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## State of Play

# Bioeconomy strategies and policies in the Baltic Sea Region countries



**Working Paper no. 1 – The Baltic Sea Regional Bioeconomy Council**

Paper drafted by Thomas Winther, Innogate ApS, for  
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## **Introduction**

The bioeconomy offers great opportunity for accelerating sustainable growth and development in the Baltic Sea Region.

However the bioeconomy is highly complex and cuts across many sectors. Stakeholders at all levels engage in the bioeconomy for a number of different reasons and to reach a number of different objectives. Therefore the bioeconomy does not fit in neatly into one specific policy area but must rather be addressed through concurrent efforts within different policy areas.

As this paper demonstrates, some countries in the Baltic Sea Region have developed holistic bioeconomy policies and some are on the way to develop such policies. In other countries the bioeconomy is being pursued within broader strategies for growth and sustainable development – and yet in others the bioeconomy is being pursued as part of sector policies for agriculture, forestry, fishery, research and innovation, rural development and environment.

Finland and Germany have recently adopted holistic National Bioeconomy Strategies – implemented through inter-ministerial structures, and supported by national bioeconomy panels/councils.

Norway, Sweden and Iceland are currently drafting national bioeconomy strategies – and Estonia is currently planning the drafting of such a strategy.

Latvia is currently considering developing a bioeconomy strategy.

Denmark has a national bioeconomy panel/council but not a bioeconomy strategy. Rather the bioeconomy in Denmark is being pursued through broader policy frameworks for growth, innovation and environment.

Lithuania and Poland also have no national bioeconomy strategies. Here the bioeconomy is currently being pursued through sector policies for agriculture, fishery, forestry, regional development, environment and innovation. However, in Poland regional considerations for developing more local bioeconomy strategies may fuel policy development activities also at the national level.

Below follows a state-of-play providing more details on bioeconomy policies and strategies in the Baltic Sea Region.

The paper aims to provide a snapshot and baseline for commencing policy dialogue and cooperation in connection to the first BSR Bioeconomy Council meeting held in Copenhagen on 1 March 2016.

## Denmark

Denmark has no dedicated national bioeconomy strategy. Rather, the bioeconomy in Denmark is being pursued through two broader government policy frameworks, “Growth Plan for Water, Bio and Environmental Solutions”<sup>1</sup> and “Growth Plan for Food”<sup>2</sup>.

The Growth Plan for Water, Bio and Environmental Solutions, launched in 2013, has three overall objectives:

- To make Denmark a growth centre for effective and intelligent solutions for the world’s water challenges.
- To make Denmark a growth centre for knowledge, technology and production in a sustainable bioeconomy.
- To facilitate that Danish companies are among the best in the world to produce more with less.

This Growth Plan includes a set of 40 actions/initiatives towards realizing the strategic objectives - some of them specifically targeting the bioeconomy, including:

- Promote a European market for biobased, renewable products, by stimulating demand with measures such as common renewability requirements within the EU and international standardisation.
- Provide excellent opportunities for research, testing and market maturation of new biobased high-value products such as bioplastics and other advanced biotech products.
- Promoting market maturation of renewable materials within product design.
- Securing EU funding for Danish innovation and development of biobased products on the basis of long-term public-private partnerships between research and industry.

Also, this Growth Plan emphasise on development of supply chains to pull the market, by:

- Increasing accessibility of renewable biomass from agriculture, fisheries, food production and waste, e.g. by developing and testing plants and production methods.
- Promoting technologies that reduce cost of biomass with a focus on harvesting, transportation, pre-processing and refining produce into cellulosic sugar and proteins.
- Reviewing nature, environmental and energy regulations.

In parallel, the Growth Plan for Food, also launched in 2013, is implemented with five overall objectives:

- Sustainable and resource efficient food production, including efforts to increase: awareness about and improve resource efficiency and sustainability; improved utilization of biomass; development of new business cases; and Denmark’s contribution in international fora and markets.

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[https://naturerhverv.dk/fileadmin/user\\_upload/NaturErhverv/Filer/Indsatsomraader/Bioekonomi/Vaekstplan\\_vand\\_bio\\_og\\_miljolosninger.pdf](https://naturerhverv.dk/fileadmin/user_upload/NaturErhverv/Filer/Indsatsomraader/Bioekonomi/Vaekstplan_vand_bio_og_miljolosninger.pdf)

<sup>2</sup> <https://www.evm.dk/publikationer/2013/16-12-13-vaekstplan-for-foedevarer>

- Solution-oriented regulations and control, including efforts to: improve regulations for food companies and industries; utilize standards; optimize feed; and improve on food control to accelerate innovation and entrepreneurship.
- Nurturing talents, dynamics and export in the food industry, including efforts to: improve on food education; improve on cooperation between industry and education institutions; support eco-entrepreneurship; support regional food growth centres; and utilize better food companies and industries export potentials.
- Growth-oriented food research and development, including effort to: increase Denmark's participation in European research and innovation cooperation (including Food-KIC); improve further food research, in particular within production and process technologies; and improve food on innovation through societal partnerships as well as need-driven research and innovation in business-university partnerships.
- Access to finance and targeted strategic export promotion, including efforts to: lowering barriers for access to capital; develop new financing models; piloting new corporate structures; and investment support to environmentally friendly farm stalls.

## Governance

The Growth Plans above are both anchored with the Danish Ministry of Business and Growth but they are a result of a wide inter-ministerial cooperation, both in the development of the plans and in the implementation of activities. The Ministry of Environment and Food is playing a important role as partner to the Ministry of Business and Growth – so is the Ministry of Higher Education and Science, including through Innovation Fund Denmark. Innovation Fund Denmark support annually early stage investments in Danish companies totalling EUR +200 Mio. – and is increasingly giving priority to bio-resource business ventures.

As part of the Growth Plan for Water, Bio and Environmental Solutions the Danish Government established in 2013 the National Bioeconomy Panel with the aim to support cooperation among ministries, government agencies and society. The Panel is hosted and chaired by the Danish AgriFish Agency under the Danish Ministry of Environment and Food. The panel is composed of 25 representatives of companies, researchers, NGOs and authorities. The panel met for the first time in December 2013 and conveys approximately three times a year.

The panel is tasked to “draw attention to opportunities for specific measures in promotion of the bioeconomy. Such measures – ranging from agriculture to fisheries, from processing to consumption – should foster a sustainable bioeconomy, in which resources and products are, to a much greater extent than today, used for the benefit of the environment, climate, growth and employment”<sup>3</sup>. Practically this happens through a number of inspiration papers, e.g. with green biomass<sup>4</sup>.

