

Sustainable growth from bioeconomy

# THE FINNISH BIOECONOMY STRATEGY



bioeconomy<sup>+</sup>

# THE FINNISH BIOECONOMY STRATEGY

## Abstract

Finland has set the course for a low-carbon and resource-efficient society and a sustainable economy. A key role in reaching this goal is played by a sustainable bioeconomy. Thanks to our plentiful renewable natural resources, high level of expertise and industrial strengths, Finland is excellently placed to become a pioneer of the bioeconomy in the world. The bioeconomy will boost the national economy and employment in Finland and enhance the well-being of the Finnish people. The vision of the first Finnish Bioeconomy Strategy is that Finnish well-being and competitiveness will be based on sustainable bioeconomy solutions.

The objective of the Finnish Bioeconomy Strategy is to generate new economic growth and new jobs from an increase in the bioeconomy business and from high added value products and services while securing the operating conditions for the nature's 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.

*The strategic goals of the Bioeconomy Strategy are:*

- 1. A competitive operating environment for the bioeconomy,*
- 2. New business from the bioeconomy,*
- 3. A strong bioeconomy competence base,*
- 4. Accessibility and sustainability of biomasses.*

Bioeconomy refers to an economy that relies on renewable natural resources to produce food, energy, products and services. The bioeconomy will reduce our dependence on fossil natural resources, prevent biodiversity loss and create new economic growth and jobs in line with the principles of sustainable development.

The objective of the Bioeconomy Strategy is to push our bioeconomy output up to EUR 100 billion by 2025 and to create 100,000 new jobs.

The Bioeconomy Strategy was drafted in a project set up by the Ministry of Employment and the Economy. Participants in this project were the 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, the administrative branches under these Ministries, as well as VTT Technical Research Centre of Finland and the Finnish Innovation Fund Sitra. Stakeholders representing the bioeconomy also gave their inputs to strategy preparation. They were consulted in five workshops, three regional bioeconomy forums and sectoral consultations. All those interested in the topic were also invited to express their views in the Otakantaa.fi survey and the Biotalous.fi website. The strategy process was facilitated by Gaia Consulting Oy.

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## 1. INTRODUCTION

### Finland to the forefront of a sustainable bioeconomy

Growth, declining natural resources, loss of biodiversity and climate change challenge us to develop a bioeconomy that is based on renewable natural resources.

In 2030, the world will need 50% more food, 45% more energy and 30% more water than today<sup>1</sup>. The growing demand will result in a scarcity of natural resources and push their prices up. The availability of raw materials and the efficiency of their use will thus become a new competitive advantage. Increasing environmental awareness and more stringent legislation will also be drivers in the manufacture of products that have a less harmful impact on the environment.

This global development lays the foundation for a change towards bioeconomy. The bioeconomy is not a new industry; it is a combination of several primary production and refining sectors and end product markets. Typical features of the bioeconomy include the use of renewable, bio-based natural resources, environmentally friendly clean technologies and efficient recycling of materials. It is justified to refer to the transition from a fossil economy to a bioeconomy as the new wave of economic development (Figure 1).

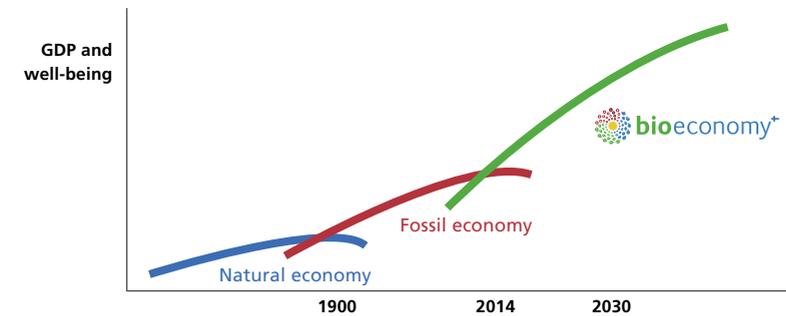


Figure 1 Bioeconomy will be the next wave of economy

Bioeconomy development is driven by changing consumer behaviour and a need to secure the preconditions for human well-being. As a result of the concern over the environment and scarcity of non-renewable raw materials, including metals and oil, the use of biomasses in the economy and across society will increase. Biomasses from the forests, fields and water systems will offer solutions for more diverse needs as the prices of non-renewable raw materials go up.

Finland has plentiful forest resources. Their increment has for decades exceeded the volumes harvested, and they thus offer major growth opportunities for our bioeconomy. Ensuring the growth potential of our forests, due care for biodiversity in the forest environment, and a determined effort to strengthen the timber market, will be crucial for the utilisation ratio of our

<sup>1</sup> YK (2012): Resilient People, Resilient Planet: A future worth choosing.

forests and lay the foundation for the growth of a sustainable bioeconomy. Finland also has many other, up until now under-exploited biomass resources for which new uses and openings are now being discovered.

Over the decades, we have accumulated considerable expertise in refining biomasses, and a strong industrial framework. By exploiting our biomass resources and expertise, Finland can contribute sustainable solutions for global efforts to mitigate climate change and for the dwindling of natural resources. At the same time, we can generate new, sustainable economic growth and well-being for the Finnish people. This is why the Finnish Bioeconomy Strategy has been defined as a growth strategy.

### The bioeconomy is based on renewable natural resources and new operating models

Bioeconomy refers to an economy that relies on renewable natural resources to produce food, energy, products and services. The bioeconomy strives to reduce our dependence on fossil natural resources, to prevent biodiversity loss and to create new economic growth and jobs in line with the principles of sustainable development.

The most important renewable resources in Finland are the biomass, or organic matter, in the forests, soil, fields, water bodies and the sea, and fresh water. Ecosystem services are the services offered by the environment, including binding carbon dioxide and opportunities for recreation. Another key aspect of the bioeconomy is not wasting natural resources but using and recycling them efficiently.

## Finland's road to bioeconomy<sup>2</sup>

Finland is in an outstanding position to develop the bioeconomy, as it has always been necessary for Finnish people to live on the terms of the nature and to adapt the technologies used to its scarcity and ability to renew itself.

The history of the bioeconomy in Finland begins from the era when the ice sheet started receding some 10,000 years ago. The first settlers in Finland lived from hunting but, as their numbers grew, there was less game and farming became an important source of livelihood. For an extensive period, the most important crop was rye grown in fields cleared by slashing and burning, which together with furs became an export product even before the era of tar trading. As farming became more prominent, people started building their dwellings from timber, which gave rise to expertise in log building.

