

# From forests to pioneering bioeconomy

Final report on the Strategic  
Programme for the Forest Sector  
(MSO)



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MINISTRY OF EMPLOYMENT AND THE ECONOMY

## MSO as a government flagship project

*The strategic programmes implemented by the Ministry of Employment and the Economy are government flagship projects, contributing to the objectives of increasing employment and economic growth. The programme operating model is based on cooperation and networks. Collaboration involves a broad range of ministries, administrations and, in particular, different operators and enterprises in the sector. Expert bodies from different fields, such as research institutes and labour market organisations, also play a key role.*

The programmes operate under the governance of the Cabinet Committee on Economic Policy and the Minister of Labour or the Minister of Economic Affairs. The programmes are guided by the framework of the strategy and steering processes of the Government and the Ministry of Employment and the Economy. They are designed to tackle major societal challenges by implementing the necessary practical reforms. The strategic programmes produce new solutions and operating models to respond to societal challenges.

The Strategic Programme for the Forest Sector (MSO) has been based on Prime Minister Katainen's Government Programme, and it has been implemented as one of the flagship projects of the electoral term. The Finnish National Wood Construction Programme, which is also based on the Government Programme, has been implemented as part of the MSO.

After the decision to initiate the MSO, the programme's main tasks, objectives and priorities were specified by the MSO advisory council. As defined by the advisory council, the main task of the MSO has been to promote the competitiveness and renewal of the sector. In the MSO, the following general development targets were set for the sector:

Target 1: The market share of wooden multi-storey buildings is 10% and the exports of processed wood products increase by EUR 0.5 billion a year.

Target 2: The value of forest industry exports amounts to EUR 13 billion a year.

Target 3: The turnover of new products increases by EUR 1 billion a year.

Target 4: The use of domestic wood totals 65-70 million cubic metres a year.

Measures concerning the use of wood and forest-related services have been mainly implemented through Finland's National Forest Programme run by the Ministry of Agriculture and Forestry. The measures have later been updated in the Forest Policy Report and the National Forest Strategy.

The focus areas of MSO activities have been further specified as the operating environment has changed during the programme. Since the most recent changes, the programme has focussed on the following areas:

- 1) implementing the Finnish Bioeconomy Strategy
- 2) increasing wood construction
- 3) promoting competitiveness, growth and internationalisation in the sector
- 4) strengthening Finland's influence in the EU and at the international level.

The last changes to the focus areas were made in the spring of 2014, when the programme was tasked with implementing the Finnish Bioeconomy Strategy.

At the beginning of the electoral term that started in 2011, the state of the forest sector was very different than in 2015. For years, the sector had suffered from extremely weak competitiveness. The paper industry was in a very difficult situation due to the long-term decline in the demand for paper. The state of the mechanical forest industry was also difficult because of its poor competitiveness and the uncertainty of wood supplies. Slight improvements could already be seen in the pulp and packaging industries, but the overall outlook for the forest sector was grim.

At present, the climate in the sector is completely different. In the spring of 2015, the largest ever forest sector investment in Finland was confirmed as Metsä Group decided to build a bioproduct mill in Äänekoski. Several smaller investments have also been made, increasing the use of domestic logs, pulpwood and energy wood at a record high level. All in all, the total value of planned investments exceeds EUR 4 billion.

In less than a decade, a new bioeconomy cluster has emerged in Finland, mainly because of the renewal of the forest sector. Forest, energy and chemical industries are at the heart of the bioeconomy. It also covers the value chains associated with the food and water industries and bioeconomy technology and services, including ecosystem services.

According to the estimates of Statistics Finland, in 2013 the total turnover of the Finnish bioeconomy was some EUR 64 billion and bioeconomy exports accounted for approximately a third of the value of all goods exported from Finland. The Finnish Bioeconomy Strategy estimates that the turnover could reach EUR 100 billion in slightly more than ten years and the sector could create 100,000 new jobs. Different operators, experts and politicians alike have strong faith in bioeconomy.

## TEMPO considered MSO a success

*According to the external evaluation conducted by TEMPO Economics, the MSO objectives have been ambitious and clearly focused on the opportunities and challenges that are the most important in terms of competitiveness. Changes in the operating environment have been continuous and rapid. Therefore, different objectives and focus areas have been emphasised and prioritised during the MSO programme.*

The perceived status of the forest industry and its role as a national field of expertise and a promoter of economic growth have changed during the MSO programme, partly affecting the perceived significance of the MSO and thereby the focus areas of the programme. Wood construction was strongly emphasised at the beginning and middle of the programme and bioeconomy towards the end of the programme.

Based on quantitative monitoring indicators concerning the general MSO development targets set for the whole sector, the target of wooden multi-storey buildings gaining a 10% market share will be reached. Based on the views of key MSO stakeholders, the programme has succeeded in increasing wood construction. However, no efficient means have been identified for promoting the growth of the wood products industry and wood product exports to achieve the objectives of Finland's National Wood Construction Programme.

In terms of increasing the use of wood, the MSO annual goal of 65–70 million cubic metres has just been reached. In 2013, domestic roundwood removals were higher than ever before. In 2014, the level remained almost the same.

In the other programme target areas, such as creating new business activities in bioeconomy, strengthening international influence and promoting the competitiveness, growth and internationalisation of the sector, targets were very ambitious and have only been partly reached. However, it should be noted that forest industry exports have picked up again, despite the decline in paper exports. New business has also emerged, for example, in the manufacturing of dissolving pulp, bio-oil, biogas, wood-based composites, wood construction elements, bioethanol and tall oil-based transport fuels.

The programme has enabled the forest sector to reach a common understanding of its strategic priorities. In this context, the special

**Forest industry exports have returned to growth. New forms of business are emerging.**

merits of the MSO include highlighting new business opportunities associated with forest and wood, in particular its projects to develop and accelerate the creation of new business in the bioeconomy sector (e.g. the International Biorefinery Competition).

The MSO has been one of the core partners and key operators in drawing up the Finnish Bioeconomy Strategy and the related Government Resolution. Other achievements include high media visibility and the successful branding of bioeconomy. The MSO has promoted the Finnish bioeconomy in Europe and the EU by actively participating in various forums.

An important form of added value created by the MSO is that the programme has enabled wood construction volumes to reach a completely new level in Finland. The programme

has also increased the understanding of and faith in the development of the forest sector and the entire bioeconomy, encouraging enterprises to reform and develop their activities. Another benefit delivered by the MSO is that the programme has promoted closer collaboration among different branches of administration and brought the public administration and industry closer together. Collaboration has led to a shared vision of the future and the growth opportunities of the Finnish forest sector and bioeconomy.

In the forest sector, the MSO has been able to restore faith in the future of the sector and has made a broad range of efforts to improve the Finnish investment environment. Thus, it is fair to assume that overall the MSO has also encouraged the recent investments that have reformed business in the forest industry.

Until now, the MSO has been responsible for implementing the Finnish Bioeconomy Strategy. To ensure that the Finnish bioeconomy continues to develop, TEMPO considers it vital to clearly assign the responsibility for promoting the bioeconomy to some other operator after the MSO programme ends.

### Summary of MSO targets and status at the beginning of 2015

At the beginning of the electoral term, the MSO advisory council defined so-called general development targets for the sector. These overall objectives have been systematically monitored throughout the MSO programme.

