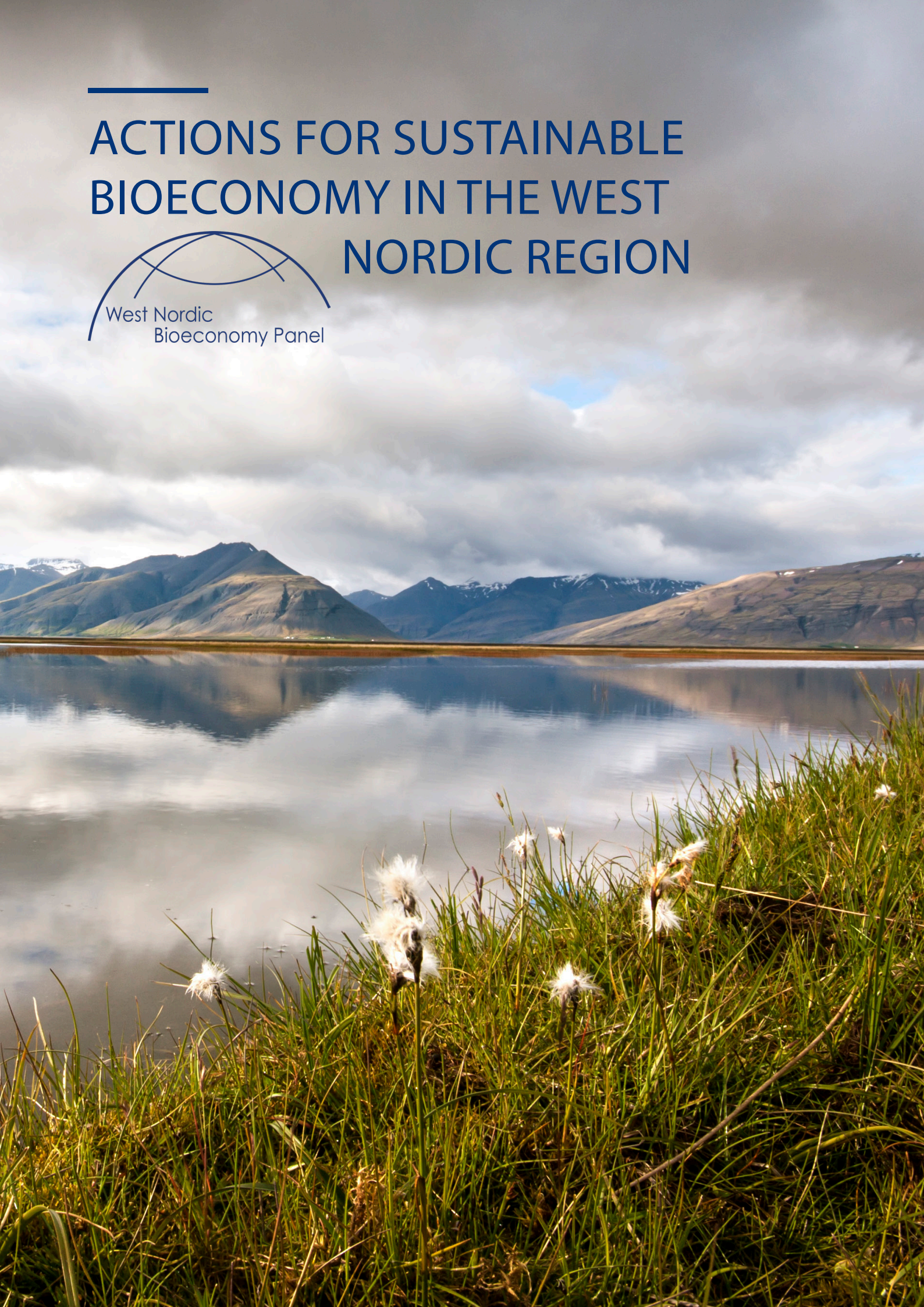


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1. EXECUTIVE SUMMARY

The purpose of the West Nordic Bioeconomy Panel is to identify common key issues of importance for the West Nordic region, identify opportunities, advice industry, governments and the public, as well as promote common key issues and policies. The West Nordic Region includes the Faroe Islands, Greenland and Iceland. The goal is to suggest a sound strategy for the West Nordic region in order to maintain and strengthen its Bioeconomy, as well as to communicate that strategy. The West Nordic Bioeconomy Panel was identified as an action in the final report "Future Opportunities for Bioeconomy in

the West Nordic Countries" (Smáradóttir et al, 2015). The work of the West Nordic Bioeconomy panel is being funded by the Nordic Atlantic Cooperation (NORA). Further information can be found at www.wnbioeconomy.com.