In early 20th century Finland, the natural resource economy relied heavily not only on fields but also on forests. The first "industrial product" from the forest was wooden ships and tar needed to protect them. The demand for forest biomass increased as a market for sawn goods evolved, and these goods became a new export product. The growing need for paper in the world market and the shortage of rags used to manufacture it resulted in technologies for making pulp and paper from wood. In addition to sawn goods, these have been among the most important products for the Finnish export industry.

The roots of sustainable forest management go back as far as the 17th century Sweden. In the first Forest Act applicable in Finland that was passed in 1886, the principle of sustainability was expressed as follows: you shall not devastate the forest. The principles of ecological and social sustainability were added to economic sustainability in the Forest Act of 1996.

We also relied on our forests in the time of war; as oil products were not available, a wood gas burner was developed. After the Second World War, timber and timber products were also used to pay a major part of the war reparations.

In food production, Finland was self-sufficient for a long time. Fields and animal manure used to be inseparable in farming, and manure was not considered as a waste product until the entry into the market of industrial fertilizers. The emerging global lack of nutrients and, in particular, phosphorus has now reinstated manure as a valuable input.

In the early days of the fossil economy after the Second World War, Finland underwent an era of rapid industrialisation, which resulted not only in fast economic growth and well-being but also extensive environmental problems. Waste waters from the forest industry were spoiling the environment, until demands were made that the factories cease polluting. The consequent development efforts were productive, and the new clean technology and closed circulation systems soon improved the state of the water bodies. By international comparison, the role of bioenergy in energy production has also been exceptionally strong in Finland for a long time.

In addition to relatively late urbanisation in Finland, our summer house culture and public access rights have fostered in the Finnish people a close relationship with nature, its values and its processes, i.e. the so-called ecosystem services. Their significance is widely acknowledged in Finnish society. All in all, the importance of bioeconomy and, in particular, forestry in Finland has been something quite unique.

Similarly to the natural resources economy and the fossil economy in their time, bioeconomy is now a global phenomenon driven by the challenges of the fossil economy discussed above and changes in consumer habits, markets, production processes and use of natural resources.

The way we use natural resources has changed and will continue to change in Finland as a result of economic and social development, and new products based on renewable natural resources have been developed as the demand for the old products declines. In addition, competition has triggered a development that has taught us to use raw materials more efficiently. Biomass will be channelled into products that are in demand and that yield the highest added value also in the future. Technological advancement will enable increasingly versatile biomass uses.

## How will our every-day lives have changed by 2030?

Irmeli, aged 48, is the mother of a family with two children. She and her family have recently moved into a city where yet another district of timber houses has been built. These buildings are five-storey zero energy houses. Nano material was used in their foundations, as the carbon dioxide emissions from traditional concrete were seen to be too high. The buildings are in part heated by solar collectors integrated in the wood-based panelling on the external walls. The residents need not worry about wasting drinking water when showering, as a wash water recycling system is in operation in the area. Today Irmeli is wearing a dress made from wood-based natural materials. For breakfast, the family has yoghurt thickened with nanocellulose. Irmeli drives to work in her car made from wood fibre materials. On her way she fills up with fuel made from renewable raw materials, including wood and wastes. As she is reading the paper on her coffee break, she discovers that a drug for treating obesity has been developed from a plant.

For the weekend the family heads out to eastern Finland, where there are numerous tourism enterprises. The sector is flourishing, as several years previously the entrepreneurs managed to create a new business model exploiting research-based health benefits of nature.

## Economic significance of bioeconomy

At more than 16%, the share of bioeconomy in the Finnish national economy is high. The output of the Finnish bioeconomy currently exceeds EUR 60 billion, and more than 300,000 people are employed in the sector. These figures are high, even if they exclude the share of the technology industry that can be classified as belonging to the bioeconomy.

The objective of the Bioeconomy Strategy is to increase the output of our bioeconomy to EUR 100 billion by 2025 and to create 100,000 jobs. The bioeconomy also produces other benefits for the national economy and Finnish society: in addition to increasing our exports, replacing fossil fuels with renewable domestic natural resources will improve Finland's current account balance, reinforce our security of supply and increase our self-sufficiency in energy. The bioeconomy also supports the goals of sustainable development, biodiversity conservation and balanced regional development.

The significance of the forestry sector in Finland has been and will be great, as over one half of Finland's bioeconomy today relies on our forests. Timber is more important for Finland than for any other country in Europe. In the bioeconomy, conventional boundaries between sectors are blurred, and new kind of cross-sectoral cooperation is being created. In the future, the bioeconomy based on sustainable exploitation of forests will result in symbiotic relationships between the forest, energy, technology, chemical and construction industries.

Table 1. Bioeconomy output, value added, people employed and exports in 2011

	Output million EUR	Value added million EUR	Employed	Exports million EUR
<b>Food, total</b>	<b>16 093</b>	<b>4 356</b>	<b>128 400</b>	<b>515</b>
Agriculture	4 822	1 658	90 100	0
Food industry	11 271	2 698	38 300	515
<b>Bioeconomy products total</b>	<b>29 273</b>	<b>9 317</b>	<b>101 400</b>	<b>13 819</b>
Forestry	4 232	2 898	25 000	68
Wood products industry	6 870	1 542	36 400	2077
Pulp and paper industry	13 653	2 967	23 300	9185
Construction	9 228	3 344	58 120	100
Chemical industry	1 644	434	1 600	1 347
Pharmaceutical industry	1 339	845	4 100	932
<b>Renewable energy</b>	<b>4 033</b>	<b>1 903</b>	<b>5 801</b>	<b>0</b>
<b>Water treatment and distribution</b>	<b>610</b>	<b>400</b>	<b>2 700</b>	<b>0</b>
<b>Bioeconomy services total</b>	<b>2 993</b>	<b>1 416</b>	<b>33 900</b>	<b>0</b>
Nature tourism	2 737	1 226	32 000	0
Hunting	85	79	100	0
Fishing	171	111	1 800	0
<b>Bioeconomy total</b>	<b>60 685</b>	<b>20 104</b>	<b>319 321</b>	<b>14 248</b>
<b>National economy total</b>	<b>375 777</b>	<b>163 424</b>	<b>2 509 500</b>	<b>54 221</b>
<b>Share of bioeconomy</b>	<b>16,1 %</b>	<b>12,3 %</b>	<b>12,7 %</b>	<b>26,3 %</b>

In addition to the fields included in these figures, the following sectors have activities relevant to the bioeconomy: technology industry, civil engineering, pharmaceutical industry, clothes industry, printing and design, and planning and expert services. There are no significant exports, or the volume of exports is difficult to estimate, in the fields of renewable energy, water treatment and distribution, and bioeconomy services.

Source: Statistics Finland. The figures for construction, chemical industry and nature tourism are estimates of the share of bioeconomy based activities in these sectors.

