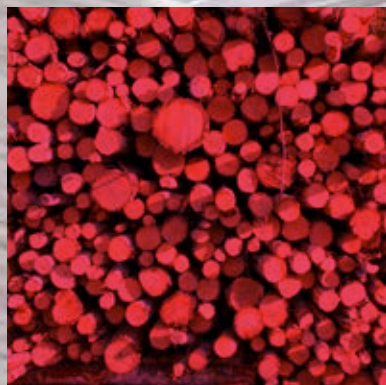
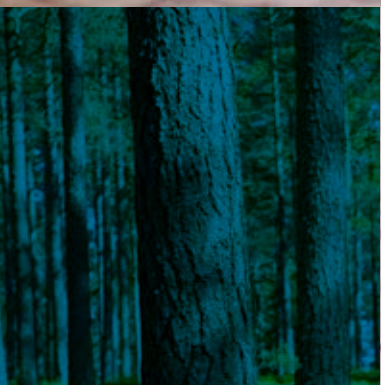


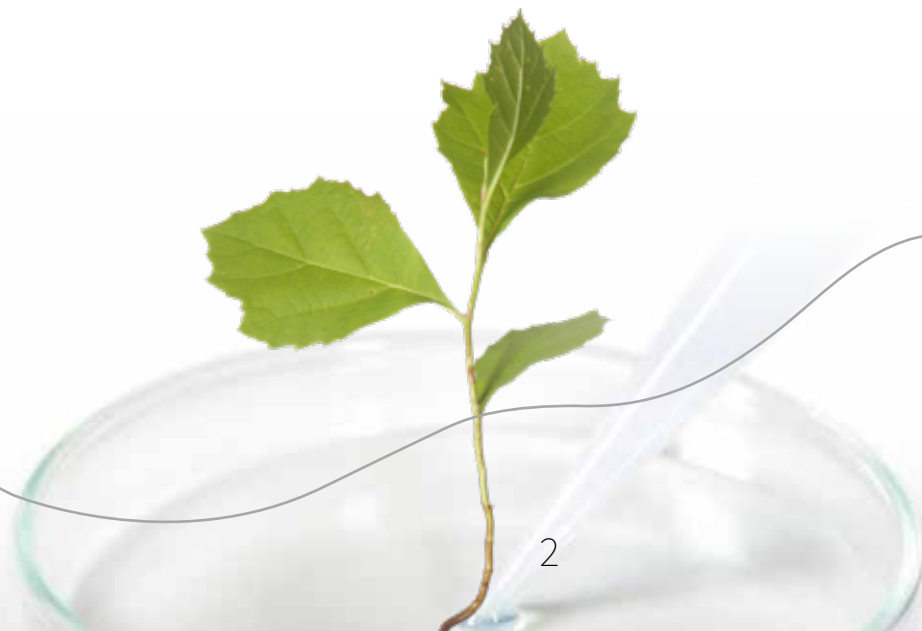
SUCCESS STORIES FROM THE FOREST



As the global population grows and urbanisation accelerates, concern about climate change and environmental load is growing. The forest industry responds to global challenges by manufacturing products from a renewable raw material. These products help to mitigate climate change and to respond to challenges resulting from population growth.

In the sustainable bioeconomy, renewable materials and natural resources are used efficiently and in a way that produces the maximum amount of added value. Wood has the advantages of being a versatile and recyclable material. It offers people the opportunity to make a difference and to choose a sustainable way of life.

Innovations made by the Finnish forest industry are international success stories that result in profitable business and new export products. In addition to continually developing existing products, the forest industry is also developing new products, solutions, and services out of this renewable raw material – wood. Innovations introduced by the successful and evolving forest industry are competitive, customer-oriented, and sought after the world over.



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More and more often, new ideas and innovations are the result of collaboration between various fields and experts.”



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An expert workforce is the backbone of the forest industry's success.

3

GETTING AHEAD WITH WOOD

Wood can already be used to replace plastic, cotton, artificial fibres, metals, fossil chemicals, and concrete. This means that there is ongoing development into new products that people do not expect to be made of wood.

Forest sector innovations, such as electronic smart packaging and antibiotics made from coniferous trees, amaze people. Wood-based composite materials, which are materials that combine wood with other materials, have led to new international business in, for example, the construction sector.

The forest industry is developing new products with fibre and wood ingredients, but it is also investing in the development of existing products, production processes, and services. Digitalisation is providing an efficiency boost especially to the industry's raw material supply and logistics. Leading with knowledge turns the forest into a treasure, which is invaluable to Finnish exports.



WOOD MAKES ITS WAY INTO MULTI-STOREY BUILDING CONSTRUCTION

Stora Enso wants to increase the use of wood as a construction material and to meet the growing international demand for wooden multi-storey buildings. But how?