This document outlines the following identified five strategic priorities and proposed related key actions by the West Nordic Bio-economy panel and stakeholder platforms, with the aim of enhancing innovation and long term sustainable value creation within the regions bioeconomy.

Strategic priority	Related key actions
Focus on the Blue Bioeconomy	Establish flagship projects to boost and communicate impact.
Underutilized resources and new opportunities	Secure access to scale-up production facilities and up to date information on biomass supply.
Regional and rural development – infrastructure to support innovation	Identify prioritized bioeconomy regions, conduct infrastructure gap analysis and establish links between bioeconomy industries, researchers and students.
Opportunities across sectors – increasing food security	Development of national food policies.
Aligning incentives for innovation in the West Nordic Bioeconomy	Strategic communication towards industry stakeholders and bioeconomy influencers.

Stakeholder engagement has included meetings with ministries, industry representatives, educational representatives, NGOs and more.

We believe that the identified key actions are sound and realistic. To achieve them real actions are needed. We therefore encourage all stakeholders, including politicians, governmental organizations and companies, to put their ambitions to the task. By doing so the West Nordic societies will contribute to achieving the United Nations Sustainable Development Goals.

2. WHY FOCUS ON THE WEST NORDIC BIOECONOMY?

The Bioeconomy is based on goods and services relying on biological resources. It includes extraction of biological resources and adding value to primary production from biological resources, consumption of biological goods and use of side streams from bioresource value chains:

"The bioeconomy or bio-based economy [...] encompasses the production of renewable resources and their conversion into food, feed, bio-based products and bio-energy. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries". However, the bioeconomy is more than a simple addition of sub-sectors. It can be seen as the set of existing relations between society and the biosphere in several aspects: provision of goods and services, the emission of pollutants and negative externalities but also the production of positive externalities to ensure that the biosphere continues to be functional for future generations"¹.

Marine bioresources play a key role in the bioeconomy of the West Nordic countries. The West Nordic bioeconomy is from that perspective different from the bioeconomy of many other regions. This fact is underlined by the high proportion of marine based bioproducts vs. land-based bioproducts. For food products, which are the backbone of bioproducts, the proportion of marine based products is in the range of 80-95%

in the West Nordic region, while it is below 5% worldwide (Smáradóttir et al., 2015).

The West Nordic countries depend to a high degree on export of biomass, with limited processing, for instance of frozen seafood products. The value potential is however increased as processing and proximity to market increases. Further processing also enables use of side streams with full utilisation and development of new job opportunities. Therefore, innovation that increases processing and production of higher value finished goods is especially important in the West Nordic countries. At the same time, labour cost is high, and many West Nordic regions are sparsely populated with changing demographics impacting regional innovation capacity. Developing human capacity also enables adaptive solutions to climate change and global challenges described in the Sustainable Development Goals by the United Nations, as well as legal obligations such as the Paris agreement.

The importance of food security has increased in past years, with climate change, growing global population, commodity price fluctuations, and political instability resulting in potential disturbances of global logistic routes. The West Nordic countries can contribute to the global need for increased food production and utilisation, but this requires certain infrastructure investments regarding food safety, which is the prerequisite for food trade. Import of food, feed and fertilizers to the region indicates opportunities to increase self-sufficiency, especially with cross sectoral utilisation of side products.

