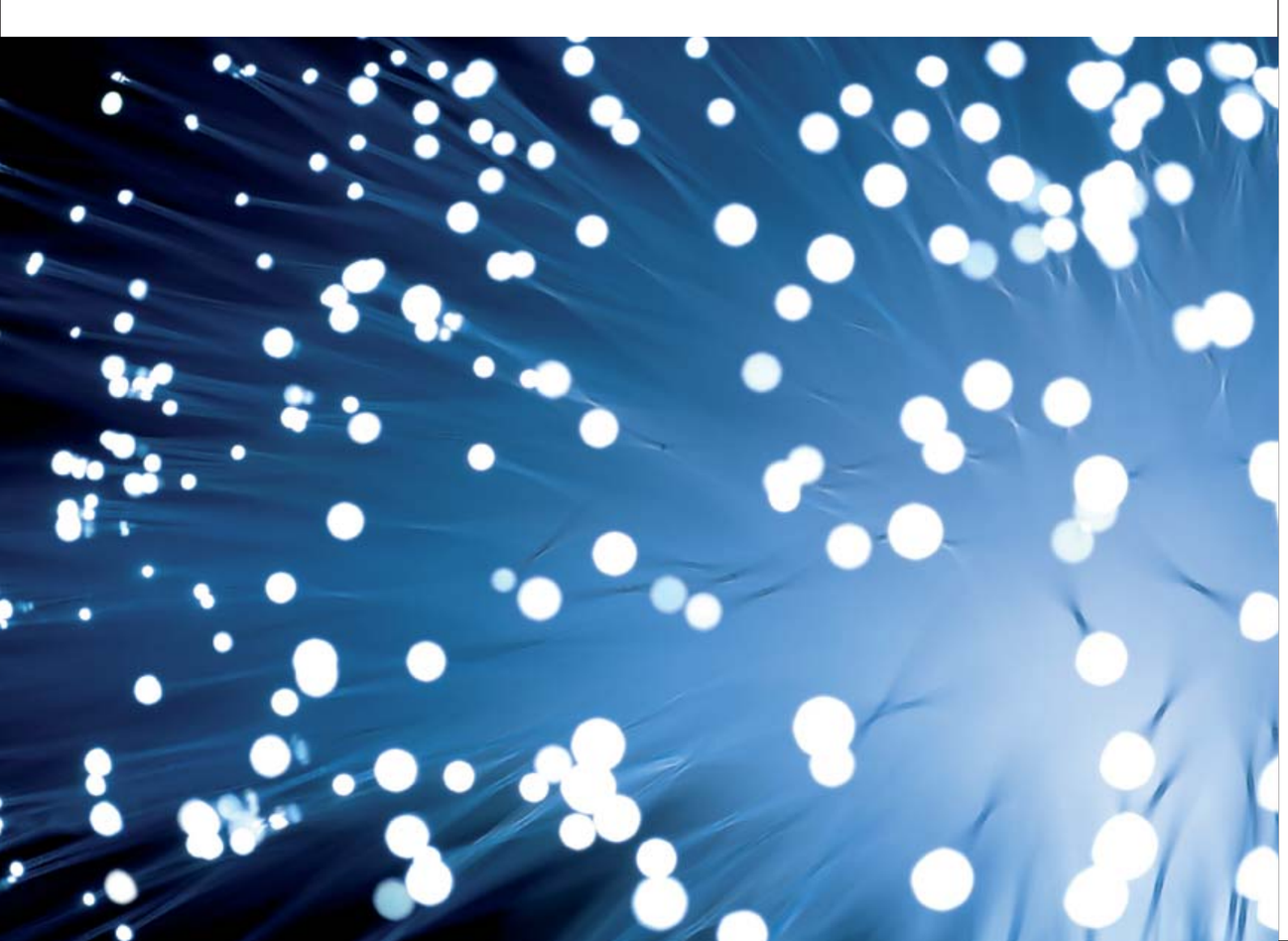
The world's leading forest cluster 2030

The forest cluster – a powerful network of businesses and expertise

A diverse network of top expertise and businesses is growing up around the forest industry: the forest cluster. The expertise and enterprise based on wood and wood processing is more extensive and wide-ranging in Finland than in any other country in the world.

In addition to the forest industry, the forest cluster comprises forestry entrepreneurs, logistics companies, industry machine and equipment manufacturers, energy producers, chemicals manufacturers, industry research facilities, universities and higher education institutions, consultants, the graphics industry, the packaging industry and construction sectors using wood.

The forest cluster accounts for nearly 30% of all industrial production and net export revenues. The forest cluster employs a total of nearly 200,000 people in Finland.



Foreword

The Finnish forest cluster is known the world over for its development of innovative products and services as well as for solutions tackling the challenges of sustainable development. The goal of the sector remains unchanged: To further its expertise as a pioneer in the industry and to develop solutions that help to renew the sector and utilise wood and fiber products in a wide variety of ways with a view to future business. By updating and enhancing the intellectual capital of the Finnish forest cluster, we will be able to take full advantage of the wide range of possibilities offered by Finnish wood and at the same time promote wellbeing in society.

THE LOW-CARBON SOCIETY of the future requires sustainable development and sustainably manufactured products. The processing of wood for these growing needs is something worth investing in. Recyclable products sustainably made using renewable raw materials are the backbone of a society responsible for the climate.

KNOW-HOW AND INNOVATION play a key role in renewing the forest cluster so that it can respond to the needs of customers and end users. Research and development can be used to improve forest cluster profitability and competitiveness as well as creating new business opportunities. Existing products, services and their new generations establish an outstanding foundation for the development of completely new types of products and services.

THE FINNISH FOREST CLUSTER RESEARCH STRATEGY outlines the focal points of research that are crucial to the forest cluster and its customers. The goal is to double the value of forest cluster production by 2030. The goal is the same as that found in the first joint research strategy, which was published in 2006. A rapid change in the operating environment, however, requires that focal points be examined and the strategy be reformed now. Focal points must also be continuously assessed in the future.

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Summary

The Finnish forest cluster research strategy outlines the focal points of research that are crucial to the forest cluster and its client sectors. The target is to double the value of forest cluster products and services from the 2006 levels by 2030. At least half of the value will come from products and services that were not yet in production in 2006.

Another goal is to establish in Finland a successful, constantly developing forest cluster, whose products and services are among the most sought after in the world. This will pave the way for a sustainable biosociety.

Changes in the international operating environment have a major impact on the Finnish forest cluster. We can prepare for the operating environment of the future through global leadership and specialisation, a strong culture of entrepreneurship and cooperation and through goal-oriented investments in research.