- We have created something entirely new: open Building Systems for wooden multi-storey buildings that are now revamping the wood construction markets, explains **SAMI TYPPÖ** of Stora Enso.

The new systems are based on large prefabricated massive wood panels and elements. Guidelines have been compiled for builders, architects, structural engineers, contractors, and investors and they allow cost-efficient, easy and reliable construction with massive wood elements.

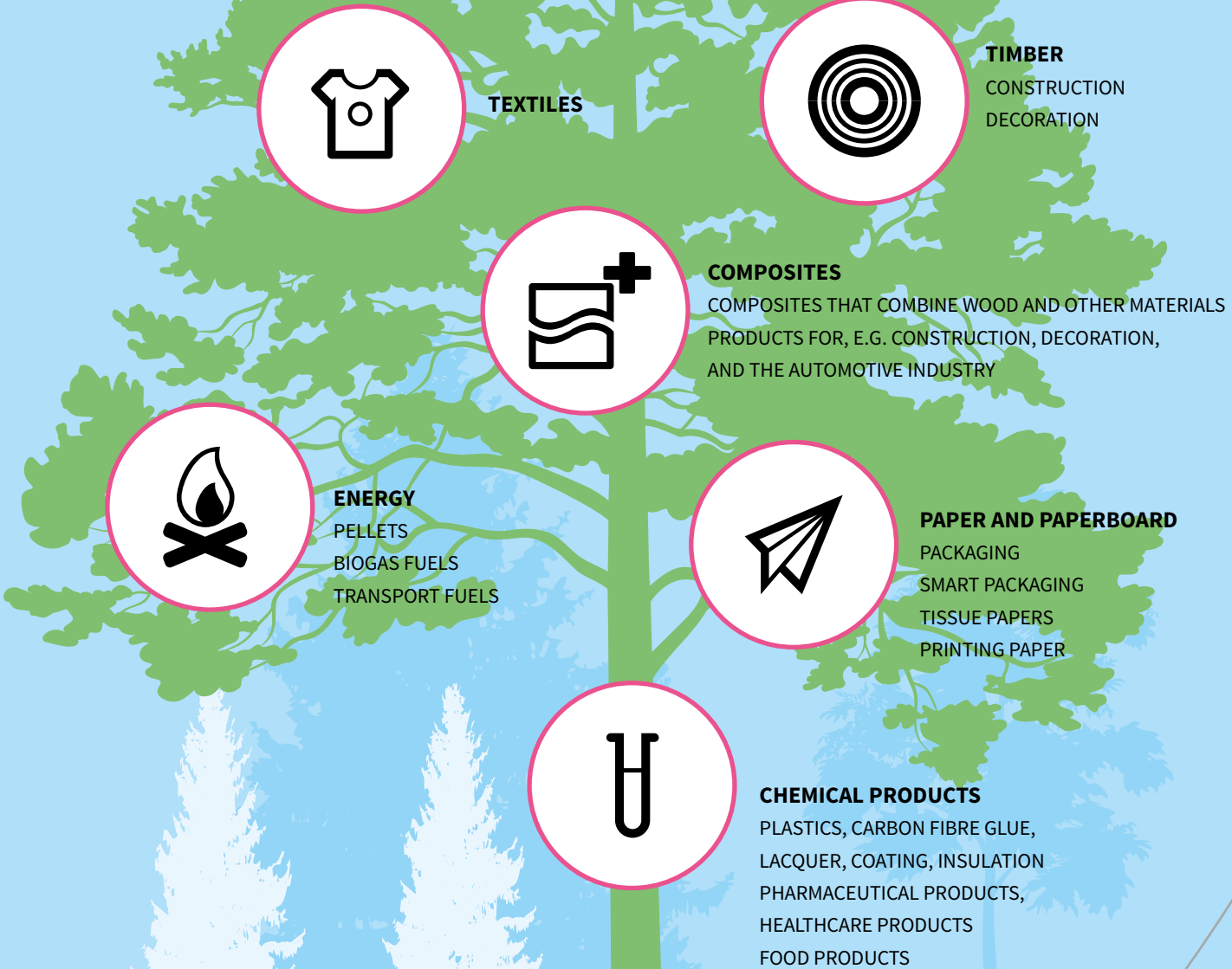
The guidelines take into account all construction phases, from planning to maintenance, of buildings of up to 12 storeys – flexibly and safely.

The building systems have been launched in Finland, France, Great Britain, Germany, Austria, and Sweden. Stora Enso delivers all system-related wood elements to customers as a one-stop service via its partner network.