## Strong EU support for bioeconomy

Bioeconomy is an important driver in the EU's growth strategy. The UN and the OECD have also made note of the opportunities offered by the green economy in supporting sustainable development while also boosting the economy. The UN Environment Programme aims to promote human well-being and justice while reducing environmental risks and ecological scarcity. The OECD uses the term green growth to refer to the strengthening of economic growth and development while securing the sufficiency of natural resources and availability of ecosystem services.

The EU adopted its bioeconomy strategy in 2012. It is linked to Horizon 2020, the EU Framework Programme for research 2014–2020. Funding for research, development and innovation will improve European competitiveness and growth and create new jobs. The programme pro-



vides funding for food safety, sustainable agriculture and marine research, shipping and inland waters. Funding is also granted to safe, clean and efficient energy production, climate actions, resource efficiency and raw materials.

The *German* bioeconomy strategy highlights striving for self-sufficiency in energy and raw materials. Germany will also invest strongly in developing green technology. The strategy priorities include energy and material efficiency, environmentally friendly energy production and storage, sustainable water supply, sustainable transport, and waste processing and recycling.

The *Dutch* bioeconomy strategy focuses on the chemical and energy sectors, with the main focus on securing the availability of biomasses for these fields.

*Sweden* aims to reach zero greenhouse gas emissions by 2050. Opportunities provided by green growth are high on the agenda, alongside with the climate-related targets. Among other things, Sweden will strive to determine the value of ecosystem services and to analyse the problems that environmental and climate challenges may pose for society.

The *Norwegian* government has drawn up a biotechnology strategy that emphasises stronger research efforts.

## The role of policy actions in promoting the bioeconomy

Thus Finland is not the only country striving to promote the bioeconomy. The EU and many industrial countries are already implementing policy actions aiming to strengthen their prerequisites for exploiting the opportunities offered by the bioeconomy. Rapid generation of new business and regeneration of the existing sectors will be vital for the evolution of the Finnish bioeconomy in order that we can be the forerunners in grasping the growth opportunities offered by the bioeconomy. The expanding global market provides new opportunities for the exportation of both bioeconomy products and expertise. Finland must become an attractive operating environment that will encourage Finnish and international companies to invest in the country. The policy actions must accelerate bioeconomy growth and remove obstacles to its evolution. Strong national determination and systematic action will be needed in order to achieve the Finnish bioeconomy targets.

The Finnish Bioeconomy Strategy strives to develop Finland into a low-carbon, resource-efficient and smart society. Many other current strategic government policies and their implementation measures aim for the same goal. As part of this entity, the Bioeconomy Strategy provides an overall picture and determines the strategic choices that are a precondition for achieving better economic growth and employment and increased well-being through the bioeconomy. The strategy reconciles the actions required to develop the bioeconomy. It strives to promote a new type of thinking and creation of cross-sectoral operating models in the scientific community, government and business life alike.

## 2. NEW BUSINESS FROM BIOECONOMY PRODUCTS AND SERVICES

New bioeconomy business opportunities in Finland will be based on smart exploitation of biomasses and water resources, the development of technologies associated with this, and high added value products and services. The role of services will have even more emphasis in the future, posing new challenges to competence. Key drivers for growth will be a favourable operating environment for bioeconomy development and policy actions that promote bioeconomy growth. It is estimated that up till 2025, the Finnish bioeconomy could experience an annual growth rate of some 4%. This means that the bioeconomy output would increase from its current level of EUR 60 billion to EUR 100 billion.

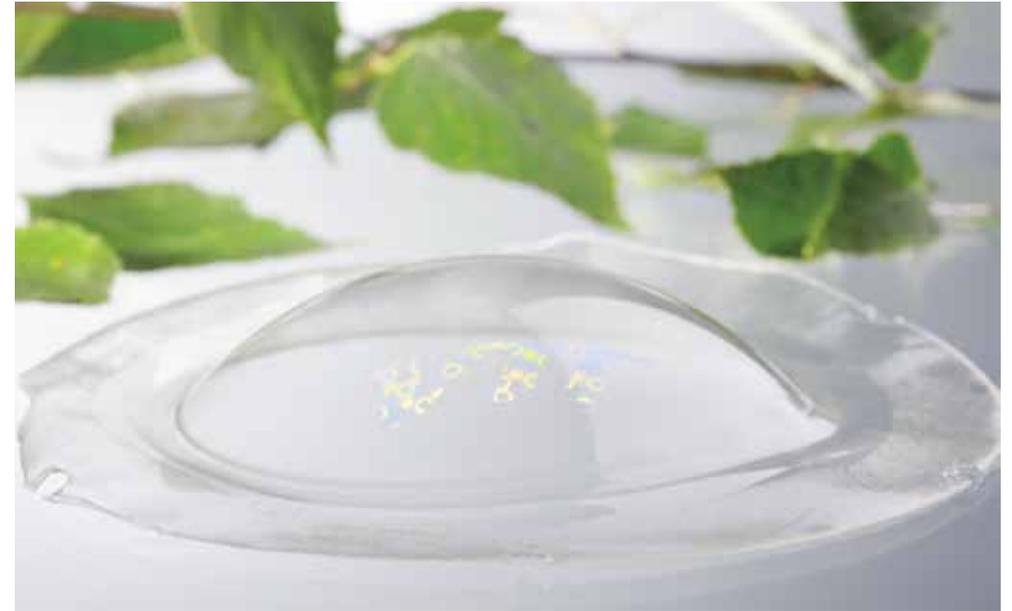
The cornerstones for developing the bioeconomy will be securing the competitiveness of the existing industries and providing them with a favourable setting in which to operate and grow. The new business opportunities arising alongside with these will rely on the smart exploitation of biomasses and high added value products and services. The greatest opportunities for growth will be found in new products and materials, in particular in forest, chemical and energy industries, and technologies and services that support them.

### Diversification through bio-based products

The industrial exploitation of wood-based biomass will be significantly diversified. In addition to traditional forest products, wood will be used in innovative high added value timber products and various new products made from wood ingredients. The new product areas will to a significant degree be based on forest industry, while the current boundaries between sectors will disappear, enabling the creation of new value networks. The forest industry will make a determined effort to develop completely new bio-based products, the share of which is estimated to increase to one half of our export earnings in this sector by 2030. Strong Finnish competence areas will also include biochemical methods, pulping technologies and enzyme production for the refining of biomass. Various combinations of process chemistry and bio and nano technologies may give rise to completely new production technologies and biomaterials.

In a sustainable bioeconomy, wastes and industrial side streams will play an even more significant role as raw materials. They will complement the raw material base of the bioeconomy and contribute to replacing natural biomasses, thus also reducing environmental loading. Regional cooperation, interaction between industrial sectors and new services that support the exploitation of surplus materials will enable efficient use of materials close to where they are produced.