**Target 1: The market share of wooden multi-storey buildings is 10% and the exports of processed wood products increase by EUR 0.5 billion a year.**

- The wood construction target will be achieved as planned. According to records on current and planned projects (2/2015), the market share of wooden multi-storey buildings was approximately 4% in 2014. In 2015, the share would seem to reach the target state of 10%.
- Unfortunately, the exports of processed wood products have declined, and no efficient ways to boost growth and exports in the industry have been found.

**Target 2: The value of forest industry exports amounts to EUR 13 billion a year.**

- Exports in the forest industry are increasing, but the overall growth has not reached the target. On a positive note, the exports of pulp, sawn timber and paperboard have clearly increased for two consecutive years. The value of paper exports has continued to decline. In 2013, the value of exports

increased by three per cent and last year by one per cent, amounting to EUR 11.2 billion.

**Target 3: The turnover of new products increases by EUR 1 billion a year.**

- New products have entered the market. These include dissolving pulp, bio-oil, biogas and wood-based composites. The production of a renewable transport fuel manufactured from tall oil was launched in 2014, and the production of dried lignin replacing natural gas is about to begin. There are no exact figures on the turnover of these new business activities, but their combined turnover is likely to be several hundreds of millions of euros a year.

**Target 4: The use of domestic wood totals 65–70 million cubic metres a year.**

- The total removals of stemwood used as raw material in industry and energy production increased to 65 million cubic metres in 2013. In 2014, the volume was almost at the same level.



**Photo 1.** The Finnish company CrossLam in Kuhmo began the domestic production of Cross Laminated Timber (CLT) panels in December 2014. (Photo: CrossLam)

## Bioeconomy to drive Finnish growth

The MSO has implemented the Finnish Bioeconomy Strategy by promoting new investments, improving the operating environment and supporting the creation of new business and the export efforts of enterprises.

Climate change, global population growth and the resulting increase in demand for products, food, energy and water, are creating major global challenges, increasing the use of renewable natural resources and leading to the ever-increasing scarcity of non-renewable raw materials. Bioeconomy is expected to be the next wave of the economy after the fossil economy.

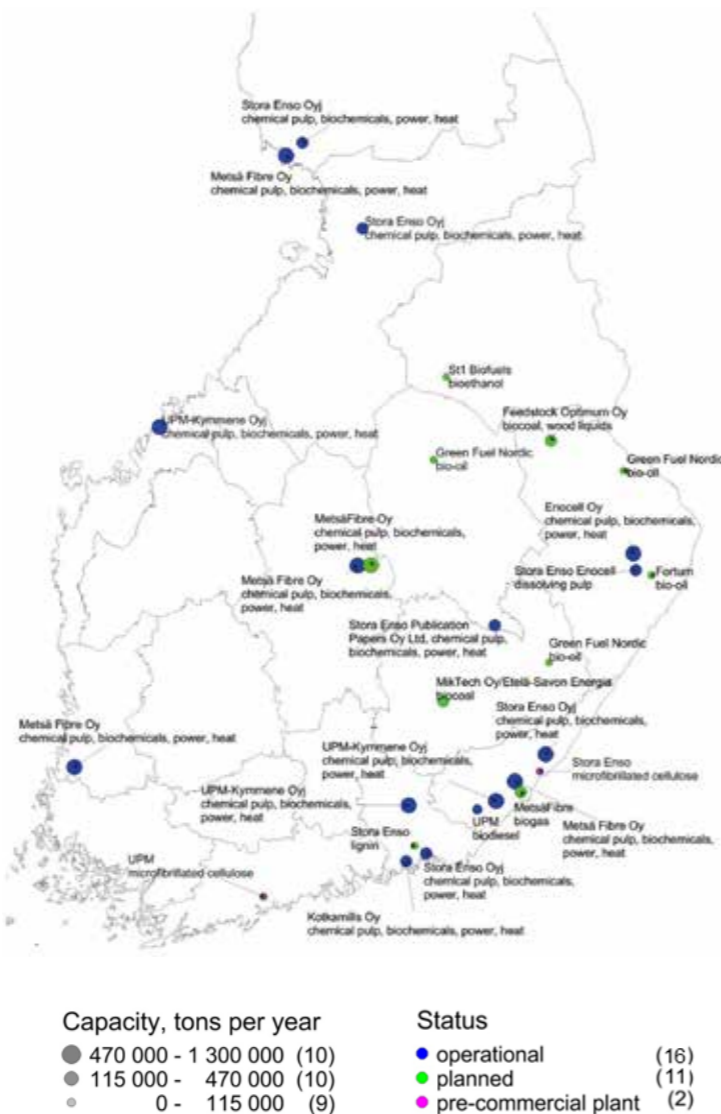
Bioeconomy means an economy that relies on the sustainable use of renewable natural resources to produce bio-based products, food, energy and services. The transition to bioeconomy will reduce our dependence on fossil resources and prevent the loss of biodiversity in natural ecosystems, while creating economic growth and new jobs in a sustainable manner. The expanding global market provides new opportunities for the export of bioeconomy products, services and expertise.

The Finnish Bioeconomy Strategy was drawn up in a project launched by the Ministry of Employment and the Economy in 2012. It was a collaborative effort involving several ministries and a broad range of stakeholders. The Bioeconomy Strategy and the Government Resolution concerning bioeconomy have been implemented as part of the MSO since the beginning of 2014. The strategy has been implemented in close cooperation with the Ministry of Agriculture and Forestry, the Ministry of the Environment, the Ministry for Foreign Affairs and other operators in the sector. Implementation measures have focused on generating new investments, exerting influence in the EU, improving the operating environment and promoting exports.

For more than a decade, Finland has made determined efforts to promote bioenergy. Since the beginning of the 2000s, the consumption of solid wood-based fuels in heat and power plants has increased from approximately 12 million cubic metres to 19 million cubic metres a year. Moreover, investments have been made in Finland in biorefineries using wood-based and other forms of biomass. In addition to the traditional pulp, electricity and heat, the main end products of these refineries also include bioethanol, biogas, biodiesel, bio-oil and biochemicals. Other new products include different composites, microfibrillated cellulose, dissolving pulp and dried lignin. There are no exact figures on the turnovers of these new production plants, but they are in the order of several hundreds of millions of euros a year.

The situation has also improved in the sawmill industry, and exports have returned to growth. A completely new sawmill

### Biorefineries using wood-based raw material



Source: Finnish Forest Industries Federation



Photo 2. The Metsä Fibre bioproduct mill to be built in Äänekoski. (Photo: Metsä Group)

has been built in Kemijärvi (Keitele Group) and the sawmill in Vilppula (Metsä Group) has been retrofitted. There have also been several smaller replacement and expansion investments. The sawmill industry has also seen a few restructuring arrangements.

Current and planned investments in bioproduct and pulp mills amount to EUR 3.5 billion. Various other kinds of bioeconomy investments have also been announced. Their total value is in the order of one billion euros. At this point, it is difficult to estimate how many of the investments will be realised, but the numerous new plans are a positive sign.