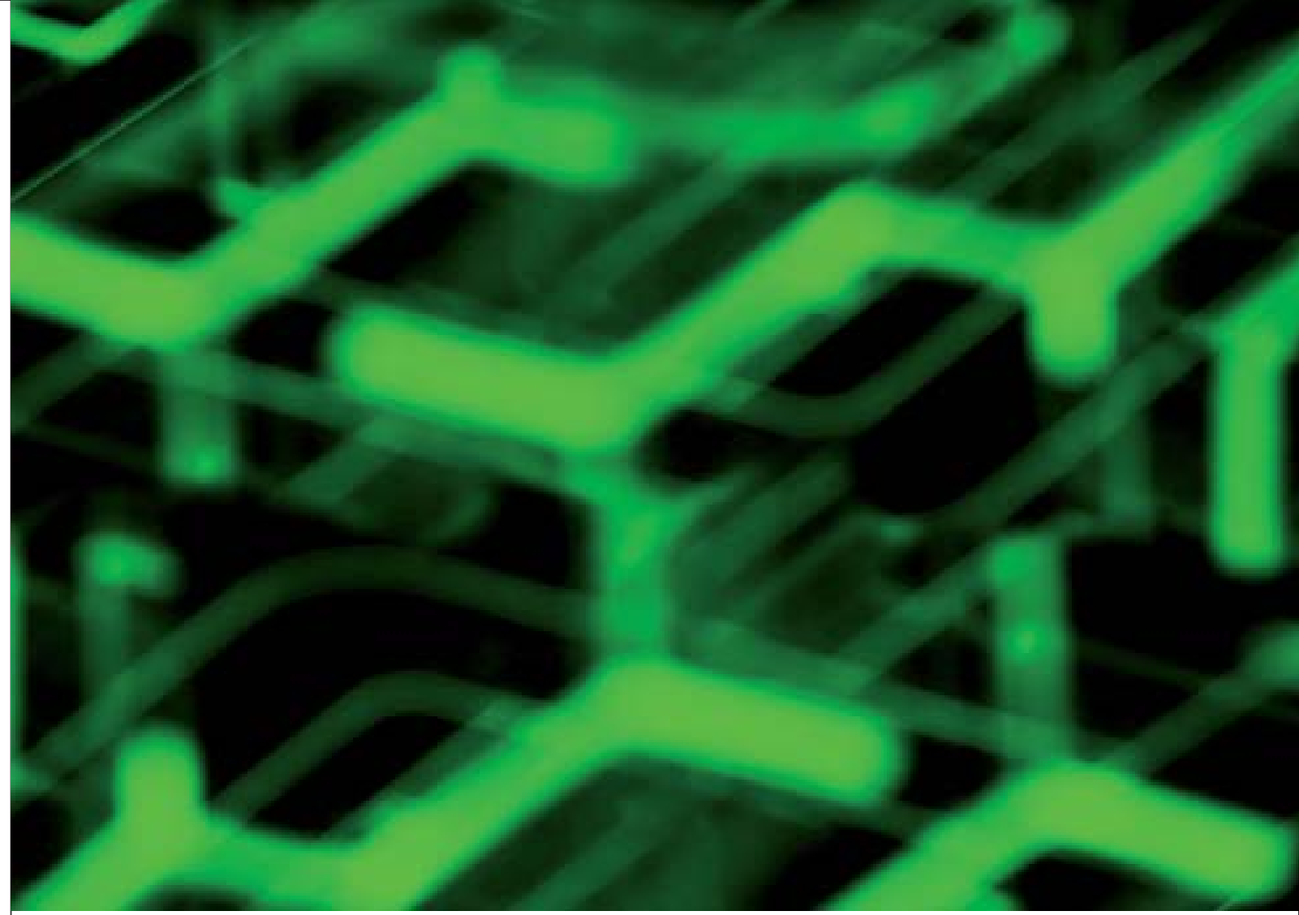
The focal points of forest cluster research are:

- customer and user as the drivers of development
- possibilities offered by new materials, services and business models
- the forest cluster as a builder of a sustainable bioeconomy

The constantly renewing and growing forest cluster needs completely new products and services alongside the existing ones. Energy products, chemicals, new materials and new business models are areas that provide new opportunities. As well as the innovation possibilities, the needs of customers and users of existing products and services should be given full consideration as possible foundations on which to build new business.

The growth and development of the forest cluster are generated by innovative people and companies. By going into new value networks and developing expertise that transcends cluster boundaries new doors can be opened. Success in this endeavour requires vision and the courage to challenge old recipes for success. Internationalism and entrepreneurship must be givens.

This research strategy is a revision of the forest cluster research strategy published in October 2006 and offers new perspectives. Global scenarios developed by the Finnish Business and Policy Forum EVA were used in predicting the future operating environment.



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1. The forest cluster as a promoter of Finnish prosperity and wellbeing

Finland has the world's strongest cluster based on wide-ranging expertise in wood processing, including its client industries. The impact that the forest cluster has on our country's prosperity and wellbeing is considerable: the cluster promotes wellbeing both through its products and services and through the direct and indirect employment it generates throughout Finland.

The forest cluster plays a key role in promoting prosperity and wellbeing in Finland and Europe, both today and in the future. It is founded on three Finnish strengths and resources: expertise, co-operation within the cluster and a renewable raw material – wood.

Wood – a versatile material

Wood is becoming a strategically important raw material. It offers a wide range of possibilities for products and solutions that meet the needs of both individuals and society. Yet many of these possibilities, such as those offered by the chemicals contained in wood, are still undiscovered.

Driven by the forest cluster, Finland has outstanding resources at its disposal to become a pioneer in sustainable development and bioeconomics. In the future bioeconomy, wood will be used for an even wider array of applications, from paper, packaging and buildings to biofuels and a full spectrum of biomaterials and bioproducts. Finland's prosperity and wellbeing will continue to be based to an important extent on the wood processing industry and the export of its products and services.

Research lays the foundation for growth and renewal

Research and innovation will play a key role in renewing the forest cluster to respond to changes in the operating environment. Research and development are means to be used to improve forest cluster profitability and competitiveness as well as to create new business opportunities.

The forest cluster must generate value added through innovations that combine different areas of expertise and technology, in turn generating value added for the customer and the user. The future of the forest cluster is crucially dependent on how well it meets the requirements of its customers and users, and on how effectively it develops competitive and customer-oriented products, solutions and services.

Implementing the 2006 research strategy

The target set in the Finnish forest cluster research strategy published in October 2006 was to double the value of Finnish forest cluster products and services from 2006 to 2030, with half of the value deriving from new products, a 25% increase in the use of domestic timber, and doubling of cluster research and development investments.

In 2008 and 2009 the forest cluster underwent an extensive restructuring in a way that could not be foreseen in 2006. The elimination of unprofitable capacity coupled with the global recession contributed to a reduction in the value of forest cluster products and services. Although a decrease in the volume of timber imported from Russia has increased the use of domestic timber, total wood consumption has not reached the long-term level as a result of a decline in production. Forest cluster research and development investments are estimated to be at the same level in 2010 as they were in 2006. The focus of research, however, has shifted toward the focal points outlined in the research strategy.

On the other hand, there has been encouraging progress particularly in the use and development of bioenergy. The use of forest chips in energy production nearly doubled in 2006–2009. In addition, the development of biofuels for transportation has made rapid progress, with significant demonstration projects and investments planned.

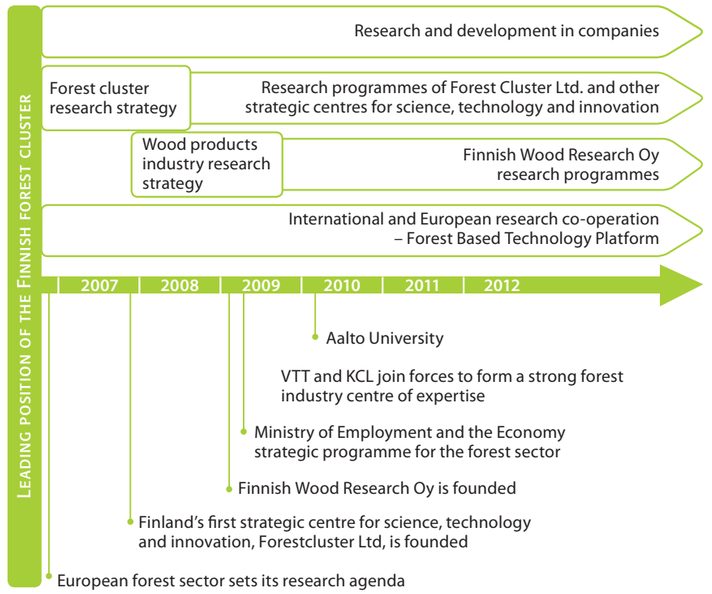
In the years 2006–2010 the Finnish forest cluster has taken major strides toward achieving the 2030 targets, and a great deal has happened in the forest cluster research and innovation environment. Finland's first strategic centre of expertise, Forestcluster Ltd was founded in 2007 to carry out the research strategy published in 2006. Leading wood product operators joined forces with the founding of Finnish Wood Research Ltd in 2009. The primary function of Forestcluster Ltd and Finnish Wood Research Ltd is the planning and execution of joint forest cluster research programmes.