Significant new business in the mechanical engineering sector and equipment manufacture will be generated from developing bioeconomy-related technologies. Strong expertise in wood biomass harvesting technologies, logistics and refining can be further developed by utilising ICT solutions. Increased use of biomasses will call for the development of efficient logistic systems



and biomass pre-treatment methods, as well as adequate maintenance and improvement of the road network and other transport routes.

### Pioneering bioenergy production and use

The use of wood-based transport fuel is increasing rapidly in Finland. The manufacture of bio-oil based on pyrolysis has already been launched, and the refining of pine oil produced in the pulp process into a second generation biodiesel is about to take off. There are also plans for other plants producing wood-based liquid fuels.

Finland is a pioneer in bioenergy production. Wood is our most important raw material in terms of energy production. Its share is higher than that of oil, coal or natural gas when not only the direct use of wood for energy but also the energy created in the forest industry process is taken into account. Most of our renewable energy stems from the side streams of wood-based industries. In addition, the combined electricity and heat production in many cities relies on renewable wood raw materials. In the future, energy fractions in the side streams from agriculture and the food industry will also be more efficiently utilised in energy production.

### Increased use of bio-based raw materials in the chemical industry

More than one out of three chemical industry companies operating in Finland are already using bio-based raw materials, and studies indicate a rapid increase in this figure. Similarly to

the forest industry, crucial factors for future growth include the availability of bio-based raw materials and a well-functioning market. Biomass and wastes will be used to produce high added value products, such as bio-based transport fuels. Combinations of process chemistry and bio and nano technologies may give rise to completely new production technologies and biomaterials.

The chemical industry will play a key role for many of the new bioeconomy value networks, as it manufactures intermediate products and chemicals for further use in many different areas. The chemical industry has the required expertise and infrastructures, and it is already operating in a similar market.

## Timber construction to account for a significant share of urban construction

The growth outlook for timber construction as part of ecological housing and other construction is very positive in Finland and globally. It is also possible to turn our expertise in timber construction into a successful export product. The greatest prospects for timber construction are found in large-scale building: solutions for residential blocks of flats, office buildings, halls and various kinds of wooden structures as well as environmental constructions, also including construction related services.

## Increase in forest use on a sustainable basis

More versatile exploitation of wood biomass will also increase the financial use of forests. The potential for sustainable economic exploitation of Finnish forests is very high indeed. The growth volume of stemwood is currently some 104 million cubic metres a year, and it is expected to improve further. In addition to stemwood, biomass is obtained from the crowns, branches and roots. In 2008–2012 the Finnish forest industry used the average of 51 million cubic metres of domestic roundwood meeting the criteria for log and fibre wood per year, which is less than 70% of the maximum sustainable roundwood removals. This puts us in an ideal position to increase our use of forest resources for bioeconomy needs. The ecological and social sustainability of commercial forests is secured through forest policy actions.

Increase in sustainable bioeconomy requires a sustainable and evolving raw material market for actors using wood. New investments relying on the use wood will not materialise without a well-functioning raw material market.

In addition to securing felling opportunities and growth, protecting forest biodiversity and natural values must also be part of exploiting the forests. In Finland forests have been conserved, nature management methods have been employed in commercial forests, and environmental and forest legislation and certification have been developed with the aim of finding a balance between the various ways of exploiting forests in line with the general principles of sustainability.

## Cost-effectiveness and environmental benefits from efficient biomass utilisation

In addition to forests, many other types of biomass could be more efficiently used in Finland. The best use of side streams is being made in manufacturing industries, where efficient use of raw materials can be translated into cost-efficiency. On the other hand, many biomasses classified as wastes are often under-used. Smart biomass exploitation means that we reap the raw materials, nutrients and energy found in biomasses while reducing negative impacts on the environment.

The bioeconomy means environmental benefits as well. The planned exploitation of biomasses will reduce transport needs necessitated by the side streams, while nutrient recycling can contribute to reducing the use of chemical fertilizers made from non-renewable minerals.



## Bioeconomy provides openings for cleantech

Sustainable operating models and technologies of bioeconomy are part of clean technologies, or cleantech, the global market for which is growing rapidly. Thanks to the high level of automation and process expertise in Finland, considerable business and export potential can be found in the utilisation of, for example, recycled materials and by-products.

Availability of clean water, chemicalisation of the environment and controlling greenhouse gas emissions are challenges that, if we can find the right solutions, will create new global business opportunities. For example, there is a demand in the international market for technological solutions relevant to energy, material efficiency, waste and water processing, and nutrient recycling. Among others, Finland has unique technologies for burning low-grade fuel at a high efficiency, and extensive expertise in resource-efficient processes.

Finland is known for our high-quality, world-class biotechnology competence. Our particular strengths include industrial biotechnology and its applications. Industrial biotechnology applies biotechnology to the manufacture of products such as chemical compounds, including antibiotics, ethanol and citric acid, or proteins, including enzymes and antibodies. In the manufacturing process, use is made of either various micro-organisms, including bacteria or moulds, or their parts, such as enzymes. Industrial biotechnology and various microbe factories are already in wide-spread use in the Finnish industries today, for example, in food, energy, enzyme, mining, pharmaceutical, forest and brewery industries.

## Bioeconomy boosts food industry turnover

The bioeconomy will enable conventional food industry businesses to grow and expand their exports. Our food industry companies derive almost one half of their turnover from the international market. New business opportunities are constantly opening up in the food system.

Completely new business may be generated if we can exploit the opportunities offered by closed systems, biorefineries, domestic animal production side streams and field biomasses. By exploiting the side streams of the food industry we can produce new biorefinery products for the chemical industry. Energy fractions from side streams can be used for energy production.

Local food production that taps regional resources and strengths is an aspect of green growth that also responds to expanding consumer demand. Small industries and agriculture can achieve higher rates of self-sufficiency if side streams are utilised for nutrient recycling and local bioenergy production. By utilising decentralised models adjusted to local conditions, resource-smart local food production can also contribute to revitalising regions by boosting production and employment.

Finnish people have expertise in developing functional foods. Natural products mean new business opportunities for the bioeconomy, and their productisation and exportation could be significantly increased thanks to the new consumer trends.

## Biotechnology enables growth in the health sector

The health sector is one of the most rapidly growing fields in the world. Finnish biotechnology expertise promotes the generation of new business from pharmaceutical research, health technology, individualised health care solutions and health sector service innovations. In addition to expertise of a significant international standard, Finland's outstanding registers, new biobanks and extensive data resources offer expanding potential for exploitation. The bioeconomy encourages cooperation between sectors and offers an excellent way of improving the citizens' well-being.