- Our objective is to be the leading supplier of wood construction solutions and the frontrunner in the development of associated technologies. More wood construction components and systems are continually being developed, Typpö says.



WOOD OFFERS MANY OPPORTUNITIES



PAPERBOARD

- some of the pulp used in production is replaced with microfibrillated cellulose
- this means that the product can be manufactured using 10% less raw material, which reduces the carbon footprint of the carton
- despite the reduced use of materials, the characteristics of the product are maintained or even improved: the carton is stiffer and printability improved
- a laminated polyethylene plastic film is used

EVEN FAMILIAR PRODUCTS CONTINUE TO BE DEVELOPED

In Finland, milk is still consumed from the gable-top milk cartons developed almost fifty years ago.

UNDER DEVELOPMENT

- a film made of microfibrillated cellulose is under development so that it could, in future, replace plastic in the layered structure of the carton
- one day, the film can also be used as an independent packaging material, for example, as a bag

CAP

- now typically manufactured from polyethylene or polypropylene
- in future, a wood-plastic composite can be used – tests have already been carried out where half of the plastic has been replaced with cellulose
- the objective is to find a solution where no plastic is used

DID YOU KNOW?

” Smart features achieved via identification technologies can be employed for business purposes across the entire supply chain, for example, for informing consumers, making the logistics chain more efficient, and for identifying the origin of products. Packaging is increasingly becoming a medium for communication, with which a brand owner can communicate with consumers. This is how we meet demand for cutting-edge logistics and packaging solutions.”

JUHA MAIJALA, Stora Enso

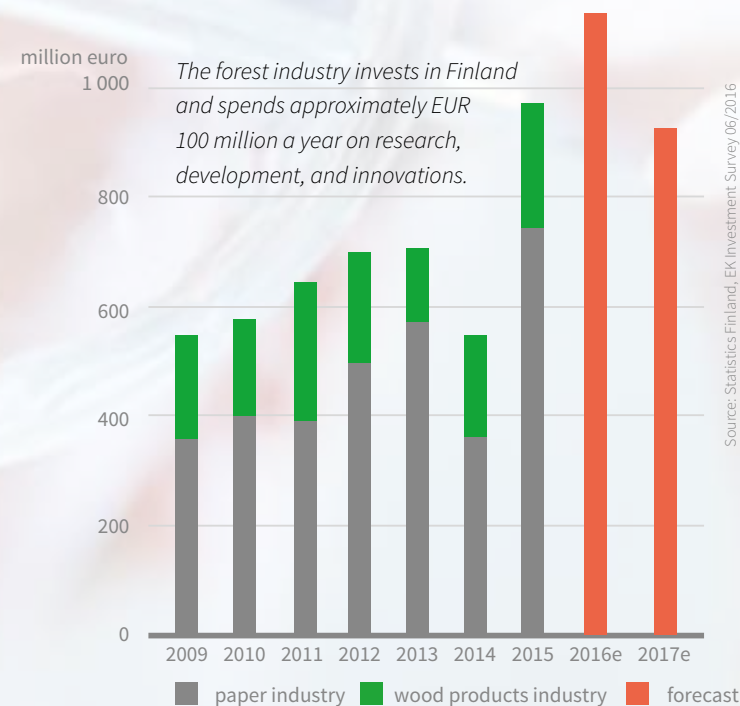
SECTOR EVOLVING THROUGH COLLABORATION

More and more often, new ideas and innovations are the result of collaboration between various fields and experts. Flexible, networked, and agile collaboration is taking place across sectors. Operating conditions and competitiveness are best developed in co-operation – not in isolation.

The forest industry is a great example of how collaboration and partnerships with various players have led to transformation in the sector. Collaboration in research and development has led to new growth opportunities that allow the ever more efficient use of the precious raw material

from forests. In future, the same products that are now manufactured from fossil fuels or metals will be manufactured from wood.

The transformation in the sector requires not only the further development of existing products but also new products and services. Furthermore, existing technology must be replaced with new technology. Success crucially hinges on how competitive and customer-oriented products, production processes, and services are. Innovations and investments are prerequisites for forest industry transformation.



CANCER RESEARCH IN A GEL

GrowDex® nanofibril gel, developed by UPM, resembles human cell media and offers valuable opportunities for growing human cells, conducting pharmaceutical research, modelling disease mechanisms, and for personalised medicine.

The gel is manufactured from water and fine cellulose fibre. It offers cells a 3D growing medium that is much more natural than a petri dish.

The University of Helsinki's Institute for Molecular Medicine Finland (FIMM) and UPM are together researching the suitability of the gel for cancer research.

- The collaboration helps us better understand the biology and drug response of cancer cells. GrowDex allows for more personalised and effective drugs for other diseases too, says UPM researcher **LAURI PAASONEN**.