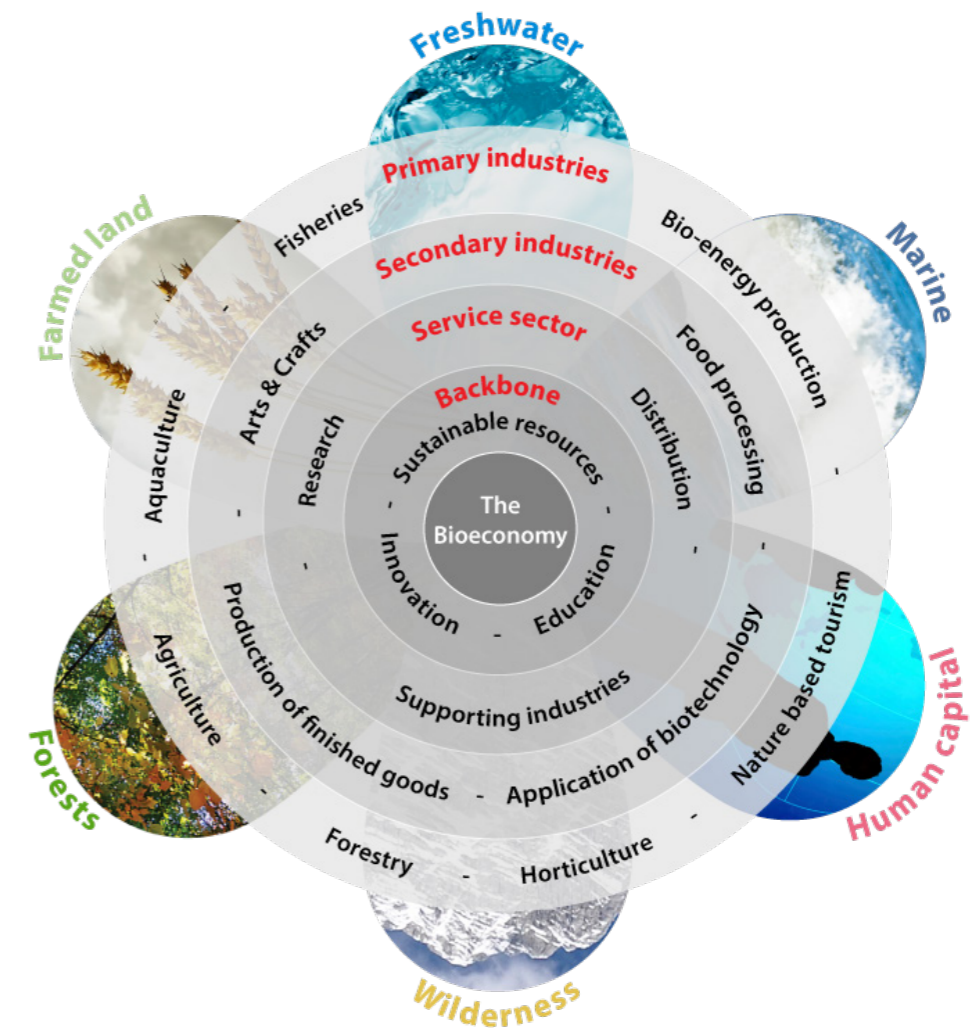


Figure 1. Proposed overview of the bioeconomy (Matís and the Environment Agency of Iceland)

Figure 1 presents a model on how the bioeconomy can be defined. The model identifies five main underlying sources of biological resources; wilderness, forests, farmed land, freshwater and marine, the sixth resource being human capital necessary for economical induction and utilisation of biological resources. Primary industries such as fisheries, agriculture and forestry have been placed on top of these basic sources overlapping with the resources. On top of the primary industries, the secondary industries and serving sectors are located, all overlapping different primary industries and sectors, emphasising the importance of cross sectoral use of resources and side products and enhanced cooperation between sectors as a driver for stronger bioeconomy leading to economic growth.

Finally, at the heart of the bioeconomy flower, three fundamental items have been identified as the backbone for a healthy and strong bioeconomy; sustainable use of resources, education and innovation capacity. These fundamental items are crucial in working towards sustainable utilisation and optimal value creation within the bioeconomy.