## Bioeconomy creates new service business

Services are considered to have a significant and growing role in the new bioeconomy value chains. Increasing service intensiveness, services associated with industrial products and immaterial value creation are clear trends that will open up new business opportunities, in particular for SMEs, and encourage cooperation and partnerships between companies. New service business opportunities will be created in value chains related to bioproducts, for example, in services based on wood products and side streams. Tourism services also offer plenty of new opportunities that have as yet not been exploited.

Natural values and the processes that maintain natural resources are vital for the bioeconomy. These ecosystem services provide opportunities for many types of business. At the same time, the nature and nature experiences are an important source of well-being for us. Well-being services that are based on natural values and that promote good health are a growing sector. The income brought by both Finnish and international customers can be significantly increased by means of nature tourism and well-being services.

New business can also be built on the ecosystem services in the construction sector and in water and landscape management. Energy recovery and exploiting water circulation, micro-climates and vegetation are part of sustainable construction and urban planning.

## Water resources support the bioeconomy

Adequate supply of clean water is a global challenge that will be aggravated in the future. The needs related to water resource use will become even more prominent and require solutions that improve water efficiency and water recycling and that are suitable for communities and industrial plants. The Finnish forest industry is a pioneer in developing and introducing processes with low water usage.

Water ecosystems have a significant production potential. Aquaculture has thus rapidly reinforced its position in the global food supply, and it is generally considered one of the most sustainable ways with the greatest potential of producing animal protein for the fast-growing

population. Great expectations are similarly placed on algaculture, for example, in terms of energy production. All in all, water and fishery resources, aquaculture and the related products, technologies and opportunities to export expertise show considerable growth potential.

## Decentralised, resource-efficient bioeconomy solutions enhance the viability of regions

Decentralised and resource-efficient bioeconomy solutions can improve regional self-sufficiency in energy and nutrients as well as promote energy and material efficiency. In decentralised solutions, raw materials are often exploited close to where they were produced, making sure that the benefits resulting from the activities remain in the area. Nutrient use can be made more efficient by various closed cycle systems, thus reducing dependence on imported nutrients while gaining environmental and climate benefits.

Regional self-sufficiency in energy can be improved by using the versatile raw material supply of the countryside as an energy source. In a decentralised bioeconomy, services related to the environment and natural resources create new business opportunities for rural areas, enhance the viability of regions and diversify their livelihood opportunities. A precondition for achieving cost-effective decentralised solutions include the creation of well-functioning markets, study of the locations where raw materials are produced, processing the materials into a marketable form and optimising the logistics and the locations where the materials are exploited.

## The role of cities, municipalities and regions in introducing bioeconomy solutions

Cities, municipalities, regions and the central government play a key role in introducing new bioeconomy solutions. Local authorities and their large-scale investments as well as public procurement provide important development environments for the bioeconomy. They can be used for experimenting with, testing and developing sustainable bioeconomy solutions, for example, for construction, energy and water supply, transport and waste management. The impacts of nature on human well-being and health are increasingly being recognized as part of a good living environment for the people.

## 3. THE VISION, OBJECTIVE, GOALS AND MEASURES OF THE BIOECONOMY STRATEGY

### VISION FOR 2025:

SUSTAINABLE BIOECONOMY SOLUTIONS ARE THE FOUNDATION OF WELL-BEING AND COMPETITIVENESS IN FINLAND

The objective of the Finnish Bioeconomy Strategy is to generate new economic growth and new jobs *from an increase in the bioeconomy business and from high added value products and services while securing the operating conditions for the nature's 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 the international market, thus boosting the welfare of the whole of Finland.

Facilitated by the actions contained in the strategy, the bioeconomy output will grow to EUR 100 billion from its current level of EUR 60 billion, and 100,000 new jobs will have been created in the bioeconomy by 2025.

Competitive products and services, legislation and consumer behaviour guided by environmental awareness will direct the evolution of the bioeconomy in the international markets. It is vital for the implementation of the Bioeconomy Strategy that existing and new policy actions will be targeted to support the growth of a sustainable bioeconomy.

## Strategic goals

The vision and quantitative targets of the Bioeconomy Strategy will be implemented by means of four strategic goals:

1. *A competitive operating environment for the bioeconomy*: a competitive operating environment will be created for bioeconomy growth
2. *New business from the bioeconomy*: new business will be generated in the bioeconomy by means of risk financing, bold experiments and the crossing of sectoral boundaries,
3. *A strong bioeconomy competence base*: the bioeconomy competence base will be upgraded by developing education, training and research,
4. *Accessibility and sustainability of biomasses*: availability of biomasses, well-functioning raw material markets and sustainability of the use of biomass will be secured.

By measures related to these goals, the government wishes to ensure that Finland provides outstanding conditions for bioeconomy enterprise and investments and that the targets set for bioeconomy growth and sustainable development in this strategy can be achieved. An effort will be made to achieve an anticipatory understanding of the development and functioning of the

markets and the operating environment in order that the government, the scientific community and policy actions can address them in their activities and appropriately support bioeconomy development. The matters concerning state funding are discussed and decided in the government spending limit and budget processes.

The following figure (Figure 2) describes the vision and strategic goals of the Bioeconomy Strategy:

Figure 2 Vision and strategic goals of the Bioeconomy Strategy



## Actions

### 1. A COMPETITIVE OPERATING ENVIRONMENT FOR THE BIOECONOMY: A COMPETITIVE OPERATING ENVIRONMENT IS CREATED FOR THE BIOECONOMY

Global markets are opening up for solutions necessitated by the dwindling natural resources. The challenge faced by Finland is to be able to exploit our unique competitive advantage by providing a competitive operating environment for bioeconomy actors. In addition to a favourable investment environment, this means an ability to exercise foresight in mapping new business opportunities emerging in the market while trying to understand better the types of top expertise Finland should focus on to grasp these opportunities. We should boldly guide the demand towards new bioeconomy solutions. All this will require new kinds of shared national operating models.

### 1.1 Anticipating the global demand for bioeconomy solutions and preparing roadmaps

Demand for bioeconomy products and services in the global market will be directed by competitive pricing, as well as by legislation and ethical consumer behaviour. The aim is at an anticipatory understanding of the development and functioning of the markets and the operating environment, which will enable us to identify those bioeconomy areas in which Finland can be a pioneer. In order to anticipate bioeconomy business opportunities, we need a system for (1) monitoring changes in the drivers and obstacles that are important for the marketing of bioeconomy products and services, (2) assessing the opportunities of Finnish export industries, and (3) drawing conclusions on the required actions and roadmaps. The development measures to be prepared in the various sectors of the operating environment of the bioeconomy will be linked to the strategy.