The most recent completed investment projects include the UPM facility producing renewable transport fuel in Lappeenranta, the Fortum bio-oil plant in Joensuu and the Metsä Group biogas plant in Joutseno. Stora Enso has converted a former birch line in its Uimaharju mill into a dissolving pulp line, and a biorefinery processing lignin has been built at the Sunila mill. The Neste Oil NEXBTL facility in Porvoo is another important biorefinery using biomass. Stora Enso is currently converting its Varkaus mill paper machine into a containerboard machine, which also requires modifications to the integrated pulp mill. The transformation investment at the Varkaus mill should be

completed in the autumn of 2015. In the spring of 2015, Metsä Group announced a EUR 1.1 billion investment in a bioproduct mill in Äänekoski, and in February 2015 Finnerpulp announced its EUR 1.4 billion plan to build a pulp mill in Kuopio. The Kemijärvi Consortium's plans of a new-generation biorefinery using softwood as raw material were also published around the same time. No investment decisions have yet been made on the last two plans.

**MSO has promoted investments and exports and improved the operating environment.**

Developing the Finnish bioeconomy requires the public and private sectors to have a shared vision of the outlook and clear strategic direction. The strategic course has been set in the Finnish Bioeconomy Strategy drafted by the Ministry of Employment and the Economy, the Ministry of Agriculture and Forestry and the Ministry of the Environment, in the industrial policy and Material Efficiency Programme of the Ministry of Employment and the Economy, and in the Forest Policy Report and National Forest Strategy drawn up by the Ministry of Agriculture and Forestry. The MSO has participated in all of the projects.



**Photo 3. Biorefinery in Lappeenranta.** (Photo: UPM)

In addition to participating in several investment projects, the MSO has also promoted their implementation. In late 2014, the programme organised an international biorefinery competition to promote new business and investments in bioeconomy. A diverse array of proposals took part in the competition, representing different areas of the bioeconomy. They varied in size from demonstration facilities worth less than a million euros to biorefineries requiring hundreds of millions of euros in investment. The combined value of the investments entered in the competition was approximately EUR 1.5 billion. The winning entry was Spinnova Ltd's new textile fibre production technology. The other two award-winning proposals were Biovakka Suomi Oy's concept for combining the production of biogas, nutrients, and transport fuel, and the Kemijärvi Consortium's proposal for the production of new biomaterials and biochemicals using novel Finnish technology. The Ministry of Employment and the Economy has assembled a funding group representing public entities to coordinate and help the three top proposals obtain public funding for the investment phase. Negotiations on potential EU funding have also been started with the European Commission.

In accordance with its operational programme, the MSO has focused on finding development and funding models for enterprises and solutions for the realisation of investments. To boost growth enterprises, pilot projects have been launched to test new models for cooperation between large companies and SMEs. Cross-sectoral activities and new symbiotic relationships between industries have been promoted by organising separate events for large companies and SMEs and joint events for different sectors. Examples of these activities relate to the above-mentioned bi-

orefinery competition, other forest industry investments and so-called bioeconomy dates. The same aims have also been promoted by the Crosscluster project launched by the MSO and coordinated by the Finnish Bioeconomy Cluster FIBIC. The project involved some 20 companies with their own case projects. The project ended in the autumn of 2014. It was financed by Tekes – the Finnish Funding Agency for Innovation.



**Photo 4. Fabric woven from wood-fibre yarn.** (Photo: Spinnova Ltd.)

The “bioeconomy dates” were organised in collaboration with the Finnish Food and Drink Industries' Federation (ETL), the Chemical Industry Federation of Finland, the Finnish Forest Industries Federation, the Ministry of Agriculture and Forestry and the VTT Technical Research Centre of Finland. The aim of the dates was to help enterprises from different sectors to form networks and find new business opportunities. In February 2015, the event attracted 50 participants representing different companies and trade associations. Based on the positive feedback, four regional events are planned for autumn 2015.



**Photo 5. A combined power plant and bio-oil refinery in Joensuu.** (Photo: Fortum).

To support the sector's new and growing companies, an event was organised in March 2015 in connection with the ChemBio Finland trade fair to provide companies with an opportunity to present themselves to potential funders and partners.

### Planned new investments in Finland amount to billions of euros.

The MSO has participated in coordinating the activities of the Centre of Expertise Programme (OSKE) and launching the Innovative Cities Programme (INKA) activities under the bioeconomy theme. In the autumn of 2013, MSO and the OSKE network organised a series of seminars concentrating on the business opportunities of forest bioeconomy SMEs. The seminars were held in eight cities, attracting a total of 600 participants. In December 2014, the MSO participated in the INKA bioeconomy roadshow in three cities.

The MSO has promoted the bioeconomy also by participating in FIBIC's research committee, the Ministry of Employment and the Economy's regional development programme for Eastern and Northern Finland, the steering group of the research theme “Potential offered by scarcity and green growth” organised by the Finnish Prime Minister's Office, the management group of

the forest sector OSKE and the steering group of the VTT project on cellulose-based textiles. The MSO has been actively involved in creating the Bioeconomy Forum, bringing together the key research and development operators in bioeconomy, such as FIBIC, the Natural Resources Institute Finland (Luke) and VTT.

The MSO has shaped the operating environment at the national and EU level. The most important national measure has been the project examining the legislative and administrative obstacles to promoting bioeconomy. The project was launched with funding from the Prime Minister's Office, and it is coordinated by the Ministry of the Environment. It should be completed during 2015.

A national bioeconomy panel was established in Finland in the winter of 2015. The panel will begin operating after the new government has been formed in spring 2015. Its task is to increase interaction between the government, the scientific community, enterprises and industry, and NGOs. It will also engage in dialogue with other programmes sharing its goals and the EU bioeconomy panel. The Finnish bioeconomy panel includes representatives of the government, funders, the research, development and education communities, enterprises and industries, and civil society and environmental organisations.

## Wood offers new solutions to large-scale construction

*The measures taken under the MSO Wood Construction Programme have focused on launching new wood construction projects, disseminating information about wood construction, improving skills and competence, and promoting research and development activities.*

The construction of wooden multi-storey buildings was enabled by changes to building regulations in 2011. The amended regulations allow the use of wood in 8-storey buildings. The MSO provided its opinions on and participated in developing and amending the regulations and instructions guiding the construction of wooden multi-storey buildings.

Negotiations on new wood construction projects have been going on throughout the programme. So far, 50 wooden multi-storey buildings have been built in Finland. The most important wooden multi-storey buildings finished in 2015 are located in Vantaa, Ii, Saarijärvi and Helsinki. New wooden school buildings are being built and planned in, for example, Pudasjärvi, Kuhmo, Espoo, Tyrnävä, Laukaa, Pieksämäki and Petäjävesi. The MSO organised a joint seminar on all on-going projects in May. A wooden hospital building is being planned in Kajaani, and the MSO has also contributed to the project. In 2015, new projects for major wooden multi-storey buildings are expected to be launched in Helsinki, Turku, Tampere, Haapavesi, Rauma and Seinäjoki.



**Photo 6.** A wooden multi-storey residential building being built for the 2015 Housing Fair in Ylästö, in Vantaa.  
(Photo: Rakennusliike Reponen)



**Photo 7.** An 8-storey wooden residential building was built in Jyväskylä in 2014. (Photo: Lakea Oy)

Stora Enso will begin manufacturing solid wood panels for wooden building elements in Varkaus in 2016. The annual production volume is approximately 100,000 m<sup>3</sup>. CrossLam in Kuhmo began the production of Finnish CLT (Cross Laminated Timber) panels in December 2014. CrossLam produces approximately 10,000–20,000 m<sup>3</sup> of CLT per year. Another domestic CLT line is waiting for an investment decision. Moreover, several production facilities for wood-based modular units are being built in different parts of the country.