¹ Definition from the 4th SCAR Foresight Exercise "Sustainable Agriculture, Forestry and Fisheries in the Bio-economy A Challenge for Europe.

² www.norden.diva-portal.org/smash/record.jsf?pid=diva2%3A791350&dswid=4131



Dried fish in Iceland

3. WEST NORDIC BIOECONOMY STRATEGY THEMES

The West Nordic Bioeconomy panel and stakeholder platforms have identified five strategic priorities and related key actions with the aim of enhancing innovation and long term sustainable value creation within the regions bioeconomy. The priorities and suggested key actions are closely linked with the United Nations Sustainability goals, especially goals nr 9 (Industry, innovation and infrastructure), 12 (Responsible consumption) and 14 (Life below water). We have chosen not to define specific responsible actors for each of the key actions. Instead, we encourage ambitious stakeholders to work towards and realise the actions.

3.1. FOCUS ON THE BLUE BIOECONOMY

Marine bioresources are the most important biological resources of the West Nordic countries, as fisheries contribute extensively to the GDP in all three countries. In order to have a positive impact on value creation in the West Nordic countries, investment in innovation and technology are needed, to ensure long term profitability in seafood value chains. The knowledge available in the West Nordic fishing industry has increased in the last decade and knowledge and technological transfer between the countries and increased cooperation would strengthen the West Nordic countries.



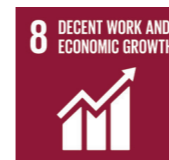
Key action

Establish flagship projects exploring various aspects related to the issue of increased utilisation and value creation from the entire catch and/or underutilised marine resources. Effective dissemination of opportunities and stakeholder engagement are vital components of such a flagship project in order to show benefits and impact and thereby increase awareness of investors, industry and society.



Moving forward

- Define and identify low hanging fruits in the area. An example could be increased value creation from pelagic resources.
- Secure funding of identified flagship projects through public-private partnership (PPP).
- Establish necessary international connections to advance the projects, including technology transfer potential and market knowhow.



3.2. UNDERUTILIZED RESOURCES AND NEW OPPORTUNITIES

The West Nordic region has a variety of biological resources available for sustainable and responsible utilisation, some of which are underutilized. The major underutilized resources include side streams, such as those found in the marine and agricultural industries. However, data on these resources are sparse, resulting in ineffective decision making.



Key action

Secure access to key facilities in order to develop resource utilisation. Such facilities may include R&D and scale-up production facilities such as an open-access biorefinery (mobile or stationary) and food-labs. Having access to food-labs and a multi-functional biorefinery/demonstration plant will speed up development and commercialization of various products from underutilised biomass. Information on biomass supply must be made more readily available and transparent. This will facilitate networking between entrepreneurs and suppliers of biomass and allow for more strategic product development, as well as support effective food policy making.



Moving forward

- Perform feasibility study on key facilities for pilot production and R&D purposes.
- If identified facilities are deemed feasible, an operational model shall be developed, including necessary investment, operation cost, collaborative model etc.
- Ongoing information gathering and dissemination on biomass availability, for instance build on-line resource plaza similar to www.audlindat.org.is



³ A biorefinery is a facility that processes biomass and extracts valuable ingredients and/or converts it into a variety of value-added products, such as feed, food, platform chemicals and energy.

3.3 REGIONAL AND RURAL DEVELOPMENT – INFRASTRUCTURE TO SUPPORT INNOVATION

Opportunities within the bioeconomy are likely to have a positive impact on the inhabitants of the area and help to reverse the trend of young educated people, especially women, moving from rural areas to larger towns, cities and other countries. People seek education away from the rural areas and often do not return due to lack of job opportunities, isolation and other problems that small communities are facing in the West Nordic countries. This results in brain-drain from these areas, social disruption in age and gender and fewer productive members in the societies. In addition, key infrastructures such as high-speed internet connections and adequate transport systems are necessary in order to grasp the regional bioeconomy opportunities.



Key action

Identify rural regions where the bioeconomy is strong and has potential for further growth. Conduct gap analysis within those identified regions regarding necessary infrastructure. Emphasise future needs of the local bioeconomy in regional educational programmes. Establish links between bioeconomy industries, researchers and students at higher education institutions to ensure that the industry can attract a talented and well-educated workforce.