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<sup>3</sup> [http://agrifish.dk/fileadmin/user\\_upload/NaturErhverv/Filer/Tvaergaaende/Biooekonomi/Fact-sheet\\_The-National-Bioeconomy-Panel.pdf](http://agrifish.dk/fileadmin/user_upload/NaturErhverv/Filer/Tvaergaaende/Biooekonomi/Fact-sheet_The-National-Bioeconomy-Panel.pdf),

<sup>4</sup>[http://agrifish.dk/fileadmin/user\\_upload/NaturErhverv/Filer/Indsatsomraader/Biooekonomi/The\\_Danish\\_National\\_Bioeconomy\\_Panels\\_recommendations\\_regarding\\_new\\_value\\_chains\\_based\\_on\\_green\\_biomass\\_September\\_2015\\_.pdf](http://agrifish.dk/fileadmin/user_upload/NaturErhverv/Filer/Indsatsomraader/Biooekonomi/The_Danish_National_Bioeconomy_Panels_recommendations_regarding_new_value_chains_based_on_green_biomass_September_2015_.pdf),

Some of the key specific themes addressed so far have been: how Denmark may address availability of more economic and sustainable biomass (as resource availability is a key bottleneck for advancing the bioeconomy in Denmark); and what measures are needed to promote research and maturing of markets within the bioeconomy.

In 2014, the National Bioeconomy Panel presented “Denmark as growth hub for a sustainable bioeconomy”<sup>5</sup>. Being a “statement” rather than a “strategy” the paper provides a number of recommendations to the Danish Government for promoting the bioeconomy, including:

- The establishment of an advanced, integrated, industrial-scale biorefinery.
- Review if incentive structures supports development of new industrial bioeconomic value chains, or if e.g. support for technological development is needed.
- Encourage more partnerships with the participation of public authorities, private sector actors and knowledge centers.
- Ensure close cooperation between relevant ministries in relation to bioeconomic development.
- Utilizing public procurement of sustainable bioeconomic products as a driver for development, including by seeking knowledge and ideas from industry organisations, knowledge centers and NGOs.

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<sup>5</sup> [http://naturerhverv.dk/fileadmin/user\\_upload/NaturErhverv/Filer/Indsatsomraader/Biooekonomi/Denmark\\_as\\_growth\\_hub\\_for\\_a\\_sustainable\\_bioeconomy\\_statement\\_by\\_the\\_Danish\\_Bioeconomy\\_Panel.pdf](http://naturerhverv.dk/fileadmin/user_upload/NaturErhverv/Filer/Indsatsomraader/Biooekonomi/Denmark_as_growth_hub_for_a_sustainable_bioeconomy_statement_by_the_Danish_Bioeconomy_Panel.pdf)

## Estonia

Encouraged by an abundance of bio-resources (arable land, forest and marine resources) but at the same time a lack of “Smart, value-adding and sustainable value-chains and between their components”<sup>6</sup>, the Estonia Ministry of Rural Affairs in cooperation with the Ministry of Environment commenced in 2014 an effort to develop the “Estonian Bioeconomy Strategy until 2030”<sup>7</sup>.

In February 2015 a conference was organised to gather input from public and private stakeholders to the development of the Strategy. With support from the Estonian Development Fund – acting as consultant – the conference identified a number of existing strategy documents that should all be taking into account with a view to align these to the strategy, including:

The Regional Development Strategy 2014-2020 (as a cross-cutting framework)

### Agriculture:

- Estonian Rural Development Plan
- Organic Farming Development Plan for 2014-2020
- Action plan for the sustainable use of pesticides for 2013-2017
- Action plan: Climate change mitigation and climate change adaptation in agricultural sector for 2012 -2020
- Seed Sector Development plan for 2014-2020
- Development plan for 2014-2020 in the cereals sector
- Honey production and marketing development plan for 2013-2016

### Forestry:

- Forestry Development Plan until 2020

### Fisheries and Aquaculture:

- Inshore fisheries development and future prospects
- Aquaculture sector development strategy for 2014-2020
- Aquaculture multi-year National Action Plan for 2014-2020
- The program "Protection of endangered fish species and restocking 2002-2010"
- Dairy Strategy 2012-2020
- Action plan for crayfish protection, resource recovery and use
- Eel management program
- Marine Monitoring Program

Additional bioeconomy related strategies and action plans in Estonia include<sup>8</sup>: The waste management plan for 2014–2020; the National Health Development Plan 2009-2020; the Resource Efficiency component of the Strategy for Research and Innovation; the National Development Plan of the Energy Sector Until 2020; the Estonian Environmental Strategy 2030; the Resource Efficiency component of the Estonian Entrepreneurship Growth Strategy 2014-2020; and the Estonian Nature Conservation Development Plan 2020.

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<sup>6</sup> [http://www.bioeconomyforum.llu.lv/images/Illar\\_Lemetti\\_4\\_Governance.pdf](http://www.bioeconomyforum.llu.lv/images/Illar_Lemetti_4_Governance.pdf)

<sup>7</sup> <http://www.agri.ee/en/objectives-activities/bioeconomy>

<sup>8</sup> <https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/country/National%20Bioeconomy%20Profile%202014%20Estonia%20.pdf>

The Estonia Ministry of Rural Affairs states that the purpose of the Estonian Bioeconomy Strategy is to create a strategic framework that connects the many different areas of bioeconomy with a view to fully utilise the value of the existing land and water resources; grow the welfare of the people; and support effective and environmentally friendly production and use of biomass.

In preparing for the strategy emphasis is on exploiting the potentials of in particular six bioeconomy value chains:

1. Food and animal feed.
2. Wood (construction, paper and cellulose, products).
3. Textile and clothing.
4. Chemicals, pharmacy and plastic products.
5. Fuels and energy.
6. Other ecosystem services connected to bioeconomy.

## **Governance**

The bioeconomy is a new political topic in Estonia and so far a bioeconomy advisory body/panel has not been established. Inter-ministerial coordination efforts are mainly being facilitated by the Council of Agriculture and Rural Development, the Council of Fisheries and the Council of Forestry.