Efforts to improve skills and competence in wood construction have included seminars organised at the national Wood Day event and RoadShow training events organised across Finland. In 2012–2015, some 4,000 people participated in the training events. The wood construction RoadShow 2015 visited ten cities with a university of applied sciences, focusing on large wood constructions and wooden bridges. The events attracted some

800 construction professionals. A new textbook on the construction of wooden multi-storey buildings (titled in Finnish “Suomalainen puukerrostalo – Rakenteet, suunnittelu ja rakentaminen”) was published in autumn 2013. The book includes the latest knowledge and experiences on the industrial construction of large-scale wooden buildings.



**Photo 8.** Prefabricated CLT modular units being set up.  
(Photo: Puuinfo Oy)

In 2014, Aalto Pro and Puuinfo Oy both organised further training in wooden multi-storey buildings for structural engineers. Approximately 40 structural engineers passed the training, achieving the AA qualification in wooden structures. In 2015, training providing AA-level qualification will be organised by both Aalto University and Puuinfo. The target for 2015 is that approximate-

ly 50 structural engineers will apply for the AA qualification in designing wooden structures. In the next few years, the aim is to provide further training to approximately 30 new AA-level structural engineers each year.

A project on the integrated industrial construction of wooden buildings was planned to be launched at the end of 2014 to enhance research and development activities concerning wood construction. The idea was to bring together developers building wooden buildings, designers, construction companies, wood product producers and research and development organisations specialising in wood constructions. The objective was to collaborate to improve the cost efficiency and competitiveness of wood construction. In the end, the project was never launched due to insufficient developer participation. The project will be continued within separate Tekes-funded projects for developers.

**Wood is a viable material option in multi-storey buildings and bridges.**



**Photo 9.** Finnish experts learning about wooden bridges in Norway in summer 2014. (Photo: MEE)

In early 2014, the Finnish Transport Agency, Metsähallitus and the Finnish Road Association started a collaborative project to develop the construction of wooden bridges. A background report guiding measures to promote the building of wooden bridges was completed in September 2014. In November 2014, the Finnish Transport Agency approved Versowood Group's standardised bridge models, and in February 2015 Puuinfo Oy and the MSO published a wooden bridge brochure targeted particularly at the Centres for Economic Development, Transport and the Environment.



**Photo 10.** A concept image of the renovated Helsinki Olympic Stadium. (Photo: K2S Architects Ltd.)

The MSO has also participated in the projects concerning the Metsähallitus science centre Pilke and the Finnish Nature Centre Haltia and the planned Guggenheim, Helsinki Central Library and Helsinki Olympic Stadium projects. In all these projects, the aim has been high-standard design and high quality construction, ensuring competitive prices and environmentally friendly practices in accordance with the Wood Construction Programme. A total of 1,715 proposals were submitted to the first stage of the Guggenheim Helsinki Design Competition – the world record of entries submitted to an architectural design competition. The six proposals to advance to the second stage of the competition were announced on 2 December 2014. The finalists did not include Finnish design agencies. The winner will be selected in June 2015.

Wood construction has also been on the agenda of the forest industry working group of the Finnish-Russian Intergovernmental Commission for Economic Cooperation, the Finnish-Russian Forest Summit and the cooperation between the MSO and the Trade Representation of the Russian Federation in Finland.



**Photo 11.** The Helsinki Central Library will have a wooden outer surface. (Photo: ALA Architects Ltd)

## Increasing competitiveness by improving the operating environment

*A competitive operating environment is a basic precondition for achieving growth and enabling companies to go international in the forest sector and the bioeconomy at large. In the MSO, measures enhancing competitiveness have focused on developing the raw material market, logistics, the image of the sector and regulation. Measures concerning the raw material market for wood have been implemented as part of Finland's National Forest Programme, under the responsibility of the Ministry of Agriculture and Forestry.*

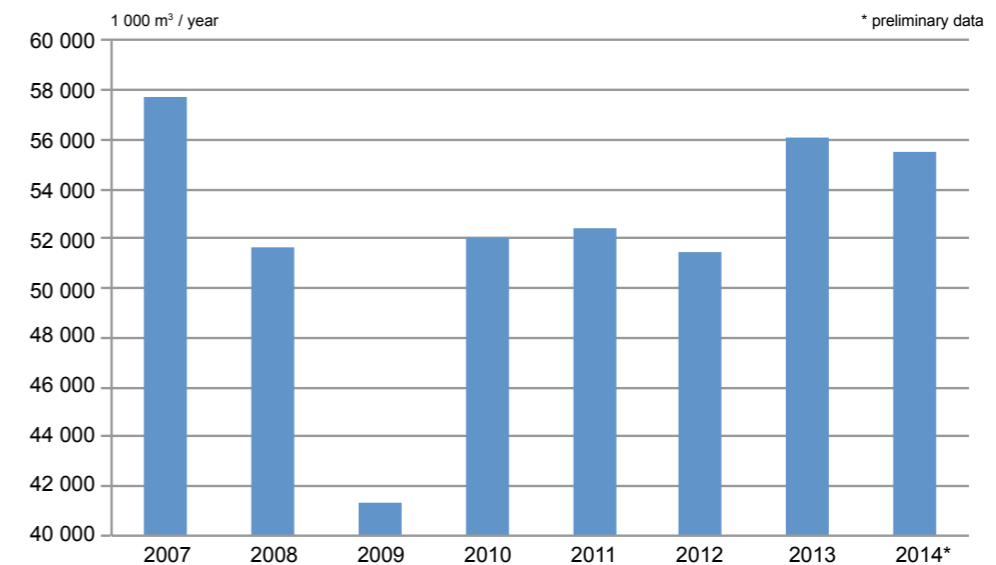
The forest industry has continued to make strong efforts to improve its cost competitiveness. According to surveys conducted by the MSO at the beginning of the electoral term and by the Ministry of Employment and the Economy in connection with its industrial policy, the cost competitiveness of the industry has improved. However, the situation is still difficult in the paper industry, which is suffering from overcapacity in the European market. In 2014, the turnovers of major Finnish forest industry enterprises declined but their operating profits increased. The largest profits were made in pulp production. Profitability also increased in packaging materials and wood products.

The wood market has been much more stable than in past years. The wood market working group operating under the Ministry of Agriculture and Forestry has worked to improve the functioning of the wood market. The MSO has also participated in these efforts, for instance, by commissioning a study which led to FOEX introducing in 2014 commercial indexes on the pric-

**Logistics, image, regulation and the functioning of markets play a key role in improving competitiveness.**

es of Finnish pulpwood and softwood logs. The indexes can be used in roundwood trade to minimise price risks and improve the predictability of prices. The Finnish Forest Industries Federation and the Central Union of Agricultural Producers and Forest Owners (MTK) are developing an online market place and a new pricing system in collaboration with the wood market working group of the Ministry of Agriculture and Forestry.