Moving forward

- Identify prioritized bioeconomy regions and conduct infrastructure gap analysis.
- Bring together educational and research institutions, companies and entrepreneurs through specific projects, such as MSc projects and vocational training. Develop educational material with focus on the local bioeconomy and food production, in order to ensure common understanding of the mechanics of food production and the bioeconomy among the public.
- Align and secure incentives to ensure long-term collaboration between industry, research and education. This includes building a system of innovation vouchers for entrepreneurs and R&D tax discount, as well as ensuring that educational institutes take industrial needs into account.



3.4 OPPORTUNITIES ACROSS SECTORS – INCREASING FOOD SECURITY

Food production is the backbone of the modern bioeconomy. There is, however, no food policy in place in the West Nordic countries, resulting in a limited effort for inter-“silo” collaboration and hence limiting growth and innovation potential. Inter-disciplinary cooperation would transfer knowhow and best practices between sectors and reveal new opportunities, such as aquaculture feed production and extraction of valuable biochemicals from agriculture side streams. Cross-sectoral innovation, based on practical research and market trends, should be emphasised when advancing the bioeconomy.



Key action

Summarize, based on previous analyses, the utilisation of various bioresources across sectors in the West Nordic countries. Such a summary, as well as analysis of relevant gaps in relation to utilisation, serves as a foundation for national food policies, which should be developed in consultation with the other West Nordic countries, given the common bioresources. These policies would include issues such as management of bioresources, vulnerability to climate change, natural fluctuations and closing of import routes, as well as potential innovation based on side streams from food production. The policy will also discuss necessary changes of the legal framework of food production to enhance full utilisation of bioresources and effective spatial planning while taking into account scientifically conducted risk assessment towards consumers.



Moving forward

- Summarize outcomes of former analyses, such as All ashore, Future Opportunities in the West Nordic Bioeconomy, Nordregio mapping and more (can be found at www.wnbioeconomy.com/bioeconomy).
- Develop and implement national food/bioeconomy policies in collaboration with a wide range of stakeholders.
- Continue an existing West Nordic platform or set up a forum to ensure efficient consultation when developing the national policies.



3.5 ALIGNING INCENTIVES FOR INNOVATION IN THE WEST NORDIC BIOECONOMY

The West Nordic bioeconomy will have the most positive impact if there is alignment of different initiatives within the region. Nordic, European and global initiatives also need to be taken into consideration. Such an approach increases the effectiveness of bioeconomy related investments, attracts human capital to West Nordic bioeconomy innovation and strengthens market links. It is important for the West Nordic countries to promote common interests, create synergies, provide inputs and influence agendas in international research programs, as well as follow and influence relevant food safety requirements and other prerequisites for biobased trade. Many countries (including Iceland) have initiated R&D tax discount programs, to incentivise R&D based innovation and creation of new products and services, often through Public-Private Partnerships (PPP). Experience shows, however, that understanding of such programs is often limited by traditional food producers, resulting in lost regional opportunities.



Key action

Ensure that the bioeconomy is strategically embedded in national research strategies and facilitate close cooperation between the West Nordic countries to promote knowledge transfer between sectors and countries. Establish and utilise already established pipelines of communications to Nordic institutes such as Nordforsk and Nordic Innovation, as well as Nordic and European research strategy influencers⁴. Establish support mechanisms such as R&D tax discounts and competitive research funds where needed. Already established support mechanisms need to be actively disseminated to industry stakeholders and development of new strategic mechanisms considered. Experience from other areas should be taken into account when assessing such development, as applicable.



Moving forward

- Communicate nationally a common West Nordic approach to bioeconomy innovation (based on chapters 3.1-3.4) with the purpose of aligning bioeconomy opportunities with national research agendas and local food safety requirements.
- Map existing and establish new pipelines of communication to Nordic and European bioeconomy strategy influencers, such as Nordic innovation and committees under EK-FJSL. Communicate a common West Nordic approach through those pipelines.
- Develop and actively disseminate support mechanisms and collaboration platforms, such as R&D tax discount programs and Public-Private Partnerships (PPP), among stakeholders.