Currently the “Estonian Bioeconomy Strategy until 2030” is being negotiated between the following ministries: Ministry of Rural Affairs (with responsibility for rural life, agriculture, fisheries, food processing industry, food safety and agricultural sciences); the Ministry of Environment (with responsibility for forest resources, fish stocks, waste management, climate policies, eco-system services and environmentally sound procurements); the Ministry of Economic Affairs and Communications (with responsibility for biotechnology, bioenergy and bioeconomy-related elements of industrial policies); the Ministry of Education and Research (with responsibility for knowledge-based strategic support, and education policy, related to various bioeconomy fields); ; the Ministry of Social Affairs (with responsibility for eating habits, healthy eating and health, and chemical safety/biochemistry); and the Ministry of Finance (with responsibility for administration and budget).

It is expected that the Strategy will be announced during 2016.

## Finland

Development of the bioeconomy in Finland is overall being addressed by a governmental programme supporting bioeconomy and clean solutions – one of five strategic policy priorities of the Finnish Government. This programme has five themes:

- Cost-efficient carbon-free, clean and renewable energy.
- Wood on the move and new products from forests.
- Circular economy and improvement on water quality.
- Profitable food production.
- Nature policy.

In 2014 Finland adopted the “Finnish Bioeconomy Strategy”<sup>9</sup>. The Bioeconomy Strategy was drafted by the Ministry of Employment and the Economy with contributions from Prime Minister’s Office, the Ministry of Agriculture and Forestry, the Ministry of the Environment, the Ministry of Education and Culture, the Ministry of Social Affairs and Health, the Ministry of Finance, as well as VTT Technical Research Centre of Finland and the Finnish Innovation Fund Sitra. Furthermore other public as well as private bioeconomy stakeholders provided input to the strategy. This happened through a number of national workshops, regional bioeconomy forums and sector consultations.

The starting point for the strategy is that Finland and the world is moving towards a third wave of economic development, the first wave being the “natural economy” that began to decline in importance in the first half of the 20<sup>th</sup> century, the second wave being the “fossil economy” that is now beginning to decline in importance, and the third wave being the “bioeconomy” that may only have begun to accelerate in importance in this century but is forecasted to grow rapidly in many years to come, the cause being that already by 2030 the World will need 50% more food, 45% more energy and 30% more water than today. This necessitates and fuels the growth of the bioeconomy.

With the Finnish Bioeconomy Strategy, Finland aims to encourage new economic growth and job creation by primarily improving business opportunities in high added value products and services while securing sustainability of ecosystems. “The leading idea of the strategy is that competitive and sustainable bioeconomy solutions for global problems will be created in Finland, and that new business will be generated both in the Finnish and international market, thus boosting the welfare of the whole of Finland”.

Finnish biological endowments in terms of in particular forestry and Finnish excellence in refining biomasses as well as strong industries and industry networks are underlined as key enablers and drivers for growing the bioeconomy in Finland.

The strategy sets clear targets, namely to increase the Finnish bioeconomy output to EUR 100 billion by 2025 (from EUR 60 Billion in 2014) and to create 100,000 new jobs.

The Strategy includes four overall goals and sets of action:

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<sup>9</sup> [http://biotalous.fi/wp-content/uploads/2014/08/The\\_Finnish\\_Bioeconomy\\_Strategy\\_110620141.pdf](http://biotalous.fi/wp-content/uploads/2014/08/The_Finnish_Bioeconomy_Strategy_110620141.pdf)

1. A competitive operating environment for the bioeconomy – including through efforts that: provide foresight and anticipation of demand for Finnish bioeconomy (business) solutions; develop steering instruments for efficient bioeconomy policy development; introduce bioeconomy public procurement; encourage sustainable consumption; promote standardisation and certification of bioeconomy solutions; encourage smart green city development; and incorporate bioeconomy in Finland's country image.
2. New business from the bioeconomy – including through efforts within: risk financing, bold experiments, development of strong domestic markets, and utilisation of sector cross-overs. More specifically this includes efforts to increase equity financing; funding pilot and demonstrations projects; development of cross-cutting platforms bringing different sectors together (such as innovation hubs and cluster development); and increasing value added in products and services.
3. A strong bioeconomy competence base – including through efforts to: develop educational content for training of experts (e.g. awareness and skills upgrading) and creating precondition for the bioeconomy through research (e.g. incorporate the bioeconomy as a key research area and intensify cross sectoral research).
4. Accessibility and sustainability of biomasses – including through efforts that ensure reliable supply of biomasses at a competitive price (a precondition for companies and investments, and thus for a successful bioeconomy) while guaranteeing the sustainability of natural resource use and appropriate operating conditions for ecosystem services; and improved use of knowledge related to biomass resources (e.g. through development of information and statistical systems).

## **Governance**

The Finnish Bioeconomy Strategy is implemented in cooperation between ministries that cooperated to conceive the Strategy. The Ministry of Employment and the Economy leads coordination. The organisations in the administrative branches of the ministries are extensively involved in the implementation. For example a number of funding organisations contribute towards realising the strategy, including: Tekes (the Finnish Funding Agency for Innovation) and SITRA (the Finnish Innovation Fund).

A detailed plan with timetables for the strategy measures is under preparation. Implementation of most measures has commenced during 2014-15.

A bioeconomy panel has been established to support the implementation and further development for the Strategy. The panel is chaired jointly by Ministry of Employment and the Economy and The Ministry of Environment and Agriculture. The panel has 40 members from industry associations, RDI, government and governmental agencies and NGOs. The first meeting was held on 19 January 2016. In going forward the panel will meet two-three times a year and thematic working groups will be established to address various specific aspects of the bioeconomy.

## Germany

On 17 July 2013, the Federal Government adopted a comprehensive National Policy Strategy for the Bioeconomy.

The *Policy Strategy – Bioeconomy* builds upon the Federal Government’s Sustainability Strategy and a number of sector specific strategies, including: the “National Research Strategy Bioeconomy 2030 – our route towards a biobased economy” (2010); the “Energy Concept for an Environmentally Sound, Reliable and Affordable Energy Supply” (2010); the “Action Plan for the Industrial Use of Renewable Resources” (2009); the “German Resource Efficiency Programme” (2012); the “Biorefineries Roadmap” (2012).

Overall the Strategy aims to support a transition towards “a resource-efficient economy based on renewable resources that either makes less use of fossil resources or dispenses with them entirely. This change is mainly driven by the bioeconomy”<sup>10</sup>.

The Strategy unites different policies such as industrial and energy policies, agricultural, forestry and fisheries policies, climate and environmental policies and research and development policies. Furthermore the Strategy relates bioeconomy with the circular economy.