The founding of Aalto University and the transfer of the KCL research institute owned by forest industry concerns to The Technical Research Centre of Finland VTT have created even stronger forest cluster centres of expertise. Finnish Forest Research Institute Metla and Metsäteho Oy have revised their strategies and operating approaches, while other forestry organisations are also developing their division of labour and operating concepts. The universities and other institutions of higher education have been actively involved in developing forest cluster research and educational programmes to meet the new needs.

Finnish forest cluster actors have actively participated in the Forest-Based Sector Technology Platform in Europe. The goal of this co-operation is to influence EU research programmes and enhance joint European forest sector research.

THE INNOVATION ENVIRONMENT OF THE FOREST CLUSTER HAS CHANGED A LOT IN RECENT YEARS

Research and development lays the foundation for the growth and renewal of the Finnish forest cluster.



2. The forest cluster operating environment in 2030

Changes in the international operating environment will have an inevitable impact on the Finnish forest cluster. Forest cluster scenarios present four different pictures of future operating environments and their potential impacts on Finland and the forest cluster. The scenarios are not forecasts, but possible outcomes.

The Finnish forest cluster can grow and renew itself in any of these scenarios. Success depends on how well we are able to seize opportunities and use our strengths to full advantage. Our most obvious strengths are the strong forest cluster network, enormous intellectual capital and growing forests.

In the future world there are many common denominators in all the scenarios. Global solutions will be sought for global questions, even though degrees of global networking and co-operation may vary. The growing national economies of China and India will have increasing importance.

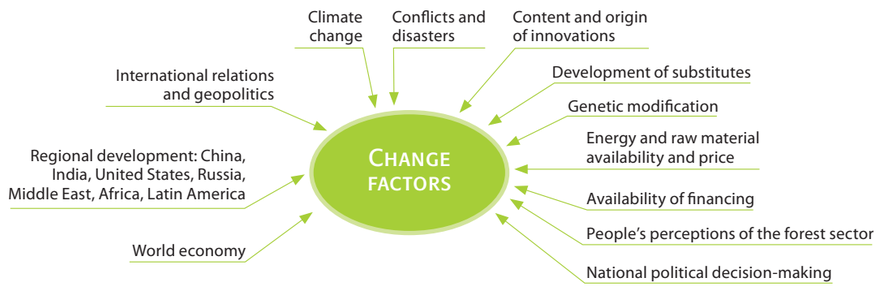
The availability and price of energy will play a major role for industry, transportation and households in all the scenarios. The sharp rise in population will have a dramatic impact, for example, on the demand for foodstuffs and for controlling climate change. An adequate supply of fresh water will become a problem in many regions and there will be shortages of raw materials. Urbanisation will affect construction and logistics.

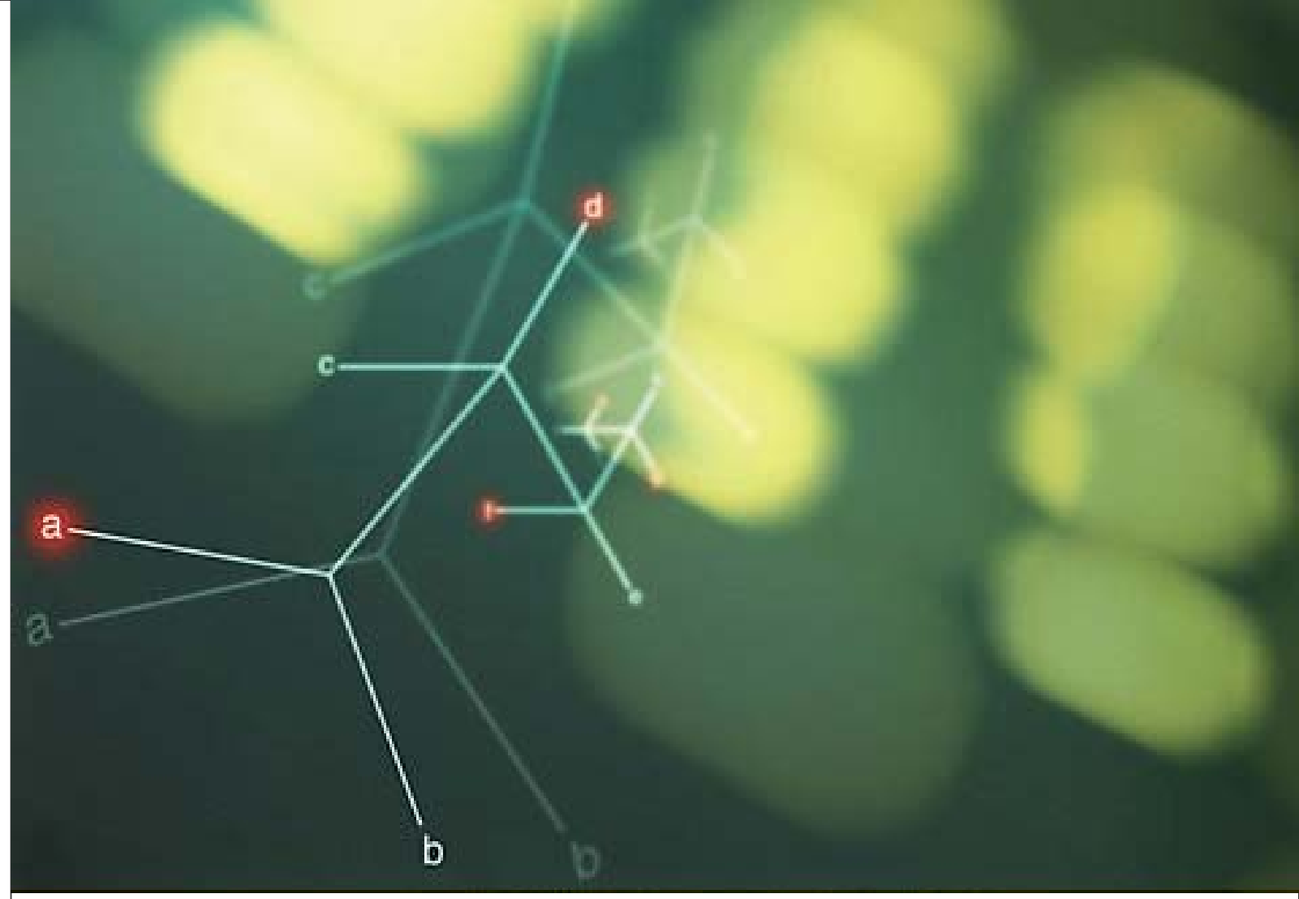
Technological development will continue and improve productivity. New innovations will constantly be generated in the fields of environmental, energy, information and communications, bio- and nanotechnologies, and in the interfaces between them. The importance of information and social networks will increase.

The greatest differences between the scenarios have to do with general economic development, the weight given to different countries and regions, the advance of climate change, the role of bioenergy and the importance of Finland's neighbouring countries as markets. The nature and origin of innovations, people's perceptions of the forest industry and national political decision-making will also determine the future of the forest cluster operating environment.

We can prepare for all the scenarios through global leadership and specialisation, through strong entrepreneurship, by making goal-oriented investments in research and by building a sustainable biosociety.

Key change factors of the forest cluster operating environment





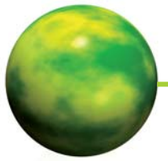
Four forest cluster operating environment scenarios

Global bioeconomy	Forests as a bioenergy source	Business as usual	Self-sufficient society
Consumers and industry have finally accepted the reality of climate change and ambitiously set out to develop a carbon neutral society.	Due to a sharp rise in the price of energy, the use of wood for energy competes with other uses for wood. The use of wood for energy keeps the value formation of forest assets low.	The strongest parts of the existing forest cluster continue in Europe. The Euro bloc leads the way in the forest cluster and sustainable use of forests.	Climate change has caused extensive damage to forests. The arid climate of the south has pushed food production farther northward. Poor arable land is in intensive biomass production.