⁴ Various Nordic committees, as well as European strategic organisations such as the Standing Committee on Agricultural Research (SCAR), European Food Safety Agency (EFSA), Program committees and more. This can be done through committee members in different committees representing the West Nordic countries and National contact points in the European Commission.

⁵ Committee of Senior Officials for Fisheries and Aquaculture, Agriculture, Food and Forestry.



4. IDENTIFIED ISSUES AND PROPOSED ACTIONS FOR EACH COUNTRY

The West Nordic Countries have a lot in common but there are also differences between them. From discussions with stakeholders in each country, specific issues have been identified and actions proposed to further bioeconomy development within in the countries.

The importance of the strong Greenlandic tradition of hunting and consuming own catch, as well as traditional food processing at home was emphasised by stakeholders. The situation is similar in the other West Nordic countries. The growing tourism and change in consumer patterns in the West Nordic countries gives opportunities to further commercialise those traditions. Based on risk assessment, it is therefore important that regulatory requirements allow small scale fishermen, farmers and hunters to serve their products to this growing market.





Dried fish in Rodebay settlement, Greenland

4.1 GREENLAND

Focus points for further development of the Greenlandic Bioeconomy

- Build up workforce capabilities
- Create educational possibilities for education in Greenland in food technology
- Increase technological know-how on side-streams
- Create solutions to build up infrastructure despite large distance between production facilities and collection of side-streams for further processing
- Introduce solutions for quick distribution of fresh raw materials
- Reduce cost of transport
- Strengthen (enforcement of) environmental regulations and R&D tax incentives
- Strengthen the basic educational system to encourage young professionals with kids moving to Greenland
- Further develop language (especially English) and other skills within the basic education system

Timeline constructed by stakeholders

When	Actions
2019	<ul style="list-style-type: none"> • FoodLab opens • Shrimp and snow crab shell utilization projects ongoing • Process water utilization projects ongoing • Fund in place which is focused on increasing value of the bioeconomy (funded by official & private funds. Funds are distributed non-politically) • An overview of funding possibilities for innovation is in place • Transport discount on rest raw materials and valorisation bioproducts in place
2020	<ul style="list-style-type: none"> • Projects ongoing to increase utilization of ground fish (cod focus) • A new food law bill ready for parliament (depends on political focus) • Seaweed is harvested from farming operations • Industry is highly collaborative with a new educational program focused on skills of key workers in the bioeconomy (e.g. skippers, fishermen, production managers etc.) • Denmark including Faroe Islands and Greenland, chairing the Nordic Council
2025	<ul style="list-style-type: none"> • Greenlandic pet food production has started • Natural sciences and engineering educational programs have graduated at least 14 students



Faroe Islands, Akraberg lighthouse

4.2 FAROE ISLANDS

Focus points for further development of the Faroese Bioeconomy

- Introduce incentives/requirements for bringing biomass ashore as a part of the fishery license.
- Secure policy-stability to encourage investment.
- Clarifying connections between traditional wage structure in the Faroese fishing fleet and the development of the bioeconomy.
- Supply of affordable housing and accommodation of newly arrived workforce.
- Facilitate scalability of operations in relation to access to biomass and market.
- Strengthen support framework for R&D e.g. tax incentives, innovation vouchers etc.
- Clarification of legal status of utilisation of straddling fish stocks and highly migratory fish stock.