The strategy defines three cross-sectorial areas of action and five thematic areas of action:

Cross sectorial areas:

- Coherent policy framework for a sustainable bioeconomy – including through efforts by an “Inter-ministerial Bioeconomy Working Group” tasked to contribute to various government departments’ policy development efforts in areas with implications for the bioeconomy. The Working Group will also guide the development and the implementation of the bioeconomy strategy and it will provide a relay between the Federal Government and the Bioeconomy Council (refer below) and other relevant consultative Federal Government committees.
- Information and dialogue within society – including provision of targeted information and facilitation of a participative dialogue with the public, as well as with bioeconomy stakeholders from science and business. The aim is to communicate about societal expectations and requirements and to encourage open-mindedness with regard to biobased products and innovations.
- Vocational training and apprenticeship – for Germany to build competitiveness in the bioeconomy the strategy highlights the need to counteract the lack of well-trained specialist personnel that is expected to materialize in the coming years due to demographic changes.

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<https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/policy/Germany%20National%20Policy%20Strategy%20on%20Bioeconomy.pdf>

## Thematic areas:

- Sustainable production and provision of renewable resources – including sustainable management of the agricultural areas, the forests, the seas and other bodies of water. The demand for biomass of plant origin is rising. In combination with a scarcity of land the Strategy address the need to increase sustainably the yields from harvests and also to use aquatic resources more sustainably.
- Growth markets, innovative technologies and products – including support to market expansion, research and development with a view to quickly benefit from innovations based on promising renewable resource technologies, products and markets.
- Processes and value-adding networks – including by networking resources and linking value chains in circular ways to reduce further the consumption of renewable and non-renewable resources, to improve economic viability, and to lower emissions.
- Competition among uses of land – including efforts to balancing claims for land through regulatory framework conditions. The principle that applies in this is that securing food supplies takes priority while respecting the protection of the environment, climate, soil and nature.
- International context – including efforts to find a balance between the competing agricultural uses of land for food security, and the use of biomass for industry and energy also at international level, while at the same time also offering new integrated rural development opportunities. Internationally-recognised standards of sustainability in agriculture, forestry and fisheries serve as an important instrument in guaranteeing compliance with requirements regarding the environment and social responsibility.

## **Policy initiatives in the Federal States / Regions bordering the Baltic Sea**

### Mecklenburg-Western Pomerania (MWP):

There have been plans to develop a federal bioeconomy strategy for MWP but it has not been published by now. The eastern areas of MWP announced to develop a model region for industrial biobased products by 2030. In 2016, the groundwork has been laid for the construction (30 Mio. Euro) of the bioeconomy and plasma technology innovation centre in Greifswald.

### Schleswig-Holstein (SH):

Bioeconomy development activities in SH is part of the federal innovation strategy (2013), with a focus on the marine economy, the life sciences, renewable energies and the food industry. In 2012, SH adopted a federal development strategy in the area of marine biotechnology ("Masterplan on Marine Biotechnology"). The bioeconomy is also defined as a cross-cutting objective in the federal Baltic Sea Region strategy (Operational Program EFRE for SH 2014 – 2020). In December 2015, the German-Danish Partnership "Actionplan on the regional collaboration between SH and the Region Zealand" has been extended to encompass the areas of bioeconomy and e-health.

## **Governance**

The bioeconomy policy strategy was developed jointly by the Federal Ministry for Food and Agriculture (BMEL) – which also coordinates the implementation efforts together with the Federal Ministry of Education and Research (BMBF), the Federal Ministry of Economics and Energy (BMWFi), the Federal Ministry for Economic Cooperation and Development (BMZ), the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMUB), the Federal Ministry of the Interior (BMI) and the Foreign Office (AA).

The ministries will in coming years further develop the strategic approaches to match long-term goals and to adapt to new challenges. In 2016, the Ministry of Education and Research will evaluate its Research Strategy (2.3 bn Euro) and will consequently start a review process of the strategy. Furthermore, an inter-ministerial effort has resulted in the commissioning of three projects for monitoring the development of the bioeconomy in Germany. These relate to gauging the economic impacts, to monitoring the sustainable use of renewable resources and to modelling the bioeconomy.

The German Bioeconomy Council plays an important role as an independent advisory body to the German Federal Government. The 17 members of the Council have expertise covering a broad thematic and stakeholder spectrum of the bioeconomy. The Council mainly seeks to promote the dialogue with the public and to advise on innovation policy and related implementation issues. Furthermore, the Council considers bioeconomy development in a global context and presents its insights to the Federal Government.

The German Bioeconomy Council convenes regularly to prepare position statements and to discuss policy issues. It organises events on relevant issues, and promotes the future vision of the bioeconomy to broader society. The activities of the council are oriented both towards long-term objectives as well as current policy requirements.

## Iceland

Iceland is currently preparing a national bioeconomy strategy. The Ministry of Fisheries and Agriculture has established a working group to oversee the work. Matis (the Icelandic food and biotech research and development institute) acts as secretariat for the effort.

A national consultation aiming to gather input from non-governmental partners will be launched in the summer of 2016. Thereafter it is expected that the strategy will be finalised and announced in October 2016.

The Icelandic Bioeconomy Strategy draws lessons from a joint effort by the West Nordic Countries (Iceland, Faroe Islands, and Greenland) to identify pathways for developing the bioeconomy in the macro-region and “to prepare the West Nordic countries for active participation in Nordic and European initiatives in the field of Bioeconomy”. This effort, led by Mátís – “Future Opportunities for Bioeconomy in the West Nordic Countries” – provided in 2015 a report<sup>11</sup> with an overview of bioresources in the West Nordic region; the current utilisation of bioresources and the future opportunities. The report was identified in 2015 by the German Bioeconomy panel as “one of eight dedicated or holistic bioeconomy strategies” alongside the European Union, Finland, Germany Japan, Malaysia, South Africa and the USA<sup>12</sup>.

The report presents how the (predominately marine-based) West Nordic bioeconomy is relatively more important to economic development than in any of the other Nordic countries. Though the West Nordic countries have already made much progress in the bioeconomy, a number of further opportunities are identified in particular as regards development of new and multiple value streams from each bioresource that improve efficiency, minimize waste and maximize value. The crossover and synergy between advancement in biotechnology, fishery and aquaculture is particular important in the West Nordic. New opportunities exist in utilisation of macro-algae – an abundant resource in the West Nordic region – as a biorefinery feedstock for bio-based production of: proteins, bulk carbohydrates, chemicals, bioactive compounds and energy. Also, research into utilization of feed, feed health promoting factors, and innovations in biomass for feed holds opportunity for the West Nordic countries. Additionally, opportunities exist to sustainably use marine biomass for crop and plant nutrition.