Required actions for all scenarios

- Specialisation in the most valuable products and solutions
- Global leadership in standardisation and norms in key areas
- Taking the role of global integrator and genuine internationalisation
- Distribution of labour and specialisation within the Nordic countries and EU
- Taking advantage of opportunities offered by Russia
- Facilitating and strengthening entrepreneurship
- Making Finland a bioeconomy
- Major investment in universities and research in selected fields

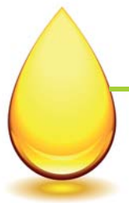
Four forest cluster operating environment scenarios for 2030



Scenario 1: Global bioeconomy

Original EVA scenario: The West sheds its skin

In 2030	How do we prepare for this situation?
• Consumers and industry have finally accepted the reality of climate change and ambitiously set out to develop a carbon neutral society. • Nuclear power and renewable forms of energy (solar, wind, wave, etc.) comprise a majority of the energy p roduced. Bioenergy does not play a significant role. • Forests are seen as carbon sinks. Wood (biomass) is the only renewable source of carbon. High demand for biomass-based products. Sharp increase in timber construction. • Russia exploits its forest assets together with Western European operators in a win-win arrangement, thus forming one of the most important carbon sinks in the world. • Asia experiences demonstrations and unrest concerning environmental issues and social imbalance. • The transport of bulk products is halved. • EU decisions steer European development and national decision-making plays a minor role.	• Operate on a customer-oriented basis so that production systems and distribution are flexible. Locate production close to customers and raw materials. • Invest in timber construction and wood products, biorefineries and related technologies. • Shift the focus from raw material supply to systems provider. Utilise networks and alliances to full advantage (e.g. Baltic Alliance of Regional Development Institutions) • Create the conditions for an enterprise-driven, innovative and international Finnish forest cluster. Put research results to effective use, also in small enterprises. • Develop technology exports, e.g. expertise in clean water technology.



Scenario 2: From forest to bioenergy

Original EVA scenario: Chinese capitalism

In 2030	How do we prepare for this situation?
• Sharp increase in energy prices, thus resulting in competition between the use of wood for energy and other uses; energy companies have seized control of major wood flows. The use of wood for energy keeps the value formation of forest assets low. • The EU is in crisis. Innovations are increasingly coming from Asia, where intellectual property rights are valued and forest industry professionals trained. • It seems possible that climate change is not caused by humans, resulting in increased use of carbon. The problem of access to fresh water has been solved. In Asia major investments have been made in solving environmental problems. • Developing nations do not adopt print media, but move directly to electronic media. Asian values and religions (entertainment, family, consumption habits, etc.) overtake Western choices, which can be seen, for example, in media and packaging consumption. The Chinese acquire forests, forestry know-how and companies from Finland and turn forests into energy plantations. Russia does not invest in developing the forest industry, thus resulting in the flow of timber from East Russia into China. The Chinese restructure the forest cluster on their own terms.	• Take advantage of opportunities for innovation and piloting in a small country, where the cluster's- strength is flexibility after capitalising on economies of scale. • Participate in Asian development. • Integrate with other industrial sectors, such as food, water and pharmaceutical chains. • Expand the raw material base with expertise in other bio- and fibre raw materials. • Cultivate biomass expertise based on gene technology. • Develop product and service combinations rather than just products.

Scenario 3: Business as usual

Original EVA scenario: Battle of the blocs

In 2030	How do we prepare for this situation?
• "Sphere of interest" mentality becomes more pronounced Obstacles and boundaries are established. Probability of conflict between blocs increases • Blocs choose their own forest cluster strategies. The strongest part of existing forest industry production in the Euro bloc gains extra time, but the market is only close to present levels. • The Euro bloc leads the way in sustainable forest policy and forest industry. The EU has set up a common forest policy. • The importance of the Russian market increases. Forest industry co-operation is close between the EU and Russia, because the Russian forest industry needs European technology as it grows. • Growth in electronic media slows and the print media lifecycle continues. Plastic is replaced by wood-based products. Major growth on the fibre packaging market. Bioenergy production is decentralised. Slow growth in timber construction.	• Emphasis shifts from preventing climate change to adjusting to it. • Russia and the possibilities offered by its forest assets are to be seen as a raw material source for products, a bioenergy source and an investment environment. • Expand business within the Euro bloc by integrating it with other parts of the value chains. • Form an alliance with the chemicals industry and energy industry to ensure that biomaterials can replace oil-based materials to a significant extent. • As the forest cluster faces greater difficulty in its global operations, bloc-specific customisation of products and services should be developed – "multilocalisation".

Scenari o 4: Self-sufficient soci

Original EVA scenario: Stimulus and collapse

In 2030	How do we prepare for this situation?
• The economy and other problems are prioritised over curbing climate change in political decision-making. Environmental ethics have declined and emission trading has ceased. • Climate change causes extensive forest damage throughout the world, thus leading to changes in tree species (hybrid poplar). Southern food production is moving farther north due to droughts. The best arable land is reserved for food production and the poorest for intensive biomass production. Water shortages. • Emphasis on family and modest living standards. A self-sufficient economy is prevalent. • There is no shortage of energy in the recession. Due to extensive protectionism, every effort is made to implement technologies that enhance energy self-sufficiency and use domestic sources of renewable forms of energy. • Economical and local solutions are emphasised in innovation. Innovations are focused on basic human needs, such as security. • Russia is closed, but Finland maintains trade ties. Russia lacks foreign investments and there is a shortage of consumer goods.	• Enhance the use of shrinking forest raw material resources by recycling and using recycled materials. Increase the recycling frequency of wood and growth of biomass. Divide wood into different uses and applications in the forest. • Develop product manufacturing and energy production locally and decentralise, for example, solar cells and decentralised energy production systems. Focus on SMEs and "multilocalisation". • Promote integration across sectoral boundaries and within the value chain. • Develop new business based on the economical use of resources, by combining products and services.

3. Vision and goals for 2030

Vision

FINLAND HAS A SUCCESSFUL, CONSTANTLY DEVELOPING FOREST CLUSTER, WHOSE PRODUCTS AND SERVICES ARE AMONG THE MOST SOUGHT AFTER IN THE WORLD. THIS WILL PAVE THE WAY FOR A SUSTAINABLE BIOSOCIETY.

Target for 2030

THE TARGET IS TO DOUBLE THE VALUE OF FOREST CLUSTER PRODUCTS AND SERVICES FROM 2006 LEVELS BY 2030. AT LEAST HALF OF THE VALUE WILL COME FROM PRODUCTS AND SERVICES THAT WERE NOT YET IN PRODUCTION IN 2006.

Strategic importance of research increasing

Research and development play a crucial role in the growth and renewal of the industry. In order to achieve this goal the productiveness of research and development investments will increase and innovation will generate commercially successful products and services.

More value added generated by Finnish wood

A two-fold increase in the value of forest cluster products and services will result in increased value added for domestic wood biomass and sustainable use will come closer to finding practical applications.

Innovative people, companies and networks are required for growth and reform

By going into new value networks and developing expertise that transcends cluster boundaries new doors can be opened. Success in this requires vision and challenging old recipes for success. Internationalism and entrepreneurship should be givens for people, companies and networks alike. Growth and development of the forest cluster will be generated by innovative people, companies and networks.

New key factors for success

The success factors for the quadrupling of Finnish forest industry turnover in the years 1980–2000 were: new investments, production benefits from economies of scale, process innovations supporting production and raw material innovations. New key factors for success will come to the fore in achieving the target for 2030.