The MSO contributed to creating a system for monitoring the market effects of forest chip subsidies and to reforming the system of production subsidies for forest chips. The MSO also commissioned a report on the impacts of changing the system.



**Figure 1.** Industrial roundwood removals in 2007–2014. (Source: Natural Resources Institute Finland)



**Photo 12.** Pilot testing of a HCT vehicle at the Lappeenranta airport. (Photo: UPM)

Because the wood market is functioning better than before, felling volumes have increased. According to preliminary statistics, industrial roundwood removals totalled almost 56 million cubic metres in 2014. The volume is almost the same as in 2013. Higher volumes have only been achieved in 2007.



The maximum measures and gross weights of trucks were increased in Finland at the end of 2013. Therefore, MSO activities included pilot projects on increasing the maximum measures and weights of trucks to improve the efficiency of logistics and using the even heavier HCT (High Capacity Transport) vehicles. A significant share of vehicles transporting timber has transferred from the gross weight of 60 tonnes to 76 tonnes, in accordance with the new legislation. Transport providers and entrepreneurs have submitted applications to the Finnish Transport Safety Agency Trafi for HCT test permits. Metsäteho Oy has conducted a preliminary study on the profitability

and routes of special trucks, and the University of Oulu is studying traffic safety issues. The Finnish Transport Agency has had to issue traffic restrictions on approximately 400 bridges due to the increased gross weights. Permit procedures and the lack of State funding for improving the condition of bridges and roads are obstructing pilot projects and the use of larger transport vehicles.

### MSO has turned the Finnish bioeconomy into a brand.

In 2013 and 2014, the MSO implemented the Stories of Wood project to promote the bioeconomy and its image and to increase its impact. The project included improvements to the bioeconomy website bioeconomy.fi and produced videos, brochures, a briefcase of product examples and presentation material in different languages, in collaboration with stakeholders, the Ministry of Agriculture and Forestry, the Ministry for Foreign Affairs and the Ministry of the Environment. The MSO has actively communicated the opportunities of the forest sector and the bioeconomy and has in many ways contributed to improving the image and attractiveness of the sector.

## Increasing exports through growth and internationalisation

*During the past few years, exports have increased in the forest sector and the bioeconomy as a whole, even though the overall exports of Finnish goods have declined. In 2013, the value of bioeconomy exports was approximately EUR 17 billion, of which the forest industry accounted for some EUR 11 billion. In 2014, the value of forest industry exports increased by one percentage point, accounting for 20% of the value of Finnish goods exports.*

Despite the shrinking of the paper industry, the bioeconomy has grown since the beginning of the 2000s. At current prices, the total output of the Finnish bioeconomy has increased from approximately EUR 52 billion to 64 billion a year.

In the forest industry, relative growth has in recent years been highest in the mechanical forest industry, which has grown by almost half a billion euros since 2010. In 2014, the value of sawn timber exports amounted to EUR 1.54 billion (+9%). Plywood exports increased to EUR 0.54 billion (+14%). The exports of processed wood products decreased to EUR 0.39 billion (-7%).

In forest industry exports, paper is still the most important product group. In 2014, paper exports totalled EUR 4.51 billion (-4%). The reduction in the value of paper exports has almost been offset by the increase in the exports of paper pulp and paperboard. In 2014, the value of paperboard exports amounted to EUR 2.41 billion (+1%). Pulp exports were worth EUR 1.61 billion (+3%).

In the bioeconomy, technology exports are also significant. Finland exports, for instance, forest industry machinery and equipment for more than a billion euros each year. Almost two thirds of the exports are machines and equipment used in the processing of pulp and paper. Forestry machinery account for less than 20% and machinery for the energy and mechanical forest industries account for 10% of the exports. Some 2,000 pieces of forestry machinery are manufactured each year. Half of them are harvesters and half forestry tractors.

### Bioeconomy and the forest sector are growing.

In terms of internationalisation and growth, the MSO has focused on the challenges of SMEs in the wood products industry. In 2011-2013, the emphasis was on supporting practical work by producing up-to-date reports based on the needs of the industry. The reports included, for example, an analysis of the sawn timber and wood products markets in Turkey, a report on the obstacles and solutions to the growth and internationalisation of the wood products industry and a comparison between the operating environments of the sawn timber and wood products industries in Finland and its key competitor countries.

Based on the reports and discussions with the wood products industry, practical measures were designed for the years 2014-2015. The measures included export promotion trips under the Team Finland concept and preparing and launching an export programme for sawmills.

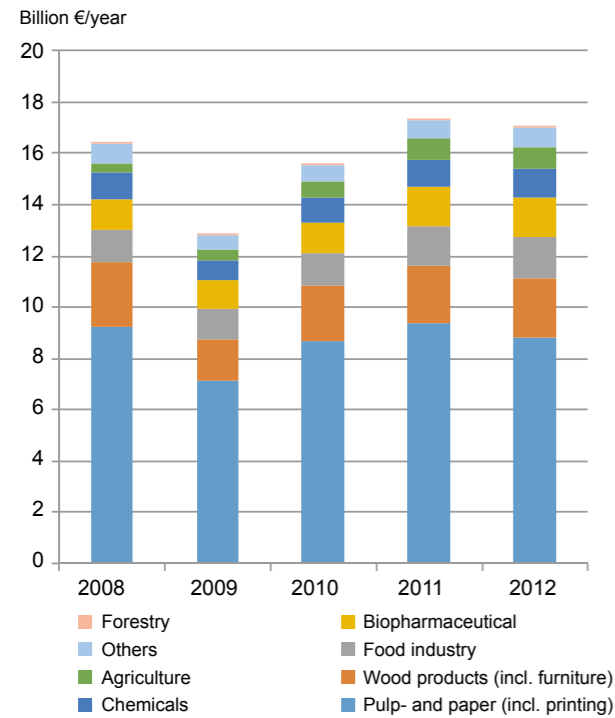


**Photo 13.** Traditional woodwork in Istanbul (Photo: Matti Lehtola, author of the market analysis on Turkey)

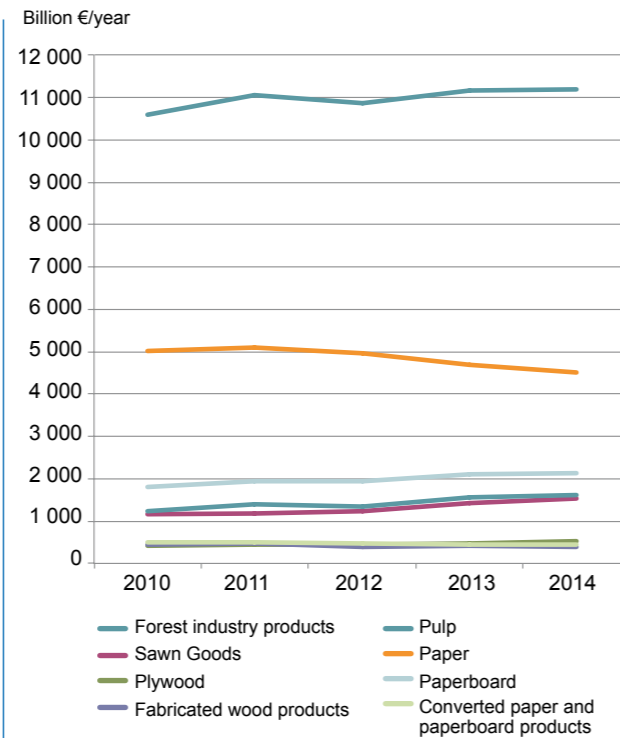
The MSO has engaged in close collaboration with the Ministry for Foreign Affairs and Finnish embassies to promote the bioeconomy and Finnish exports. Bioeconomy has systematically been integrated in Team Finland activities and Finland's country brand activities. The materials produced in the Stories of Wood project were presented and the importance and opportunities of the Finnish bioeconomy explained at the annual meeting of Finnish Heads of Mission in 2014.