Importantly, the report also emphasise the importance of the bioeconomy offering new development opportunities to rural and remote areas, thereby potentially providing *the* key to rejuvenate these areas by offering young new exciting job opportunities.

The report suggests four actions for further West Nordic bioeconomy cooperation: Create a West Nordic Bioeconomy panel; Establish an interdisciplinary Centre of Excellence (CoE) for the West Nordic region; 3. Advance cooperation on biotechnology in the Arctic (Arctic bioeconomy II); and develop a programme focusing on “The Blue Bioeconomy”.

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<sup>11</sup> <http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A791350&dswid=-5474>

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[http://www.bioekonomierat.de/publikationen/?tx\\_rsmpublications\\_pi1%5Bpublication%5D=93&tx\\_rsmpublications\\_pi1%5Baction%5D=show&tx\\_rsmpublications\\_pi1%5Bcontroller%5D=Publication&cHash=642bc2912d5359cebe44884d819a8538](http://www.bioekonomierat.de/publikationen/?tx_rsmpublications_pi1%5Bpublication%5D=93&tx_rsmpublications_pi1%5Baction%5D=show&tx_rsmpublications_pi1%5Bcontroller%5D=Publication&cHash=642bc2912d5359cebe44884d819a8538)

The “headlines” for future West Nordic cooperation on bioeconomy – policy dialogue, excellence, biotechnology and blue growth – provide important corner stones in the current efforts to develop the national Icelandic bioeconomy strategy.

Another importance source of inspiration for the development of the Icelandic national bioeconomy strategy is NordBio:

NordBio (“The Nordic bioeconomy initiative (NordBio)” was launched by the Icelandic 2014 Chairmanship of the Nordic Council of Ministers. It is based on the Nidaros Declaration made by the Nordic Council of Ministers for Fisheries and Aquaculture, Agriculture, Food and Forestry in 2012. The 2014-2017 NordBio initiative involves five Nordic Councils of Ministers: Environment; Fisheries and Aquaculture, Agriculture, Food and Forestry; Trade, Energy and Regional Policies; Education and Research; and Culture.

NordBio is a three-year program acting as is an umbrella uniting a number of different projects and sectors, all with the aim of improving the way we use our resources and minimize our generation of waste<sup>13</sup>.

Cooperation activities under NordBio include:

- “Innovation in the Nordic Bioeconomy”, aiming to improve the direct economic impact of the bioeconomy through innovation and value-creation (keywords are increased production of biomass, improved efficiency and increased sustainability in food production).
- “Marina”, aiming to reduce emissions and increase the use of alternative fuels in the marine sector.
- “Biophilia”, aiming to motivate entrepreneurs and encourage the interest of children and youth in science and innovation.
- “Ermond”, aiming to facilitate new thinking and new solutions in preventing damage and loss of lives due to natural disasters in the Nordic countries.
- “Wood Bio”, aiming to highlight the role of forestry in the Nordic bioeconomy with an emphasis on wood biomass as raw material.

Also, under NordBio the “Nordic Bioeconomy Panel” has been established. The panel aims to promote and coordinate the Nordic cooperation within the bioeconomy. It is proposed that the panel among its key activities shall map opportunities for international funding for research and development, and strengthen the Nordic voice in international bioeconomy policy formulation and cooperation.

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<sup>13</sup> <http://www.norden.org/en/theme/nordic-bioeconomy/nordbio/about-nordbio>

## Norway

An evaluation of the Norwegian agricultural research institutions completed in December 2013 provided important catalyse to the development of a national bioeconomy strategy. The Norwegian Research Council called for further efforts to develop the bioeconomy – and more specifically a bioeconomy that aims to meet global food and environment challenges; develops biobased business; and builds on a strong research sector<sup>14</sup>.

The drafting of the Norwegian Bioeconomy Strategy is currently in process and a comprehensive strategy will be presented before the summer 2016. The Ministry of Trade, Industry and Fisheries and the Ministry of Agriculture and Food are responsible for the drafting – in cooperation with the Prime Ministers Office. The Ministry of Trade, Industry and Fisheries provide secretary for the interministerial cooperation.

The Strategy will identify overall priorities for a national effort to accelerate the Norwegian bioeconomy and it will set out objectives and measures for a long-term perspective. It is important to notice that the national strategy will have strong focus on value creation and how to raise competitiveness of the Norwegian industries.

The national Bioeconomy Strategy will not replace national white papers for the different sectors like seafood, forestry and agriculture – rather the Bioeconomy Strategy is meant to add on and facilitate cross-over cooperation and innovation. This includes also the National Strategy for Biotechnology 2011-20<sup>15</sup>.

The point of departure for the strategy work is the perception that with “bioeconomy” the Norwegian government means: 1) sustainable, effective and profitable production based on utilisation and value creation of renewable resources for food, ingredients, health products, energy, materials, chemicals, fibres, and other products; and 2) value creation based on production and utilisation of renewable resources in opposition to non-renewable carbon.

During the drafting of the Strategy it has been a priority to facilitate a productive dialogue with relevant stakeholders. To this end for example a national stakeholder conference was organised in June 2015 and a comprehensive written consultation also took place. A total of 41 contributions were submitted from all spheres of society.

While the Bioeconomy Strategy will be new, a number of efforts supporting the development of the bioeconomy in Norway are on-going:

Since 2012 the Norwegian Research Council has implemented the programme BIONAER. “BIONÆR/BIONAER is the Research Programme on Sustainable Innovation in Food and Bio-based Industries. The programme mode is user-oriented and focus on continuous learning to solve challenges through financing research and innovation promoting the bioeconomy”.<sup>16</sup> Among research activities funded are projects contributing to how Norway becomes a smart bioeconomy (this particular project feeds into the Bioeconomy Strategy development); how Norway may benefit more from organic waste; what approaches and technologies Norway may use for pest management; identifying through research what may be the potentials of

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<sup>14</sup> [www.regjeringen.no](http://www.regjeringen.no)

<sup>15</sup> <https://www.regjeringen.no/en/dokumenter/national-strategy-for-biotechnology/id666235/>

<sup>16</sup> [http://www.forskningradet.no/prognett-bionaer/Home\\_page/1253971968569](http://www.forskningradet.no/prognett-bionaer/Home_page/1253971968569)

macro-algae; and what may be the many bioeconomy opportunities within the area of research-driven innovation<sup>17</sup>.