Conditions for growth and renewal are strong

In practice, the vision and target are realised through the success of company innovations. There are four innovation challenges:

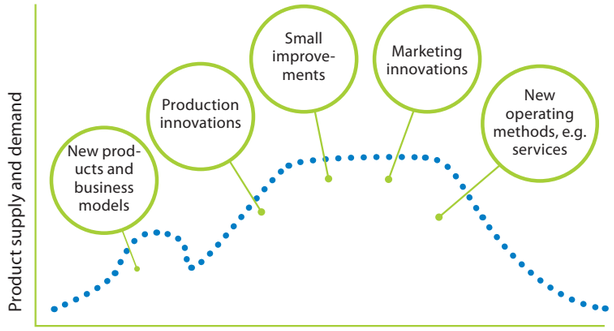
- How can the lifecycles of key modern-day business activities – wood products, papers and packaging – be renewed? Even if customer needs or intended product uses remain unchanged, renewing the lifecycle can require a radically new production technology, business model or material technology.
- How do current businesses adapt to markets where population growth and wealth generate new demand?
- How should the growing energy business be expanded and developed? Opportunities arise for both existing and new operators.
- How can new businesses be formed to initiate new lifecycles?

Different kinds of innovations are needed at different points in the lifecycle of products and services

To fulfil the forest cluster's vision for 2030 means becoming a multitalented innovator. On one hand, lifecycles must be given new starts and new services must be created, while on the other, new applications must be found for fibre and wood. In addition to this, processes using wood and energy production technologies must be updated.

It is characteristic of research and development that initial turnover growth for a new business is slow. Once the pieces of the developed business fall into place and it becomes established, growth accelerates.

DIFFERENT KINDS OF INNOVATIONS ARE NEEDED AT DIFFERENT POINTS IN THE LIFECYCLE OF PRODUCTS AND SERVICES.



In addition to technologies, innovations breathe new life into operating methods, products and services.

4. Prerequisites: innovative people, businesses and networks

The growth and development of the forest cluster will be generated by innovative people, companies and networks. By going into new value networks and developing expertise that transcends cluster boundaries new doors can be opened. Success in this requires vision and challenging old recipes for success. Internationalism and entrepreneurship should be givens for people, companies and networks alike.

Skilled people and an effective education system are prerequisites for the success of the Finnish forest cluster, both now and in the future. Strengthening Finnish intellectual capital will make it possible to exploit the wide range of possibilities offered by wood and forests, thus ensuring Finland's international competitiveness and prosperity.

Operating within value networks

In addition to product and production innovations, the forest cluster's existing value networks offer opportunities for a wide variety of business innovations. In order to identify opportunities, such as reducing the number of intermediaries or creating new kinds of service entities, active gathering of information and focused action are essential.

The creation of entirely new value networks requires better networking skills than expanding the role within existing networks. In order to be able to assess, for example, the opportunities offered by ideas, we must understand the value network as a whole, starting with the needs of end users. We also have to identify any obstacles used by existing players to defend their position and we must also find the right partners.

Expertise across cluster boundaries

Expertise that transcends cluster boundaries opens doors that would not be available within the cluster. Combining the strong intellectual capital of the forest cluster with that of other clusters and value networks generates new business. For example, wood-based extracts that promote health must be commercialised together with the health cluster.

Institutions of higher education and universities establish the conditions for creating expertise across cluster boundaries, e.g. by developing educational programmes and co-operation both within institutions and between them. Companies can diversify their expertise, for example, by changing the focus of their recruitment.

Internationalism

In a global economy knowledge and expertise are global. International co-operation and international markets are already very familiar to many Finnish operators. However, a clearer understanding of how people in other countries work and think is constantly needed. For example, low-income, "base of the pyramid" markets require a new approach to understanding and a local presence. Familiar ways of achieving this, strating with student exchanges, are still important, but cultural expertise must be systematically developed.

European research projects are a key way for Finns to work in co-operation with top international experts and, for example, finance major demonstration projects. Many research topics require European co-operation, as the application of results requires operating at the EU level. These types of research efforts include research projects which deal with sustainable development.

International co-operation, however, is not limited to the EU. Networks must be established with experts in China, India and other rapidly developing economies and relationships must be formed with top experts in countries such as the United States and Canada.

Entrepreneurship

Developing a new business is largely a question of will and the ability to make things happen and take risks. Innovation ideas often come from the desire to do things differently or better, or to create a better product or service. Entrepreneurship is advantageous in any endeavour, but it is especially vital in developing a business.

There are great opportunities for stronger entrepreneurship in the forest cluster and in the Finnish innovation sphere as a whole. Facilitating enterprise and improving opportunities for financing growth businesses are two of the most important goals of Finnish innovation policy.

There is a strong need to enhance the level of co-operation between large and small companies. Small companies can focus, for example, on producing innovations while large companies can offer comprehensive service packages for their extensive clienteles. The forest cluster must develop functional approaches to the application of open innovation principles.

5. Focal points of research

The three focal points of the Finnish forest cluster are: 1) Customer and user as the drivers of development; 2) Possibilities offered by new materials, services and business models; and 3) Forest cluster as a builder of a sustainable bioeconomy. All three focal points can also be perspectives used in the development of the same product, service or business.

Customer and user as the drivers of development

Customer and user perspectives are playing an increasingly central role in research and innovation. The value added of products and services is generated in interaction with customers and consumers. This requires an active ability to anticipate customer and consumer needs, expectations and behaviour.

To identify new business opportunities we need to know the routines and practices of the customers and end users of products and solutions. This also applies both to the forest cluster's existing products and services and to new products, services and their applications.

Possibilities offered by new materials, services and business models

Integrating new materials and services with products creates significant new areas of business.

The use of materials and raw materials increases as the world's most populous countries prosper. Shortages of non-renewable materials open new doors for the use of renewable wood-based materials. Solutions can also be sought through combining different materials.

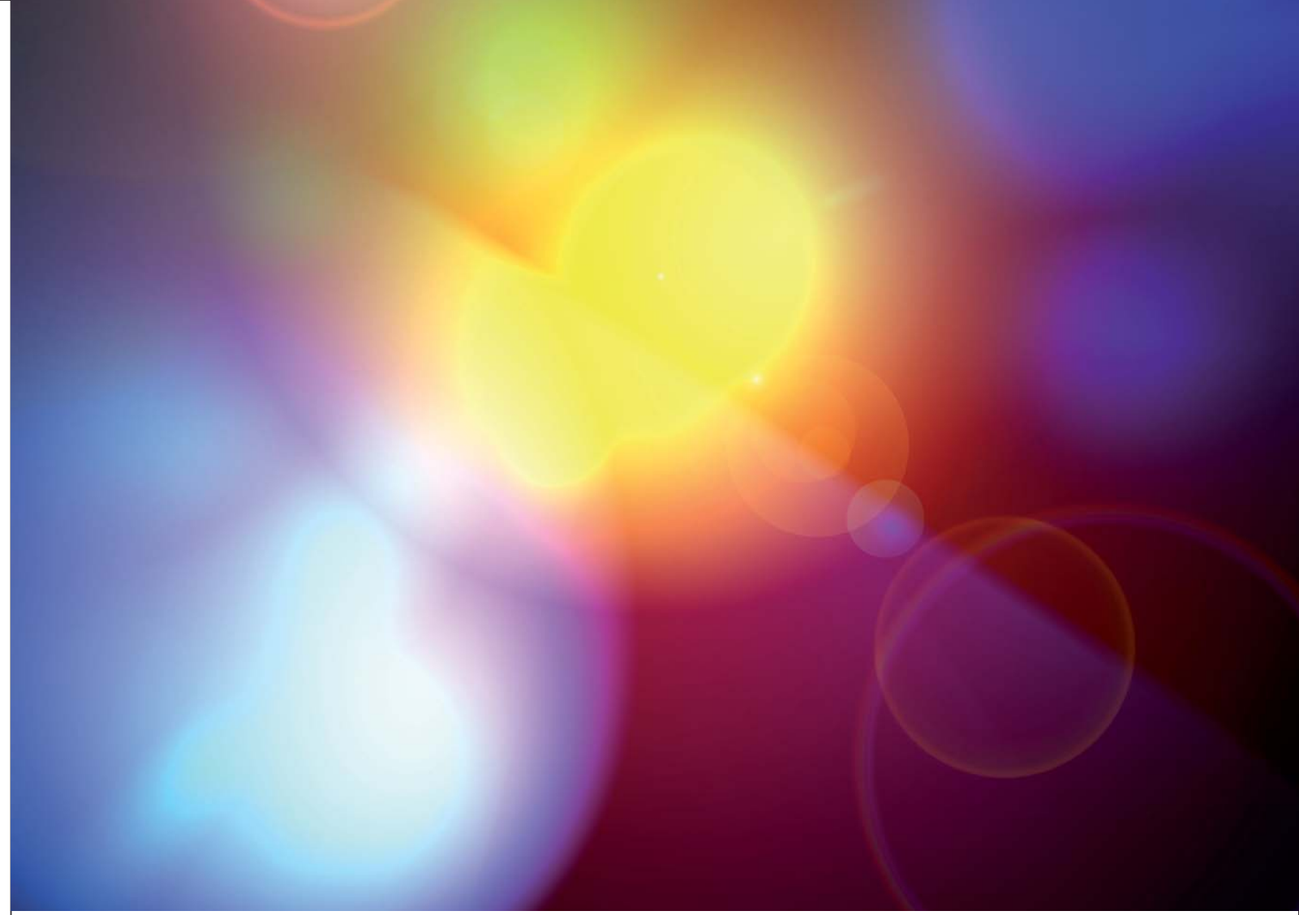
Daily user routines and customer practices and approaches can reveal opportunities for service providers. Long waiting times, material waste or excessive quality assurance measures provide strong clues for improving service. Other opportunities lie in providing expert services or in the tourist and recreational use of forests.