The MSO has participated in several export promotion trips with Finnish ministers, and many foreign delegations have visited the MSO. The Minister of Economic Affairs made an export promotion trip to Chile and Peru in autumn 2014. One of the objectives of the trip was to promote the exports of forestry machinery and equipment and education in forestry. During the trip, the forest delegation organised two seminars, visited several companies and ministries and met representatives of the education and training organisations in the target countries.

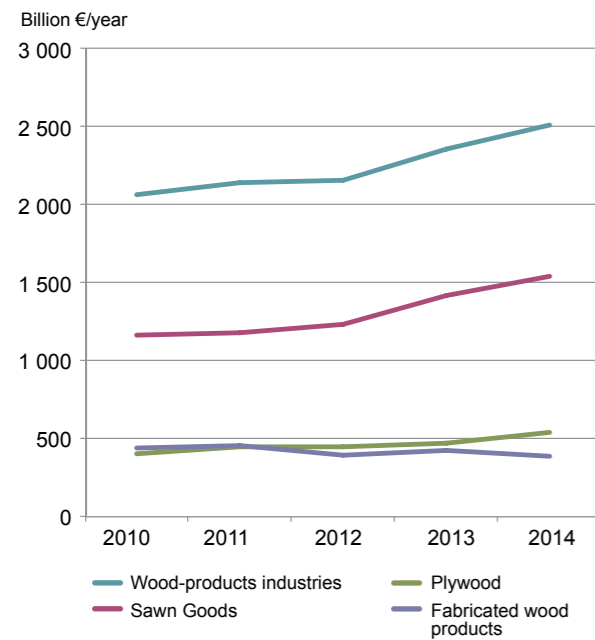




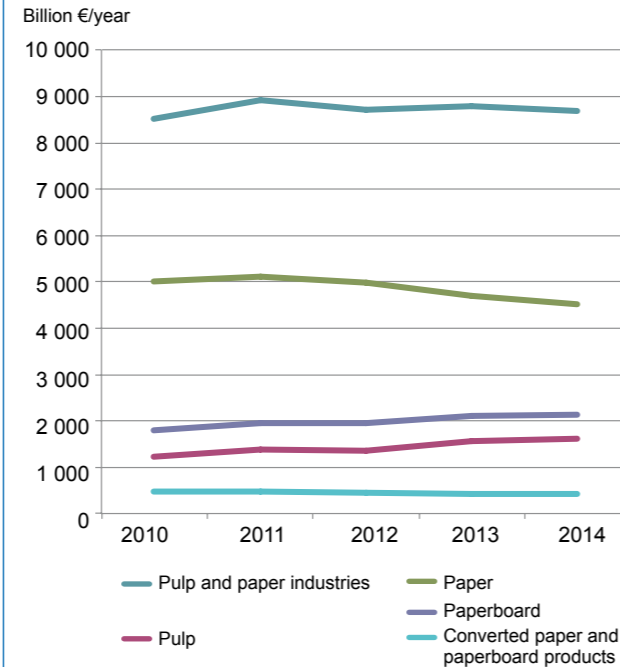
**Figure 2. Bioeconomy exports.** (Source: Statistics Finland)



**Figure 3. Development of forest industry exports in 2010-2014.** (Source: Natural Resources Institute Finland)



**Figure 4. Development of wood product exports in 2010-2014.** (Source: Natural Resources Institute Finland)



**Figure 5. Development of pulp and paper industry exports in 2010-2014.** (Source: Natural Resources Institute Finland)



**Photo 14. The Team Finland exhibition space of the Finnish sawmill industry at the international Furniture China 2014 Expo in Shanghai.** (Photo: Finnish Sawmills Association)

In 2014, the MSO and Finpro jointly organised two export promotion trips to China, focusing on the wood products industry. Both trips were led by the Minister of Agriculture and Forestry. Seven organisations and companies from the wood products industry took part in the first trip. The objective of the trip was to form contacts with Chinese wood product organisations and operators. Cooperation was started with, for example, the China National Furniture Association (CNFA) and the China Timber & Wood Products Distribution Association (CTWPDA).

The delegation of the second trip to China in 2014 included 12 sawmills. Operating under the Team Finland logo, the delegation shared a booth at the international Furniture China 2014 Expo in Shanghai. The trip also included a high-level Team Finland seminar. The event was opened by the Finnish Minister of Agriculture and Forestry and the president of CNFA. The seminar attracted approximately 120 Chinese wood product operators. In the spring of 2012, the MSO and a few sawmills al-

so accompanied the Minister of Economic Affairs on a trip to Chongqing in China.

The MSO and Finpro have organised two minister-level export promotion trips to Turkey, based on the Team Finland model. The Minister of Agriculture and Forestry led a wood product export promotion trip to Istanbul, Turkey, in May 2014. A wood construction seminar was organised in connection with the trip. Ten wood sector companies participated in the trip, and the seminar attracted approximately a hundred representatives of Turkish enterprises.

The second export promotion trip to Istanbul and Ankara was organised by the MSO and Finpro in connection with the official visit of the Minister for Foreign Trade in February 2015. One of the key objectives of the trip was to market Finnish expertise in bioeconomy and the potential uses of wood fibre in the textile industry.



**Photo 15. Yarn spun from wood fibre.** (Photo: VTT)

In March 2015, the MSO participated in an export promotion trip to Serbia, organised by an under-secretary of state from the Ministry for Foreign Affairs. The themes of the trip were bioeconomy, forest energy and bioenergy technology.

As part of promoting the exports of wood products, Puuinfo has created an online market place for wood products. In the market place, enterprises can market their products and customers can place orders. The website is available in several languages ([www.woodproducts.fi](http://www.woodproducts.fi)).

A dozen wood sector companies have participated in the Tekes Growth Track programme. In total, their turnover amounts to approximately EUR 65 million.

At the beginning of 2015, the MSO began preparing a growth programme for bioeconomy, in collaboration with Finpro and different operators from the sector. As part of the growth programme, the parties have drawn up a three-year export programme for sawmills, aiming to support Finnish sawmills in exporting their products to China and other growing markets. The goal is to better understand the markets and customer needs and to enable growth in exports. The programme will be launched in spring 2015. In addition to the sawmill industry, growth programmes are being drawn up for agrotechnology, packaging materials, bioenergy and energy production from waste. The energy-themed programme is prepared together with the Cleantech programme. Together with Finpro, Tekes and enterprises, a growth programme is planned for innovative biomaterials, focusing on promoting exports, creating new business and organising "Invest in" activities.