Also a number of research institutes and activities feed into the bioeconomy, including the Norwegian Institute of Bioeconomy Research (focusing mainly on the green bioeconomy); Nofima and The Norwegian Seafood Research Fund (both focusing mainly on the blue bioeconomy and food); and Sintef (a large independent multidisciplinary research institute with expertise in technology, medicine and the social sciences).

Innovation Norway (the main Norwegian innovation, enterprise and industry development funding body) has in recent years also implemented a number of efforts to accelerate the bioeconomy. For example Innovation Norway provided a comprehensive report on innovation in the Norwegian bioeconomy. This intelligence was fed into the national bioeconomy strategy work. Also, as a follow up to this report, a fiscal act was drafted and submitted for the 2017 national budget, suggesting additional support for biobased industries and development of the bioeconomy.

Furthermore, Innovation Norway and the Norwegian Research Council support the development of the bioeconomy at local and regional level through the “Norwegian Innovation Clusters” programme (which has recently succeeded the for NCE and ARENA cluster programmes), including support to the to the following industry network and cooperation activities: “Biotech North”, “Legasea”, “Ocean Space”, “Arena Heidner”, “Arena Tre”, “NCE Aquaculture”, “NCE Seafood Innovation Cluster”, “Arena Innovasjon Torskfisk”, “NCE Eyde”, “Smart Water”, and “The Industrial Biotechnology Network Norway” (Norsk Nettverk for Industriell Bioteknologi).

## **Governance**

The development of the bioeconomy in Norway is in progress. There are several activities on-going. It is expected that the national strategy will give guidance on how to proceed including coordinating activities, implementation and evaluation.

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<sup>17</sup> <http://www.forskningradet.no/prognett-sfi/SFIsentrene/1224067097216>

## Latvia

Latvia has no national bioeconomy strategy<sup>18</sup>. However, currently Latvia is looking into developing such a strategy. The Parliamentary Committee for Sustainable Development leads this dialogue in Latvia. On 17 February 2016 the Committee will have its first panel discussion on the framework for a Latvian bioeconomy strategy.

The Ministry of Agriculture is the main ministry responsible for development of the bioeconomy in Latvia and in this capacity the Ministry act as secretariat to the Parliamentary Committees. Bioeconomy encourages cooperation between the Ministry of Agriculture and other ministries: there is close collaboration with the Ministry of Environmental Protection and Regional Development on circular economy issues, and cooperation with the Ministry of Education and Science regarding the Smart Specialization Strategy.

The bioeconomy enablers and drivers in Latvia include first and foremost an abundance of biomass – in particular from forestry – coupled with a need to increase production efficiency and production of higher value added products in firms and farms.

Latvia's smart specialization strategy (RIS3) provides an important framework for currently bioeconomy development efforts in Latvia. Overall this strategy aims at a "Transformation of the economy towards higher added value, productivity and more effective usage of resources"<sup>19</sup>.

More specifically two of six priorities within the smart specialization strategy target the bioeconomy, namely "Modern education" and improving "The knowledge base" (in Bio-economy; Biomedicine, medical technologies, biopharmacy and biotechnology; Smart materials, technology and engineering, Smart energy; and ICT). Five specialization areas are in focus: Knowledge-based bio-economics; Bio-medicine, medical technologies, bio-pharmacy and biotechnologies; Advanced materials, technologies and engineering systems; Smart energy; and Information and communication technologies.

In addition to the smart specialization strategy the bioeconomy in Latvia is being pursued through a number of sector initiatives, the most important being<sup>20</sup>:

- Efforts within agriculture, food and feed production to promote application of non-residual technologies to produce new and innovative products and efforts to utilise food production by-products in high added value food and feed production.
- Efforts in the forestry sector to develop innovative forest management technologies, develop innovative wood and non-wood products, improve resource efficiency in forestry, and significantly increase product value added.
- Research efforts in agriculture, bioenergy, biotechnology etc. under the National Research Programmes, including the research and business development coordination

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<sup>18</sup><https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/jrc/JRC-SCAR%20MS%20Bioeconomy%20Survey%202014%20LATVIA.pdf>

<sup>19</sup> [http://www.izm.gov.lv/images/RIS3\\_Baltic\\_dimension\\_25032015.pdf](http://www.izm.gov.lv/images/RIS3_Baltic_dimension_25032015.pdf)

<sup>20</sup> <https://biobs.jrc.ec.europa.eu/sites/default/files/generated/files/jrc/JRC-SCAR%20MS%20Bioeconomy%20Survey%202014%20LATVIA.pdf>

efforts of the “Environment, Bioenergetics and Biotechnology Competence Centre”. This centre aims generally at increasing the competitiveness of businesses by facilitating research-industry cooperation on technology and product development. Within the bioeconomy the Centre aims to support product development leading to substitution of chemically synthesized substances with substances from nature.

The research sector in Latvia is a strong proponent of the bioeconomy. In addition to the research efforts presented above Latvia University of Agriculture (LUA) together with 7 agriculture and food research institutes and 3 forest sector research institutes established in September 2014 the “Latvia Bioeconomy Strategic Research Alliance”. This Alliance unites 400 doctors of science in a joint effort to enhance the competitiveness of Bioeconomy sectors through research and innovation<sup>21</sup>.

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<sup>21</sup>[http://www.errin.eu/sites/default/files/publication/media/7%20Bioeconomy\\_20\\_03\\_2015\\_latvia%20\\_final.pdf](http://www.errin.eu/sites/default/files/publication/media/7%20Bioeconomy_20_03_2015_latvia%20_final.pdf)

## Lithuania

Lithuania has no national bioeconomy strategy – and a dedicated strategy is currently not planned.

In Lithuania the bioeconomy is currently being pursued within the government's sector policies for agriculture, fishery, forestry, regional development, environment and innovation.

Traditionally, the Lithuania government has supported the bioeconomy mainly within the area of biotechnology:

From 2007-2010 the “National Industrial Biotechnology Development Programme” was implemented – and continued/re-launched (after a short interruption due to the financial crisis) for the period 2011-2013. The government Agency for Science, Innovation and Technology (MITA) has led the implementation of these programmes.

The biotechnology programmes have emphasized on hightech industry development within the life-science area but they have also aimed to reduce the country's dependence on imported, fossil fuels and to increase added value in agricultural and forestry products, through e.g. technology development in order to process local biomass resources into bioplastics, second generation biofuels, biopharmaceuticals and animal drugs and other biobased materials. Activities have also included environmental biotechnology efforts such as pilot and demonstration projects and promotion of infrastructures for commercial use of side and waste products<sup>22</sup>.