Measures:

- Creating a bioeconomy foresight and scenario system and an international network that supports it to identify global trends and sustainability challenges as well as Finland's opportunities for generating business from solving these challenges.
- Implementing the health sector growth strategy and food export programme as elemental parts of the implementation of the Bioeconomy Strategy.

*Responsibility: Prime Minister's Office, Ministry of Employment and the Economy, Team Finland*  
*Other actors: Ministry of Education and Culture, Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Social Affairs and Health, Ministry for Foreign Affairs, Tekes, VTT Technical Research Centre of Finland, Sitra, Natural Resources Institute Finland, the Finnish Environment Institute*

### 1.2 Developing steering methods to support new bioeconomy solutions

Legislation and other steering instruments can be used to support the generation of new bioeconomy solutions and to ensure that the use of raw materials needed in the bioeconomy is on a sustainable foundation. The aim is at a business and investment environment favourable for the bioeconomy, promoting a high added value bioeconomy and ensuring the sustainability of the bioeconomy. From this initial position, we must ensure that no unnecessary administrative burdens or regulation is imposed on the industry exploiting biomasses compared to our competitors. Creation of new business is promoted through smooth and flexible permit procedures. A national bioeconomy panel will be set up to coordinate cooperation between various actors.

Measures:

- Mapping the steering instruments for the bioeconomy in the administrative branches of the Ministry of Agriculture and Forestry, the Ministry of Employment and the Economy and the Ministry of the Environment and assessing the impacts of these on the operating conditions of the bioeconomy.
- Launching a drafting process with stakeholder involvement to develop regulation.

*Responsibility: Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Employment and the Economy*



### 1.3 Providing incentives for the replacement of non-renewable natural resources by renewable ones in public procurement

Public sector procurement is of a high significance in the national economy. When new solutions are being launched on the market, the volume of demand that procurement represent may be crucial for obtaining references.

Measures:

- Developing the criteria for sustainable public procurement so that the competitiveness of bio-based products in awarding public contracts can be improved.
- Updating government resolutions on public contracts to also cover bioeconomy procurements by 2016.
- Encouraging municipalities to introduce sustainable procurement as part of their business and industry strategies and to include strategic development of procurement in Structural Fund and other programmes.

*Responsibility: Ministry of Employment and the Economy, Ministry of Finance, Ministry of the Environment*

*Other actors: Ministry of Agriculture and Forestry, Hansel, Tekes, Association of Finnish Local and Regional Authorities, Motiva*

### 1.4 Promoting demand for bioeconomy products and services

A precondition for bioeconomy development is that the structures of society enable sustainable choices and customers are aware of the alternatives offered by the bioeconomy. Housing, transport, food and various well-being services provide great opportunities for the bioeconomy. In order for these opportunities to materialise, bioeconomy actors must be able to communicate clearly and reliably about the sustainability of their activities and products. Good examples and practices must be brought up and introduced to broader use in society.

Measures:

- Influencing consumer choices by highlighting the sustainability of bioeconomy products.
- By means of active communication, emphasising the material and immaterial consumption alternatives offered by the bioeconomy and supporting the replication of good practices.

*Responsibility: Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Employment and the Economy*

*Other actors: Finpro*

### 1.5 Promoting the standardisation and certification of bioeconomy solutions

The EU has prioritised the bioeconomy as a key target for standardisation in the next few years. Finland should be proactive and take part in specifying the contents of the new standards, as standardisation will create the framework for the new markets for bioeconomy products and technologies.

Measures:

- Making international efforts for bioeconomy standardisation a priority area of our national work on standardisation by means of resource allocation and intensified cooperation.

- Developing policy actions, e.g. certification systems, that improve the market position of bioeconomy based products.

*Responsibility: Ministry of Employment and the Economy, Ministry of the Environment*

### 1.6 Smart green urban regions as development environments for bioeconomy solutions

In the future, 70% of the global population will live in cities. Efficient use of water, materials, energy and space will be a necessity in areas with high population densities. The bioeconomy provides sustainable solutions for energy and water supply, transport and waste management in cities. The bioeconomy will be developed through city innovations, linkages between them and by disseminating them. Interaction between cities and the surrounding countryside will be stepped up in order to derive more benefits from the bioeconomy, including local food and renewable energy production.

Measures:

- Supporting long-term development environments structured upon the large investments of urban regions, in which we can experiment with, test and develop resource-effective solutions of the new generation of renewable energy and water supply and waste management as well as models for ecologically sustainable transport.
- Together with urban regions, creating open marketplaces based on public sector innovation and procurement needs where new applications can be developed together with companies and organisations and their dissemination and commercial introduction can be speeded up. Harnessing existing cooperation models to these experiments (SHOK Centres, INKA programme projects, subregional pilot projects, research cooperation models, land use planning). Developing regional operating models for more efficient utilisation of side streams and urban waste.

*Responsibility: Ministry of Employment and the Economy, Ministry of the Environment, Ministry of Agriculture and Forestry*

*Other actors: Sitra, Finnish Environment Institute, SHOK Centres, cities, Regional Councils*

### 1.7 Incorporating the bioeconomy in Finland's country image

The great challenges faced by the globe, including population growth, climate change, lack of clean water, depletion of natural resources, and deterioration of the state of the environment, will require solution models that are consistent with sustainable development in areas where Finland has strong expertise. We can brighten Finland's image by offering resource and energy efficient products and services of a high ethical standard to the global market and thus attract direct international investments to Finland. There is also a demand for bioeconomy solutions in development cooperation.

Measures:

- Finland's reputation as a pioneer of bioeconomy development, expertise, enterprise and sustainable use of natural resources will be enhanced by integrating the bioeconomy in the Team Finland strategy.
- The Team Finland network will be used to actively inform international actors of the opportunities of investing in Finland's bioeconomy.

*Responsibility: Team Finland, Ministry of Employment and the Economy*

*Other actors: Ministry for Foreign Affairs, Prime Minister's Office, Ministry of the Environment, Ministry of Agriculture and Forestry*

## 2. GENERATING NEW BUSINESS FROM THE BIOECONOMY: NEW BUSINESS WILL BE GENERATED FROM THE BIOECONOMY BY MEANS OF RISK FINANCING, BOLD EXPERIMENTS, A STRONG DOMESTIC MARKET AND THE CROSSING OF SECTORAL BOUNDARIES

The growth of the bioeconomy market is only beginning. As Finland has engaged in long-term efforts to develop our bioeconomy expertise, we are in a particularly good position to grasp the new opportunity. New business will renew the existing industries located in Finland and can also spark completely new enterprising. A prerequisite for this, however, is that the domestic bioeconomy market is made as attractive as possible for developing new business. This will require new funding solutions for innovations and growth companies as well as efforts to direct demand towards new bioeconomy solutions.