Cooperation with Russia has been active. The forest industry working group operating under the Finnish-Russian Intergovernmental Commission for Economic Cooperation has convened five times. Key themes discussed have included forest sector investments, collaboration in research and training, and wood construction. The MSO and the Trade Representation of the Russian Federation in Finland have organised, for instance, a seminar on the production of forestry tractors and two events on wood construction. Several delegations from different Russian regions have visited the MSO to hear about the Finnish bioeconomy and wood construction. Almost all delegations have visited wood construction sites in the Helsinki region.

## Putting Finland on the European map of bioeconomy

*In the MSO operational programme, the aim has been to have a stronger and more proactive influence on the preparation of EU legislation, policies, decisions and actions concerning the forest industry and the forest bioeconomy at large.*



**Photo 17. EU decision-makers getting to know the sustainable Finnish forestry.** (Photo: Tarja Ollas)

In 2014, the MSO organised three events in Brussels, in collaboration with Finland's Permanent Representation to the EU. Efforts to promote bioeconomy have been continued based on the non-paper on bioeconomy drawn up with the Ministry of Agriculture and Forestry and the Ministry for Foreign Affairs.

In January 2015, Finland's Permanent Representation to the EU and the MSO invited a group of influential EU figures from Brussels to Finland to learn about the Finnish bioeconomy. The group of more than 10 people included top-level civil servants from the various departments of the European Commission, as well as the EU ambassadors of leading bioeconomy countries. The purpose of the visit was to present Finland as a leading bioeconomy country with an ability to utilise forest-based biomass and the diversity of nature in a versatile and sustainable manner. The significance of collaboration in the development of Finnish and European bioeconomy was also emphasised. A similar trip to present the Finnish forest bioeconomy is being planned for September 2015.

In autumn 2014, Finnish members of the European Parliament (MEPs) contributed to establishing a bioeconomy subgroup under the European Parliament Intergroup on sustainable development. The MSO played a key role in establishing the subgroup, for example, by drawing up a draft programme for the group.

Awareness about the Finnish bioeconomy has been raised by presenting the Finnish Bioeconomy Strategy and bioeconomy in different European forums, such as the EU bioeconomy conference in Turin, a Dutch-Finnish bioeconomy meeting in the Hague, a meeting of Nordic forest owners' associations and "State Secretaries for forest affairs" in Norway in October 2014, an international bioeconomy conference in Berlin, a bioeconomy forum in Barcelona in November 2014, and the bioeconomy seminar of the Nordic Council of Ministers held in Warsaw in March 2015. In March 2015, Finland also participated in the joint meeting of EU bioeconomy countries in Brussels.

The MSO has also made efforts to influence international matters concerning the forest sector and bioeconomy through various other forums (e.g. the EU EIP on raw materials, EU sub-committee for forest affairs and collaboration with Russia, Slovenia, Sweden, Catalonia and the Koli Forum).

**Finland has defined its priorities for exerting influence within the EU, promoting the priorities in different EU forums.**

**Bioeconomy growth programmes aim for a significant increase in exports and foreign investments.**



**Photo 16. The first growth programme was launched in the sawmill industry.** (Photo: Finnish Sawmills Association)

## Broad range of R&D activities concerning bioeconomy

*Finland has world-class research and development expertise in bioeconomy. To accelerate the commercialisation of research results, public funding has been granted to Tekes and the Finnish Industry Investment Ltd for pilot and demonstration projects and capitalisation. Another objective of public funding is to attract private funding to the sector.*

The Government growth package in 2014 included EUR 100 million of additional capital to the Finnish Industry Investment Ltd for developing the bioeconomy and other areas with growth potential. For Tekes, the package included an additional permanent annual authorisation of EUR 20 million to be used on the bioeconomy and cleantech. The Finnvera authorisation for export funding has also been increased.

As part of the sustainable use of natural resources, bioeconomy is one of Tekes' strategic priorities. It targets the entire value chain from the production of raw materials to products, services and the related processes, machinery and equipment. Target areas also include intangible solutions concerning, for example, nature's ecosystem services. In total, Tekes funding for bioeconomy amounted to approximately EUR 162 million in 2013.

Bioeconomy will continue to be one of Tekes' strategic priorities. Natural resources were selected as one of the themes of the Direction Strategy (Suunta in Finnish) compiled by Tekes, the Finnish Innovation Fund Sitra, the Academy of Finland, Finnvera and VTT. Within the strategic framework, the organisations will create a new operating model to build an ecosystem under the theme "Multifunctional biorefinery". Bioeconomy is also a key focus area for the Strategic Research Council at the Academy of Finland.



**Photo 18.** Growing stock volume being determined digitally.  
(Photo: VTT)

The aim of the Innovative Cities (INKA) programme managed by Tekes is to accelerate the creation of attractive innovation clusters in Finland and the launching of pilot projects. These measures will expedite the commercialisation of new solutions and the creation of new business activities. The programme has five themes, each of which has been assigned a city or region that is responsible for its implementation. One of the themes is bioeconomy. Joensuu and its partner cities Jyväskylä and Seinäjoki are responsible for the bioeconomy theme.

**Finland has great potential to become a pioneer in bioeconomy innovations.**

The Finnish Bioeconomy Cluster FIBIC is one of the six Strategic Centres for Science, Technology and Innovation (SHOK) in Finland. Dedicated to bioeconomy, it offers companies and research organisations a new way of engaging in close long-term research and development collaboration and developing a sustainable competitive edge. Research programmes form the core of FIBIC's activities. The interaction between consumers, companies and researchers during the programmes enables the identification of new development opportunities. Joint research efforts also provide more opportunities for taking risks in selecting research activities and topics. FIBIC's goal is that its research programmes form the world's most innovative development environment for bioeconomy.

In Finland, institutions of higher education engage in a broad and diverse range of teaching and research activities concerning bioeconomy. The activities often involve laboratory and pilot projects, benefitting local companies in particular.

The most significant Finnish research institutes include the Natural Resources Institute Finland, the Finnish Environment Institute and VTT Technical Research Centre of Finland. One of VTT's three business areas focuses mainly on bioeconomy and partly on cleantech. VTT has a number of pilot activities in the fields of bioenergy, gasification, pyrolysis, biotechnical processes, process chemistry and fibre products. These pilot environments serve both domestic and foreign clients and have led to the development of, for example, a fast pyrolysis process. The first commercial facility using the process is in Joensuu.