Since 2014 biotechnology policies are mainly being addressed as part of Lithuania's Smart Specialization Programme, which is linked to the country's “Innovation Development Programme” (2014–2020)<sup>23</sup>.

The smart specialization programme was developed by the Ministry of Education and Science, Ministry of Economy – and with the Research and the Higher Education Monitoring and Analysis Center (MOSTA) heading up the implementation efforts.

The smart specialization programme emphasize in the broader sense on promoting economic growth and the contribution of high added-value, knowledge-intensive and highly-qualified-labor-intensive economic activities” to the GDP – and specifically on biotechnology a priority area for Agro-innovation and Food technologies.

The latter programme includes an action plan for sustainable use of agro-biological resources and safe food. Also, functional food is considered important for public health and well-being. In terms of actions, the smart specialization programme gives priority to RTI, nurturing knowledge-intensive businesses and clusters, and promoting cooperation between research and business to accelerate commercialization of R&D results. Also, the action plan encourages the development of biorefinery plants in Lithuania.

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<sup>22</sup> [http://gbs2015.com/fileadmin/gbs2015/Downloads/Bioeconomy-Policy\\_Part-II.pdf](http://gbs2015.com/fileadmin/gbs2015/Downloads/Bioeconomy-Policy_Part-II.pdf)

<sup>23</sup> <http://www.esinvesticijos.lt/en/>

## Poland

Poland does not have a dedicated national bioeconomy strategy. Rather the bioeconomy is currently being pursued through sector policies for e.g. agriculture, fishery, forestry, regional development, environment and innovation.

In more detail, aspects of the bioeconomy are included in three integrated strategies – that are all part of the Polish Medium-Term Development Strategy<sup>24</sup>:

The Strategy for Innovation and Efficiency of the Economy<sup>25</sup> – aiming to create a highly competitive economy (innovative and effective) based on knowledge and cooperation through efforts to:

- Adapt policy regulation and finance meet the needs of an innovative and efficient economy.
- Stimulate innovation by enhancing the efficiency of knowledge and work.
- Increase efficient use of natural resources and raw materials.
- Increase the degree of economy's internationalization.

The Strategy for Energy Safety and Environment<sup>26</sup> – aiming to ensure Poland's energy security, an efficient and competitive economy and high quality of life while ensuring environment protection and sustainable development through efforts to:

- Promote sustainable management of the resources.
- Ensure secure and competitive energy supply.
- Improve environmental conditions.

The Strategy for Sustainable Development of Agriculture, Rural Areas and Fisheries<sup>27</sup> – aiming to identify key directions of development of rural areas, agriculture and fisheries by 2020 through efforts to:

- Improve quality of human capital.
- Improve living condition in rural areas.
- Ensure food safety.
- Increase productivity and competitiveness of the agro-food sector.
- Improve environmental protection and adaptation to climate change in rural areas.

A number of Ministries are involved in the above strategies related to the bioeconomy:

- Ministry of Environment – environment and water management.
- Ministry of Energy – energy related issues (renewable energy and energy efficiency).
- Ministry of Development – national and regional development, business support etc.
- Ministry of Agriculture and Rural Development – rural development incl. modernization of agriculture and support to ecological production.
- Ministry of Health – health protection (including healthy aging),

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<sup>24</sup> [https://www.mr.gov.pl/media/3336/Strategia\\_Rozwoju\\_Kraju\\_2020.pdf](https://www.mr.gov.pl/media/3336/Strategia_Rozwoju_Kraju_2020.pdf)

<sup>25</sup> [http://www.me.gov.pl/files/upload/20046/SIEG\\_ENG\\_wersja%20ksiazkowa.pdf](http://www.me.gov.pl/files/upload/20046/SIEG_ENG_wersja%20ksiazkowa.pdf)

<sup>26</sup> [http://www.mos.gov.pl/g2/big/2015\\_09/43af1db4587a65ef8c3703ec2bf57972.pdf](http://www.mos.gov.pl/g2/big/2015_09/43af1db4587a65ef8c3703ec2bf57972.pdf)

<sup>27</sup> <http://www.minrol.gov.pl/Informacje-branzowe/Strategia-zrownowazonego-rozwoju-wsi-rolnictwa-i-rybactwa-na-lata-2012-2020/Dokumenty-analizy>

- Ministry of Marine Economy and Inland Sailing – maritime environment, fishery etc.

## **Regional level**

In addition to national efforts to develop the bioeconomy there are also efforts taking place at the regional level. On 27<sup>th</sup> of August 2015 Regional Parliament of the Lodzkie Region established Lodzkie as the first Bioregion in Republic of Poland. This entails a plan to transform the Lodzkie Region into one of the most innovative regions in Europe and Poland in the area of sustainable bioeconomy as a strategic development approach

The plan build on and adds to the Regional Innovation Strategy for the Lodzkie Region LORIS2030<sup>28</sup> - a strategy that targets six key development sectors in the region:

- Modern textiles and fashion industry (including design).
- Advanced building materials.
- Medicine, pharmacy, cosmetics.
- Power engineering, including renewable energy sources.
- Innovative agriculture and food processing.
- IT and telecommunications.

... and four key enabling technologies areas:

- Biotechnology,
- Nanotechnology and functional materials,
- Communication and information technologies,
- Mechatronics.

In the near future the Lodzkie Region plan the following activities:

- International Congress of Bioeconomy and Bioeconomy on 6-7 October 2016. The conference will provide a meeting place for dialogue between for companies, national and regional authorities, R&D institutions, business-related organizations or institutions responsible for bioeconomy development, in Lodzkie, Poland and abroad.
- Analysis of bioeconomy potentials of the Lodzkie Region. The analysis will during 2016 provide an inventory of the regional potentials in the field of the bioeconomy.
- With the analysis as baseline the Lodzkie Region will develop a Bioeconomy Development Strategy, including the Lodzkie Region's areas of competencies (competitive advantages), recommendations concerning smart specialization, and opportunities for cooperation with other regions in the field of bioeconomy. The Strategy will launched in 2017.

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<sup>28</sup> [http://s3platform.jrc.ec.europa.eu/documents/20182/91720/rsi\\_ang.pdf/dd167e2f-dbf3-4fa6-bdc0-6af78c023437](http://s3platform.jrc.ec.europa.eu/documents/20182/91720/rsi_ang.pdf/dd167e2f-dbf3-4fa6-bdc0-6af78c023437)

## Sweden

Sweden currently has no national bioeconomy strategy. There exists a kind of “road map” to reach a biobased economy, e.g. policies for a fossil free society and more. However, a strategy/agenda is currently discussed within the Government. The format and scope will probably be decided during the 1<sup>st</sup> half of 2016.