Timeline constructed by stakeholders

When	Actions
2019	<ul style="list-style-type: none"> • Open path for students into fields of study with practical importance for the for the Faroese National Economy through partnership • Ongoing projects to increase value through utilisation of pelagic species (handling focus) • Comparative study of wage system in fisheries in the Nordic countries in relation to full utilisation of fisheries in the context of biorefinery • Marine spatial planning to enable establishment of multitropical aquaculture • Pursue funding opportunities for innovative bio-economy actions by combining national, Nordic and European grants • Identify product and market possibilities for Faroese resources through cross-sectoral collaboration (fishing-aquaculture-health-ICT-research etc.) • Increase efforts to participate in bioeconomy policy development on national, Nordic and European level
2020	<ul style="list-style-type: none"> • Assessment of the socio-economic impact of fisheries act reform • Powerful dissemination of the value creation of innovation in the bioeconomy to relevant stakeholders on national, Nordic and European level • Identify needs and create technical standards for utilisation of pelagic resources • Projects ongoing to increase value through utilisation of pelagic species (product and market development) • Projects ongoing to increase value through utilisation of salmon (product development and marketing) • Denmark including Faroe Islands and Greenland, chairing the Nordic Council • Biorefinery pilot plants for macro-algae and potential side streams products from fisheries • Initiate flagship projects within the Blue Bioeconomy in collaboration with industry actors in Greenland, Iceland, Europe and North America
2025	<ul style="list-style-type: none"> • Projects ongoing to increase value through utilization of marine resources based on a blue bioeconomy approach with a significant impact on biological, social and economic sustainability



4.3 ICELAND

Focus points for further development of the Icelandic Bioeconomy

- Form and follow adaptation policy to prepare the society for climate change.
- Make scientific risk assessment and secure policy-stability to encourage investment.
- Implement policies including Bioeconomy Policy.
- Clarifying connections between traditional wage structure in the Icelandic fishing fleet and the development of the bioeconomy.
- Promote global free trade to encourage progress in the bioeconomy.
- Commit long term view regarding necessary infrastructure and institutional sustainability to enhance innovation and sustainably grow the Bioeconomy
- Clarification of legal status of utilisation of straddling fish stocks and highly migratory fish stocks

Timeline constructed by stakeholders

When	Actions
2018	<ul style="list-style-type: none"> • Formation of Food Policy for Iceland starts
2019	<ul style="list-style-type: none"> • Iceland chairs the Nordic Council with focus on bioeconomy • Risk assessment framework installed in Iceland, enabling increased innovation in the bioeconomy • Food policy of Iceland introduced partly based on 2016 draft of bioeconomy policy • Large societal challenges in focus of the Science and Technological Council of Iceland • Iceland chairs Arctic Council
2020	<ul style="list-style-type: none"> • Food and bioeconomy policies for Iceland active and in implementation, including initiatives to lower carbon emissions in line with international agreements • Formation of a fund to incentivise innovation in value chain of food production
2021	<ul style="list-style-type: none"> • Horizon Europe starts. As of 2018 the outlook is for drastically increased investment in the blue bioeconomy. It is important that West Nordic interests are represented in Horizon Europe (see chapter 3.5.)
2030	<ul style="list-style-type: none"> • Strategic bioeconomy innovation has been major contributor to achieve the Sustainable Development Goals
2040	<ul style="list-style-type: none"> • Strategic bioeconomy innovation has contributed to Iceland's carbon neutrality

MEMBERS OF THE WEST NORDIC BIOECONOMY PANEL

Iceland – appointed by The Ministry of Industries and Innovation:

- Sveinn Margeirsson (previously Sigrún Elsa Smáradóttir), which is chairing the panel (Mátis)
- Eiríkur Vignisson (HB GRANDI)
- Ægir Þór Þórsson (Rannís)

Faroe Islands – appointed by the Ministry of Fisheries:

- Olavur Gregersen (Syntesa)
- Dr. Sigurð í Jákupsstovu (University of the Faroe Islands)
- Dr. Janus Vang (Director INOVA)

Greenland – appointed by the Ministry of Fisheries, Hunting and Agriculture:

- Henrik Leth (Employers' Association in Greenland and Polar Seafood)
- Lisbeth D. Schönemann-Paul (Royal Greenland)
- Birgitte Jacobsen (Ministry of Fisheries, Hunting and Agriculture in Greenland)

Strategy support team:

Arnljótur Bjarki Bergsson, Bryndís Björnsdóttir, Þóra Valsdóttir (Mátis)

Among the panel members are members of the Nordic Bioeconomy Panel, allowing for information exchange between the two panels and their work.

For more information visit www.wnbioeconomy.com

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