Forest cluster as a builder of a sustainable bioeconomy

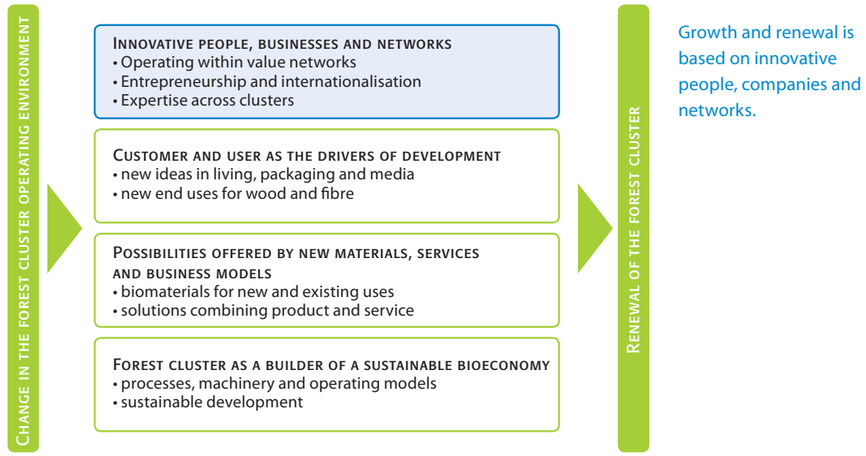
Building a sustainable economy requires a bioeconomy based on renewable materials. This is very much in line with the EU's objectives. In Finland the most important renewable resources are growing and sustainably managed forest assets, which we have the duty to make good use of.

Finland has outstanding resources at its disposal to become a pioneer in sustainable development and bioeconomics driven by the forest cluster. In the future bioeconomy, wood will be used for an even wider array of applications, from paper, packaging and buildings to biofuels and a broad spectrum of biomaterials and bioproducts.

Our high level of expertise in modern wood processing, from machine engineering to timber harvesting, is the basis for new development. Adding new products and energy production to biorefinery operations is a natural progression, but it requires new operating models and wide-ranging development. Even the most radical new processes are possible through research.



THE FOCAL POINTS OF THE RESEARCH STRATEGY CORRESPOND WITH CHANGES IN THE FOREST CLUSTER OPERATING ENVIRONMENT AND SERVE TO RENEW THE FINNISH FOREST CLUSTER



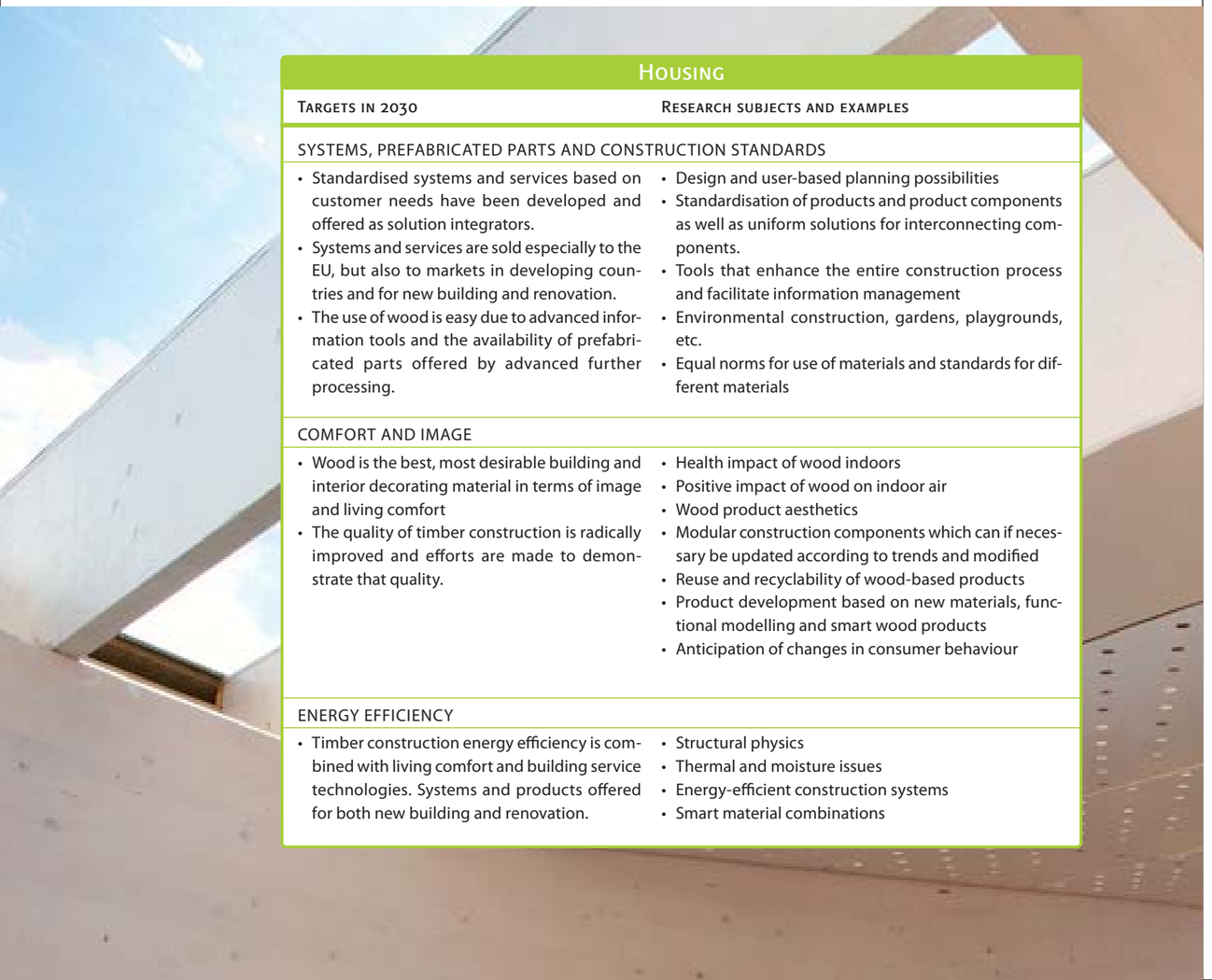
Growth and renewal is based on innovative people, companies and networks.