In 2012 Sweden adopted the “Swedish Research and Innovation Strategy for a Bio-based Economy”<sup>29</sup>. The strategy was prepared upon request from the Swedish Government and prepared by Formas (The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning) – in consultation with VINNOVA (Swedish Governmental Agency for Innovation Systems) and the Swedish Energy Agency.

The research and innovation strategy emphasise that “Sweden, in comparison to many other countries, has good preconditions given by natural geographic conditions, traditional industry and infrastructure for being able to convert to a bio-based economy”. Also, the bioeconomy offers Sweden many opportunities, including: “new opportunities to complement traditional products with new products and services to maintain and improve Sweden’s competitiveness”. Furthermore, the bioeconomy “offers inherent opportunities for increased use of biomass raw materials within other commercial sectors. This applies, for example, to the transport sector, the motor industry, the construction sector and the chemical industry.”

The research and innovation strategy emphasise on the following *needs*:

- The replacement of fossil-based raw materials with biobased raw materials (bio-based raw materials, nutrient and fertilizer optimization systems, new and improved biomass properties, utilisation of ecosystems other than fields and forests for biomass production and more).
- Smarter products and smarter use of raw materials (refinement of biomass products, bi-products and waste as raw materials, biorefineries and more).
- Change in consumption habits and attitudes (increase product lifetimes and recycling, more efficient transport, improved distribution and storage, behaviours and more).
- Prioritisation and choice of measures (addressing simultaneously environmental and socio-economic consequences and conflict of objectives in governing policies).

And the strategy emphasise on the following *innovation efforts and opportunities*:

- Growing cross-industry collaboration in research and development, including by engaging also with public actors and civil society.
- Developing strong research and innovation environments that contribute with relevant knowledge and create preconditions for innovation within the area.
- Accelerating development, verification and commercialisation of new bio-based

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<sup>29</sup> [http://www.formas.se/PageFiles/5074/Strategy\\_Biobased\\_Ekonomi\\_hela.pdf](http://www.formas.se/PageFiles/5074/Strategy_Biobased_Ekonomi_hela.pdf)

solutions, including through support for the demonstration of products and services.

- Collaboration between large companies and SMEs has great opportunity to increase the pace of commercialisation of new technologies and innovations.

In addition to the innovation and research strategy a number of government agencies in Sweden are supporting bioeconomy development:

- The Swedish national innovation agency, VINNOVA, has supported the bioeconomy through a number of efforts: In 2012 VINNOVA announced the research and innovation programme: “Strategic research and innovation agendas.” A total of 73 agenda initiatives in various areas were granted, 10 of them with strong linkages to the bioeconomy: The electronic highway from construction to clearing site; Welfare materials from sustainable forest resources; New bio-based materials and products; National mobilisation of resources for new applications of forest materials; Biorefinery agenda / Green agenda; Sustainable harvesting of forest raw material; Wood agenda; Made in Sweden – Future Textiles and Paper; and Mobilisation of resources around new processes for bio-based materials<sup>30</sup>.
- In 2014 Vinnova, the Sweden Energy Agency and the research council Formas, in cooperation with 60 public and private partners, followed up with the initiative BioInnovation. With EUR +10 Mio per year this initiative aims to increase added value and competitiveness of the Swedish biobased industry through efforts that create excellent opportunities for developing new biobased material, products and services- in particular within the areas of forests, agricultural land, water, and waste. The Swedish Forest Industries Federation provides secretariat and coordination for the initiative<sup>31</sup>.
- In the Research Bill for 2013-2016 Research Council Formas received a new budget allocation of EUR 10 Mio per year for research on “biomass for the bio-economy”.
- The Ministry for Enterprise & Innovation is working on a long-term national forest program to be launched 2017. The Action includes a number of efforts to develop the forestry-based bio-economy, including on: Sustainable use of forest; Processing and innovation; Experience and recreation; and Sweden in the world (know-how and export).
- The Swedish Energy Agency also supports the development of the bioeconomy. Biofuel is particularly important to the bioeconomy in Sweden, 90% of it coming from Swedish forestry. The Swedish Energy Agency support for example R&D in biofuel system development (availability, resource cost reductions, yield increases and more) as well as a number of sustainability efforts related to biofuels and bioliquids.
- The Swedish forest industries is focusing more and more on the forest’s contribution to a bioeconomy. They have increased the total research budget allocated to “bio-

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<sup>30</sup> <http://www.vinnova.se/PageFiles/751324632/A%20BIO-based%20Economy.pdf>

<sup>31</sup> <http://www.bioinnovation.se>

economy research” to EUR + 25 Mio per year.<sup>32</sup> Added to this are investments in new biorefinery concepts. There are also several and increasing “public-private-partnerships” concerning bioeconomy. One example is the project “Processum” that support “research and development in the areas biotechnology, energy technology, in organic chemistry, organic chemistry and raw materials with a focus on sustainability”.<sup>33</sup>

- The Ministry for Rural Affairs has launched in 2012 the action plan “Sweden: the Forest Kingdom”. The Action include a number of efforts to develop the forestry-based bio-economy, including on: Sustainable use of forest; Processing and innovation; Experience and recreation; and Sweden in the world (know-how and export)<sup>34</sup>.
- The Swedish Energy Agency also supports the development of the bioeconomy. Biofuel is particularly important to the bioeconomy in Sweden, 90% of it coming from Swedish forestry. The Swedish Energy Agency support for example R&D in biofuel system development (availability, resource cost reductions, yield increases and more) as well as a number of sustainability efforts related to biofuels and bioliquids.

## **Governance**

As it appears from above the governance of the many government supported bioeconomy development efforts is divided among many institutions and organisations in Sweden.

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<sup>32</sup> [http://www.forestindustries.se/i\\_fokus\\_-\\_startsidenotiser\\_1/the-forest-industry---the-driver-for-a-sustainable-bioeconomy](http://www.forestindustries.se/i_fokus_-_startsidenotiser_1/the-forest-industry---the-driver-for-a-sustainable-bioeconomy)

<sup>33</sup> <http://www.processum.se/en/>

<sup>34</sup> <http://www.sifi.se/wp-content/uploads/2012/05/Forest-Kingdom-Sweden.pdf>