Over the next 10-year period an estimated 2.1 billion euros of public funding will be needed to reach the growth objectives for the bioeconomy, to be distributed between risk funding to companies (1.0 billion), research and innovation funding (0.5 billion) and inputs in piloting and demonstration projects (0.6 billion).

### 2.1 Increasing equity financing and innovation inputs in the bioeconomy

Equity financing and investments in innovation will be required to ensure bioeconomy development and attract investments. By developing equity financing for bioeconomy companies we can create prerequisites for the establishment and fast growth of new business and growth companies. An effort will be made to create opportunities for the Finnish export industries to launch new products rapidly and as pioneers, thus maximising the business profits. The challenge lies in generating innovative fast-growing business and companies in the bioeconomy that aim for a pioneering role in new markets.

Measures:

- Ensuring the availability of risk financing for bioeconomy growth companies as part of government funding solutions aiming to increase growth enterprising.
- Prioritising the bioeconomy through cooperation between public finance providers for research and innovation and allocating public research and innovation funding to the bioeconomy within the limits allowed by the state economy.

*Responsibility: Ministry of Employment and the Economy*

### 2.2 Funding piloting and demonstrations projects of new bioeconomy solutions

In many respects the bioeconomy market is new and in a growth phase. References will be needed to trigger demand: new bioeconomy solutions must be experimented with, piloted and

demonstrated in order to commercialise innovations, ensure the functioning of the solutions and reap concrete benefits. A precondition for this will be adequate and flexible funding, even for bold experiments. Other actions to support the market access of new bioeconomy solutions will also be needed, including the development of testing, certification and standardisation.

Measures:

- Implementing bioeconomy pilot and demonstration projects in cooperation between finance providers (financial instruments of the EU programming period 2014–2020, domestic public and private R&D&I funding).
- Adjusting the operating models of finance providers for research and innovation to enable experimentation.
- Harnessing the competence of government sectoral research institutes and testing environments to the planning and implementation of pilot and demonstration projects.

*Responsibility: Ministry of Employment and the Economy, Ministry of Agriculture and Forestry*  
*Other actors: Tekes, Natural Resources Institute of Finland, Finnish Environment Institute, VTT Technical Research Centre of Finland, Academy of Finland, Universities*

### 2.3 Developing bioeconomy cooperation platforms across sectoral boundaries

Bioeconomy cooperation platforms (SHOK Centres, INKA programme actors, research cooperation models) must be geared to cross-sectoral activities that create innovative solutions and improve competitiveness to give momentum to business that is successful in the international market. Cities and subregions must be harnessed to this cooperation, and strong links must be forged with international networks. Promotion of bioeconomy growth must also have a role in land use and urban planning.

Measures:

- Gearing cooperation platforms (SHOK, INKA) to cross-sectoral activities and international cooperation by targeting the funding.
- Proposing the launch of a bioeconomy action plan to Tekes and the Academy of Finland to bring together actors in various sectors.
- Improving interaction between regions through Structural Funds programmes and allocating Structural Fund financing to support the cooperation platforms (SHOK, INKA).
- Creating a setting for bioeconomy development by ensuring that sustainable use of natural resources, natural values and economic activity are reconciled in land use planning and by launching general planning development projects that support this.
- Establishing a national bioeconomy panel to step up interaction between the government, the scientific community and enterprises and industry.

*Responsibility: Tekes, Academy of Finland, Ministry of Employment and the Economy, Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Education and Culture*

### 2.4 Promoting immaterial value creation to increase the added value of products and services

Our bio-based products have traditionally relied on our plentiful biomass resources and had a low added value. The future challenge to the Finnish business sector will be increasing the

added value. A higher value for customers can be produced by investing in various immaterial value creation factors, including brand management, intellectual property rights and design, while also achieving competitive advantages that are difficult to imitate. For example, the recently launched National Design Programme makes valid points about how the desirability and usability of products and services can be improved by design competence.

The nature, and culture and art drawing on it, also produce well-being and reinforce images that may increase the demand for bioeconomy services. The significance of immaterial values of the bioeconomy is often recognized locally and regionally as a source of business, culture and well-being. This trend must be supported systematically across society. We must more consciously utilise natural values to create a good living environment and to promote health, well-being and ecologically sustainable business.

Measures:

- Paying cross-cutting attention on the opportunities of immaterial value creation in bioeconomy policy actions.
- Launching user-oriented experiments and developing operating models for promoting immaterial value creation and ecologically sustainable business.
- Mapping the opportunities for nature tourism and other service activities relying on natural values, developing new forms of services for the international market, and arousing the interest of foreign customers in bioeconomy services.
- Securing the preservation of immaterial natural values.

*Responsibility: Ministry of Employment and the Economy, Ministry of the Environment, Ministry of Agriculture and Forestry, Ministry of Education and Culture*  
*Other actors: Tekes, Natural Resources Institute Finland, Finnish Environment Institute, VTT Technical Research Centre of Finland*

## 3. CREATING A STRONG BIOECONOMY COMPETENCE BASE: DEVELOPING THE BIOECONOMY COMPETENCE BASE BY UPGRADING EDUCATION, TRAINING AND RESEARCH

Bioeconomy innovations and new business require world-class expertise, research and product development. New solutions will be created on the interface between competence and actors and in a new type of cooperation. Competence and research must cover the entire value chain, and they must be channelled to creating added value.

### 3.1 Developing education content to train bioeconomy experts

Producing sustainable bioeconomy solutions for global problems requires multidisciplinary competence and combination of expertise. There is little general awareness of the opportunities offered by the bioeconomy, however, and we must thus increase public awareness of them

to motivate the working life, scientists, teachers and students. The current educational offer can be exploited to educate bioeconomy experts by incorporating renewable natural resources in the existing programmes. As the bioeconomy aims for new business and jobs, the relevant education should also contain business studies and encouragement to enterprising.

Measures:

- Increasing awareness of the bioeconomy among young people.
- Offering further education, updating of qualifications and re-training based on the need identified by employers. Supporting re-training of life science experts to reinforce their innovation, product development and business skills.
- Deepening cooperation between universities and research institutes in a multi-annual development process (Government Decision of 5 September 2013); paying attention to opportunities for business development in bioeconomy besides the research, development and innovation activities.

*Responsibility: Ministry of Education and Culture, business life*

*Other actors: Universities, vocational institutes, Ministry of Employment and the Economy, National Board of Education*

### 3.2 Creating preconditions for bioeconomy through research

Competitive bioeconomy requires the creation of centres of expertise of an international standard and reform of the priorities and operating models of research. The bioeconomy is a multi-disciplinary entity where competitive solutions cannot be produced without consolidating several sectors and types of competence. New knowledge and expertise are continuously being created in the world. Finland must make sure of its ability to utilise and apply this knowledge fast and efficiently in creating bioeconomy solutions.