5.1 Customer and user as drivers of development

Customer and user perspectives are playing an increasingly central role in research and innovation. The value added of products and services is generated in interaction with customers and consumers. This requires an active ability to anticipate customer and consumer needs, expectations and behaviour.

Opportunities and challenges for the current key end users of forest industry products, housing and packaging, are: growth in demand as the global economy grows; wood and fibre properties and performance; and competition with other materials. In the media the main challenge facing fibre-based products is to find its own role in a world where there is growing interaction and electronic readers and the Internet are rapidly developing.

To identify new business opportunities we need to know the routines and practices of the end users of products and solutions. This also applies both to the forest cluster's existing products and services and to new products, services and their applications.



Housing

Targets in 2030	Research subjects and examples
SYSTEMS, PREFABRICATED PARTS AND CONSTRUCTION STANDARDS	
• Standardised systems and services based on customer needs have been developed and offered as solution integrators. • Systems and services are sold especially to the EU, but also to markets in developing countries and for new building and renovation. • The use of wood is easy due to advanced information tools and the availability of prefabricated parts offered by advanced further processing.	• Design and user-based planning possibilities • Standardisation of products and product components as well as uniform solutions for interconnecting components. • Tools that enhance the entire construction process and facilitate information management • Environmental construction, gardens, playgrounds, etc. • Equal norms for use of materials and standards for different materials
COMFORT AND IMAGE	
• Wood is the best, most desirable building and interior decorating material in terms of image and living comfort • The quality of timber construction is radically improved and efforts are made to demonstrate that quality.	• Health impact of wood indoors • Positive impact of wood on indoor air • Wood product aesthetics • Modular construction components which can if necessary be updated according to trends and modified • Reuse and recyclability of wood-based products • Product development based on new materials, functional modelling and smart wood products • Anticipation of changes in consumer behaviour
ENERGY EFFICIENCY	
• Timber construction energy efficiency is combined with living comfort and building service technologies. Systems and products offered for both new building and renovation.	• Structural physics • Thermal and moisture issues • Energy-efficient construction systems • Smart material combinations

Packaging

Targets in 2030	Research subjects and examples
PROTECTIVE PACKAGING	
• Composite packaging is developed to meet the needs of aseptic foodstuffs packaging, thus reducing food chain waste by half. • Resource-efficient transport packaging developed with radical material savings.	• Ambitious packaging development by combining customer needs and manufacturers' material expertise • Recyclable material developed to meet the needs of developing countries • Possibilities offered by new biomaterials • Smart packaging
PACKAGING AND PRODUCT INFORMATION	
• Product properties and manufacturing and use information are linked by means of printed electronics on the packaging much more effectively than at present.	• Special needs of packaging required for online shopping, including printed matter delivered in packages • Utilisation of product information that generates communality • Future pharmaceutical packaging
SALES PACKAGING	
• Experiential packaging properties are fully developed and advanced packaging technology, such as on-demand production and printed electronics, further enhances product and event marketing.	• Multifaceted package usage research • Establishing a Living Lab testing centre • Developing flexible packaging lines • Industrial design and user-based design possibilities

Media

Targets in 2030	Research subjects and examples
PAPER-BASED MEDIA PRODUCTS FOR INTERNET APPLICATIONS	
• Paper-based media products are developed and maintained based on end use and value chain expertise and with Internet applications in mind. The focus is on the whole system and on services, not on the product itself. • The business expertise required for a fragmented media product sector is developed and learned. • Printed products are a relevant part of social media.	• Paper products serving as both a communications channel and packaging to meet the needs of low-income population segments • Location-specific advertising, using decentralised printing for distribution. • Products specially designed to meet environmental requirements • A Living Lab for new print products, allowing fast demonstrations • Purchasing through two-way hybrid media, social media and self-guided learning products • Community publications and learning tools
INTEGRATED OPERATING MODEL FOR PRINT COMMUNICATIONS	
• A business model is developed that integrates the print communication value chain and is faster, simpler and more economical than the current model.	• Joint project for operators in the print communication value chain to reduce the amount of wasted time, capital and material.

5.2 Possibilities offered by new materials, services and business models

Integrating new materials and services with products creates significant new areas of business.

The use of materials and raw materials increases as the world's most populous countries prosper. Shortages of non-renewable materials open new doors for the use of renewable wood-based materials. Solutions are also sought through combining different materials. Thanks to new processing techniques and the combined use of materials there are unrealised possibilities offered by wood and fibre.

Daily user routines and customer practices and approaches can reveal opportunities for service providers. Long waiting times, material waste or excessive quality assurance measures provide strong clues for improving service. There are also opportunities, for example, in providing expert services or in the tourist and recreational use of forests.

The development of solution and service business operations is an important and challenging strategic change for companies to make. Its success depends on good management and the adoption of new operating methods. Can future forest cluster business models revolutionise the industry in the same way that Dell did with the manufacture and sales of computers or budget airlines did in aviation?

New materials, services and business models

Targets in 2030	Research subjects and examples
New materials and printed intelligence	
• Entirely new products based on renewable raw materials and new production technologies are developed. • Competition between different materials is under control and the opportunities of wood-based products are recognised. • New material solutions are sought systematically.	• Composite materials, including new possibilities offered by materials science • Possibilities offered by nanotechnology • Development of new wood and biomaterials for housing and construction • Wood-based materials for demanding applications, such as wind power towers • Developing wide-ranging materials performance expertise • Composite material smart packaging and logistic solution for home delivery food service for the elderly • Foodstuffs packaging for online shopping • New uses for paper, such as ground cover for agriculture or in the collection of solar energy • Paper or label that contains installation information for wood structural components • Packaging that advertises other products according to the buyer's profile
Business models and services	
• New companies and business models are developed for the industry • Offering services as part of the product business has become common practice. • The ability to produce larger entities that meet customer needs has been developed. This "system integrator" model is utilised especially in wood products and packaging	• Reproducable and internationally scalable service innovations and business models • Service and solution business expertise and management • Service culture and service market • Service business revenue models • Process industry service concepts • Integrated service concepts • Organisation of service businesses • Business model customisation • Open innovation opportunities • Energy improvement solution for post-war two-storey detached house type • Developing forests for recreational use • Skills and methods necessary for management of the value network

5.3 Forest cluster as a builder of a sustainable bioeconomy

Building a sustainable economy requires a bioeconomy based on renewable materials. This is also very much the desire of the EU. In Finland the most important renewable resources are growing and sustainably managed forest assets, which it is our duty to put to good use.

Our high level of expertise in modern wood processing, from machine engineering to timber harvesting, is the basis for new development. Adding new products and energy production to biorefinery operations is a natural progression, but it requires new operating models, value networks and wide-ranging development. Even the most radical new processes are possible through research.

The increased importance of bioenergy production and production of biofuels requires new expertise. The production of chemicals and new materials in biorefinieries poses a challenge for process expertise. A broad range of expertise in bioprocesses is required in the manufacture of new bioeconomy products.

As the bioeconomy gains strength, the pressure on forest use increases. This requires ecologically sustainable and economically rational approaches to the production, acquisition and refining of biomass. The sustainability of value chains and networks must be ensured and demonstrated.