## Public efforts to develop bioeconomy should be continued

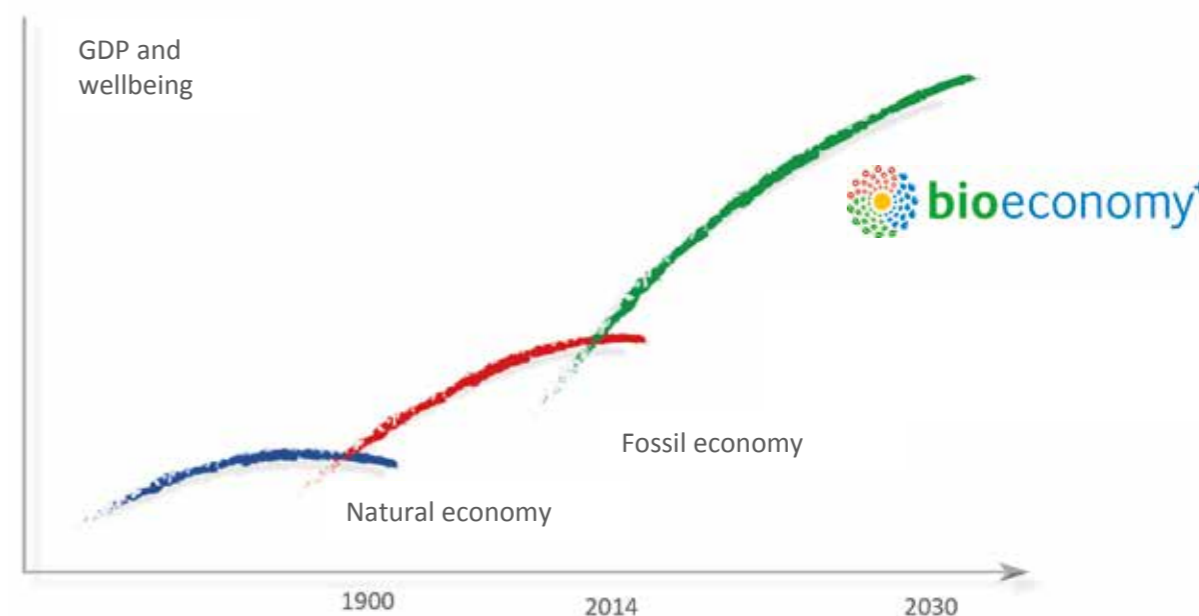
*For the next term of office, the Finnish Government should launch a cross-sectoral bioeconomy programme with the main task of supporting the sustainable growth of the Finnish bioeconomy. The objective of the programme should be to create economic growth, new jobs and well-being by developing business activities in the bioeconomy and the sustainable use of natural resources and values.*

The new programme should also improve the balance of Finland's current account, its security of supply and its energy self-sufficiency by increasing the exports of high value-added products, clean technology and knowledge-intensive services and by replacing imports with domestic renewable products and services. The programme should coordinate activities to influence bioeconomy matters at the EU and international level. To improve the operating environment, it is highly important that Finland makes proactive and active efforts to influence developments in bioeconomy in the EU and international forums.

Global challenges, such as climate change, global population growth and the resulting increase in demand for bio-based products form the foundation of the bioeconomy. Bioeconomy is expected to be the next wave of the economy after the fos-

sil economy. The transition to bioeconomy will reduce our dependence on fossil resources and prevent the loss of biodiversity in natural ecosystems, while creating economic growth and new jobs in a sustainable manner.

Well-being in Finland is based on our ability to utilise our natural resources in a sustainable manner. The annual output of the Finnish bioeconomy exceeds EUR 64 billion. The bioeconomy directly employs more than 285,000 people (11% of all employed people), and the value of bioeconomy exports totals more than EUR 17 billion (30% of all exports). In the past few years, bioeconomy investments have amounted to roughly EUR 1.5 billion. According to the Finnish Bioeconomy Strategy, the output of Finnish bioeconomy has the potential to grow by tens of billions of euros.



**Figure 6.** Bioeconomy will be the next wave of the economy.



**Photo 19.** The product examples included in the bioeconomy briefcase have been used to present the Finnish bioeconomy abroad. (Photo: Juho Jokinen)

Thanks to our plentiful renewable natural resources, high level of expertise and industrial strengths, Finland has great potential to become the world's bioeconomy pioneer. The traditional Finnish forest, energy, chemical and construction industries have developed into a new kind of an integrated cluster, using wood not only for traditional and new wood-based products but also for energy, transport fuels and different chemicals. New bioproducts are estimated to account for a half all export revenues in the forest sector by 2030.

The development of the bioeconomy opens up new opportunities for developing food systems. Food value chains have a major impact on employment, and the sector is seeking significant growth in exports. The manufacturing of construction materials, construction work and the use of buildings cause approximately 40% of all greenhouse gas emissions, energy consumption and waste. Significant reductions could be achieved by using renewable materials in construction and housing. The use of bioeconomy services and side streams is expected

to become increasingly important. Natural values and the processes maintaining our natural resources (ecosystem services) provide opportunities for various business activities. They also play a key role in human health and well-being. Safeguarding the ecosystem services is a prerequisite for the sustainability of the bioeconomy.

### Innovation, collaboration and integration will make Finland a pioneer in bioeconomy.

Public research and development investments should be extensively directed to the bioeconomy. Tekes activities should support actions taken under the cross-sectoral bioeconomy programme. The Finnish Bioeconomy Cluster FIBIC, the Strategic Centre for Science, Technology and Innovation in Bioeconomy, should offer research programmes that enable companies and the research community to engage in close, long-term R&D collaboration to commercialise products and innovations. The purpose of the Innovative Cities programme on bioeconomy should be to commercialise new solutions and accelerate the creation of new business through innovation clusters and pilot projects. One of the VTT business areas should primarily focus on bioeconomy. VTT also carries out a significant number of pilot activities, the most recent example being the Bioruukki piloting centre established in Espoo. The Natural Resources Institute Finland should direct its investments towards the availability of biomass to meet the increasing demand, the functioning of raw material markets, and the acceptability and sustainability of the utilisation of resources. The activities of the Finnish Environment Institute (SYKE) should raise awareness of ecosystem services and the importance of the sustainable use of ecosystem services and biomass. Collaboration among research institutes and cross-sectoral activities are of primary importance.

The Government should allocate resources to the cross-sectoral activities of the bioeconomy programme by providing separate funding for programme operating expenses and reports directly associated with the programme activities. The implementation of the government-led programme would rely on a broad range of public administration and private sector operators. The funding for developing the bioeconomy should be based on different public financial instruments, EU funding and funding from the operators involved. Public funding should be used to encourage private financing in the sector. Public funding should be targeted at research, development and innovation activities, investments and the promotion of exports, and it should be channelled through the Finnish Industry Investment Ltd, Tekes, Finnvera, the Team Finland network, funding for renewable energy and regional financial instruments.

The Ministry of Employment and the Economy instituted the Strategic Programme for the Forest Sector (MSO) for the period between 1 October 2011 and 30 September 2015 to implement the Government Programme's focus area concerning the strengthening of economic growth, employment and competitiveness by promoting competitiveness and renewal in the forest sector.

The programme's goals were to increase forest industry exports, wood construction and the use of domestic wood, and to commercialise new products. During the programme period, implementation of the Finnish Bioeconomy Strategy, promotion of internationalization of the forest sector and enhancement of Finnish influence within the EU were updated as additional objectives.

The programme was steered by an advisory board made up of representatives from labour market organisations, nationwide business organisations and research institutions as well as key ministries. The steering group was chaired by the Minister of Economic Affairs who reported on the programme to the Government's Cabinet Committee on Economic Policy.

The head of the MSO was Strategic Director Sixten Sunabacka. Development Manager Markku Karjalainen was responsible for the National Wood Construction Programme included in the programme. Ministerial Advisor Reima Sutinen was in charge of the international operation of the programme and the enhancement of forest industry exports, as part of Team Finland activities. After the Finnish Bioeconomy Strategy was completed in the summer of 2014, its implementation within the programme was enhanced by Development Manager Jussi Manninen. The secretary of the programme was Planning Officer Anne Jatila-Jokinen.

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