Measures:

- Making an effort to incorporate the bioeconomy theme to the process where decisions are made on the themes and priorities of the Strategic Research Council to be set up in connection with the Academy of Finland.
- Intensifying research cooperation that crosses sectoral boundaries and accelerating the exploitation of research results by means of a reformed SHOK concept.
- Improving our ability to exploit international research in Finland by influencing the contents of the EU Framework Programme for Research and Innovation, by encouraging Finnish actors to take part in international research networks and by promoting the international mobility of scientists and students.

*Responsibility: Ministry of Employment and the Economy, Ministry of Education and Culture, Ministry of Agriculture and Forestry, Ministry of the Environment, Prime Minister's Office*

*Other actors: Tekes, Academy of Finland, SHOK Centres, Natural Resources Institute Finland, Finnish Environment Institute, VTT Technical Research Centre of Finland*

## 4. ACCESSIBILITY AND SUSTAINABILITY OF BIOMASSES: SECURING THE AVAILABILITY OF RENEWABLE NATURAL RESOURCES, WELL-FUNCTIONING RAW MATERIAL MARKETS AND SUSTAINABILITY OF RAW MATERIAL USE

The transition from a fossil economy to a bioeconomy will mean much more extensive exploitation of renewable natural resources. The reliable supply of biomasses at a competitive price will be a crucial condition for companies and investments, and thus for a successful bioeconomy. While we make sure that the biomasses produced by the forests, fields and waters are available for diverse exploitation in the bioeconomy, we must also guarantee the sustainability of using these natural resources and appropriate operating conditions for ecosystem services. Better information about biomass availability and trends can be produced by developing planning systems and statistical services.

### 4.1 Ensuring the possibilities of using biomasses and their availability for the needs of a growing bioeconomy

The natural resources of the Finnish forests and waters and the opportunities for their sustainable use are exceptionally great on the EU and international scale. As the growth potential for the Finnish bioeconomy to a great extent depend on exploiting our biomass resources, we must ensure that EU legislation or other international decisions will promote rather than obstruct the use of biomass. As the biomass resources are mainly in private ownership in Finland, in terms of biomass availability we must encourage the financial exploitation of biomasses as well as their imports. By means of jointly adopted rules, we must be able to show that the exploitation of biomass in Finland rests on a sustainable basis.

Measures:

- Finland influences the key decisions and legislation on natural resources use in the EU and internationally to ensure that we have the opportunity to exploit our biomass resources in a versatile manner for the needs of a growing and sustainable bioeconomy. The ministries will create an operating model that will ensure joint and anticipatory influence on EU and international decision-making processes.
- Improving the availability of biomasses and the operating conditions of the production chain by developing the land ownership structure, production methods and land use planning and by enhancing logistics and the infrastructure.
- Developing business activities and entrepreneurship based on versatile exploitation of natural resources.
- Evaluating the sustainability of biomass use by generally accepted methods (e.g. the European RES Directive, Timber Regulation, Pan-European criteria and indicators for sustainable forest management and domestic certification systems), which will be updated and complemented as necessary. Finland will play an active part in the development of new methods.

*Responsibility: Ministry of Employment and the Economy, Ministry of Agriculture and Forestry, Ministry of the Environment, Prime Minister's Office*  
*Other actors: Natural Resources Institute Finland, Finnish Environment Institute, VTT Technical Research Centre of Finland*

#### 4.2 Making more efficient use of knowledge related to biomass resources

Finland has an excellent knowledge base on biomass resources and their availability - forest resources, field biomasses, fisheries, and to a certain extent also various wastes and side streams. This information is fragmented, however, and the opportunities of e.g. localised information have not been fully exploited. Up-to-date information to which various actors have easy access will create preconditions for providing new bioeconomy services, securing the sustainable use of biomasses and safeguarding ecosystem services.

Measures:

- Launching the collection of information on biomass resources and ecosystem services as part of a national system for natural resource accounting.
- Improving information collected by means of public funding on biomass reserves and waste streams. Collecting information in up-to-date geographical information systems and facilitating their availability and use.
- Developing the statistics system on the bioeconomy.

*Responsibility: Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Finance*  
*Other actors: Natural Resources Institute Finland, Finnish Environment Institute, Statistics Finland, VTT Technical Research Centre of Finland*

## 4. IMPLEMENTATION AND MONITORING

The Finnish Bioeconomy Strategy will be implemented in cooperation between several ministries. The efforts will be coordinated by the Ministry of Employment and the Economy. Other parties responsible for strategy implementation will be the Ministry of Agriculture and Forestry, the Ministry of Education and Culture, the Prime Minister's Office, the Ministry of Finance and the Ministry of the Environment. The organisations in the administrative branches of these ministries will be extensively involved in the implementation. A detailed plan with timetables for the measures will be prepared in the context of organising the strategy's implementation. Most of the measures should get started by the end of 2014. Strategy implementation will be supported by a bioeconomy panel to be set up. The panel will consist of actors in the bioeconomy sector, and it will engage in dialogue with other programmes aiming for a low-carbon and resource-efficient society.

Strategy implementation will be monitored using the indicators provided by public sources (Table 2).

Table 2. Key figures, indicators and data sources for the implementation of the Bioeconomy Strategy.

Key figure to be measured	Indicators	Data source
Growth of bioeconomy and its significance in the national economy	Bioeconomy output/value added/ the number employed and their share in the national economy	Statistics Finland
Added value produced for natural resource use	Raw material input/value added to raw material streams	Finnish Environment Institute, Thule Institute, Statistics Finland
Environmental benefits from the bioeconomy	Raw material inputs used/greenhouse gas emissions avoided	Finnish Environment Institute Centre, Thule Institute, Statistics Finland
Sustainability of the bioeconomy	Total use of natural resources/ growth and harvested volumes of standing timber, cereal crops, fish bag, endangered species, urban waste	Statistics Finland, Luonnontila.fi
Sustainability of the bioeconomy	Indicators to be developed for ecosystem services, environmental and resource efficiency as well as wealth and environmental assets	Statistics Finland

The objective of the Finnish Bioeconomy Strategy is to generate new economic growth and new jobs from an increase in the bioeconomy business and from high added value products and services while securing the operating conditions for the nature's 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.

The Bioeconomy Strategy was drafted in a project set up by the Ministry of Employment and the Economy. Participants in this project were the 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, the administrative branches under these Ministries, as well as VTT Technical Research Centre of Finland and the Finnish Innovation Fund Sitra. Stakeholders representing the bioeconomy also gave their inputs to strategy preparation. They were consulted in five workshops, three regional bioeconomy forums and sectoral consultations.

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