Bioeconomy

Targets in 2030	Research subjects and examples
Bioenergy	
• Substantial availability of forest biomass for energy use Functional balance in the use of energy and other raw materials • Finnish forest cluster is a leading actor and expert in forest biomass energy applications • Policy instruments are efficient.	• Sustainable production and use of forest biomass. • Development and assessment of new raw material production methods, e.g. possibilities offered by intensive agriculture • Development of wood-based biofuels and production technologies • Research into the impacts of economic and political control instruments
Biorefinery operating models	
• Business practices and production models have been developed for versatile biorefineries. Refinery products combine existing wood products and chemical forest industry products with new materials, chemicals and energy. • Finland is a world leader in refinery production expertise, the manufacture of production equipment and chemicals, and expert services. Expertise in both large-scale integration and smaller scale applications.	• Basic research in wood chemistry • Investigating the potential of uses for bioproducts and product management • Methods for managing extensive product lines and applications • Effective integration of bioproducts into existing production facilities and optimal facilities for the processing of new products • New pulping methods and approaches for producing interior decoration products from wood • Production technology development projects • New products and energy technologies • Technologies designed for use in developing countries, such as factory technology adapted to Indian raw materials and in accordance with a wide variety of local needs (energy, waste management, etc.)
Sustainable development methods	
• Requirements for the sustainable development of a bioproduct economy evolve into methods and standards, which support business in all product categories. The reviews extend from the forest and forest management issues through production to products and their use. • Finland plays a globally leading role in standardisation and norms.	• Extensive modelling of the bioeconomy • Sustainability reviews, interfaces and production expectations of various value chains, and issues related to the cultivation, harvesting and use of forests • Research on packaging logistics and durability throughout the value chain • Technologies that preserve the environment • Minimised need for transport; factories with closed water systems • Demonstrating the environmental performance of timber construction

6. Genesis of the research strategy

Revision of the forest cluster research strategy was begun in October 2009, and the first preparatory workshop was held in November of the same year. The research strategy conclusions and strategic choices together with the focal points and content of the research were completed in spring and summer 2010. In all, four preparatory workshops were held and two extensive online stakeholder discussion forums were arranged.

A scenario approach was employed in the preparations in order to gain an understanding of the future operating environment. The scenarios were based on the Future Playing Fields scenarios developed by the Finnish Business and Policy Forum EVA and Capful Oy in 2009. The forest cluster scenarios were developed on the basis of the online stakeholder forums, which covered vital issues concerning the future of the forest cluster, change factors and beliefs. The scenarios were brought to life by presenting imagined news headlines from the future.

The possibilities and risks of the scenarios were then assessed by the stakeholders. In the same context expertise needs were also examined. The viewpoints expressed were then submitted for assessment by outside experts. The research strategy vision, targets and focal points were defined on the basis of these assessments.

Over 70 influential persons and experts from the forest cluster and outside experts participated in preparation of the research strategy.

The forest cluster research strategy is based on scenarios developed by the Finnish Business and Policy Forum EVA and extensive stakeholder discussions.

7. Closing remarks

In discussions concerning the forest cluster the opportunities have been obscured by the challenges in recent years. Scenarios of the future operating environment of the forest cluster, however, indicate that there are numerous opportunities. As a renewable material, wood and its attendant expertise will play an increasingly important role in the future. Whether the Finnish forest cluster succeeds in the future is entirely dependent on us.

Finland has outstanding resources at its disposal to become a pioneer in sustainable development and bioeconomics, driven by the forest cluster. In the future bioeconomy, wood will be used for an even wider array of applications, from paper, packaging and buildings to biofuels and a broad spectrum of biomaterials and bioproducts. Finland's prosperity and wellbeing will continue to be based to a significant extent on the wood processing industry and the export of its products and services.

The target set for 2030 is a challenging one. However, its realisation will mean a successful and renewable Finnish forest cluster that will pave the way for a sustainable biosociety in the future.

The focal points of the research strategy were defined on the basis of the best viewpoints available. The world is constantly changing, however, which is why the research strategy should be critically re-evaluated in a few years' time. All those who have something to offer the future of the forest cluster are also welcome to discuss and participate in the implementation and development of the strategy.

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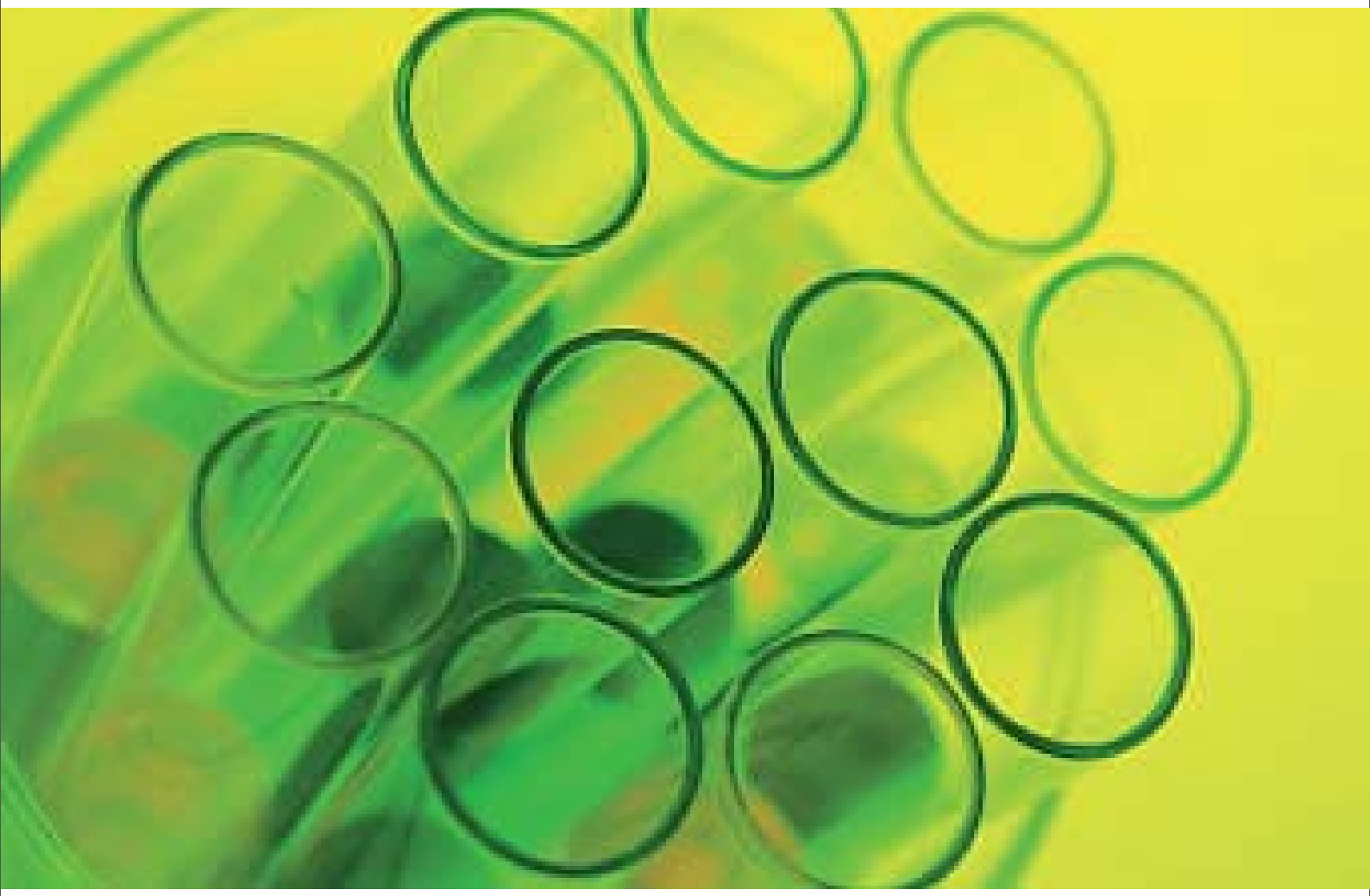
Our target is to double the value of forest cluster products and services



THE FINNISH FOREST CLUSTER RESEARCH STRATEGY OUTLINES THE FOCAL POINTS OF RESEARCH THAT ARE CRUCIAL TO THE FOREST CLUSTER AND ITS CLIENT INDUSTRIES. THE OBJECTIVE IS TO BUILD UP A SUCCESSFUL, CONSTANTLY DEVELOPING FOREST CLUSTER, WHOSE PRODUCTS AND SERVICES ARE AMONG THE MOST SOUGHT AFTER IN THE WORLD. IT IS PAVING THE WAY FOR A SUSTAINABLE BIOECONOMY.

Forest-Based Sector
Technology Platform