Cancer cells are adaptive and finding the correct drugs can often be a game of chance. If treatment is started with the wrong drugs, the cancer becomes even more resistant.

Cancer cells taken from the patient are grown in the gel and various drugs are tested on them.

- By selecting the correct drug, we can avoid administering the wrong treatment as well as adverse drug side effects. This is crucial not only for the patient but also for economic reasons.

3D-printing is becoming more common in the medical sector. According to Paasonen, it is possible that in future, tissue and entire organs can be grown with the help of GrowDex.



CUSTOMERS FIRST

WOOD INTO THE TANK

Helsinki Region Transport (HSL) aims to transition to using only 100 per cent renewable biofuels by 2020.

As part of this objective, HSL has tested Finnish wood-based diesel fuel in its buses in the Greater Helsinki Area. The fuel in question is UPM's renewable BioVerno diesel, which is manufactured in Lappeenranta from tall oil, which is a by-product of the pulp manufacturing process.

Laboratory tests by the Technical Research Centre of Finland VTT and HSL's year-long traffic test runs have shown that wood-based diesel functions like the highest quality diesel fuels in buses.

In laboratory tests, wood-based fuel showed significantly lower emissions than conventional fossil diesel. Thanks to wood-based biodiesel, carbon dioxide emissions and the tailpipe emissions of public transport can be substantially reduced and thus the air quality in the Helsinki Metropolitan Area can be improved.

- Traffic tests have shown that BioVerno works very well in various blends and its use does not increase average fuel consumption. BioVerno could completely replace conventional fossil diesel in the existing bus fleet, says Director **REIJO MÄKINEN** of HSL.

THE FOREST RESPONDS

People's environmental awareness and demands as consumers have grown. The forest industry meets these demands by offering ecologically sustainable and recyclable products made from a renewable resource, products such as ecological packaging.

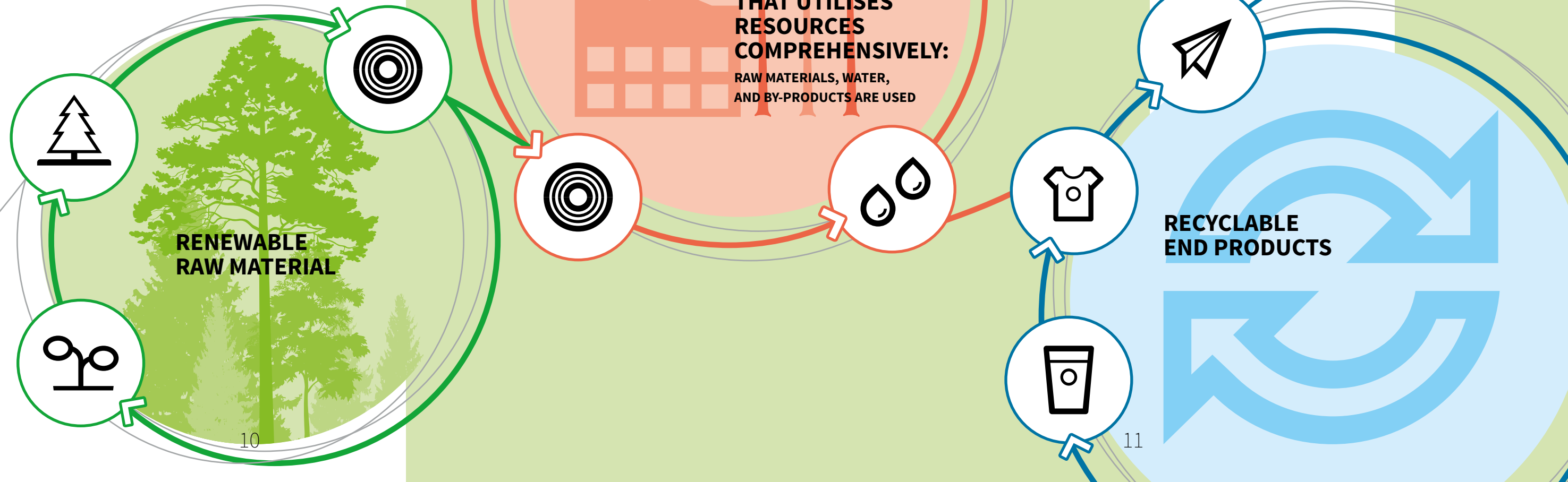
The sector takes seriously its responsibilities regarding the environmental impact of its operations as well as the efficient and sustainable use of energy and raw materials.

The forest industry is leading the world towards a low-carbon future. About two thirds of Finland's renewable energy is linked to the forest industry. Trees are used in their entirety, as even production side streams are used as raw material for new products or for energy.

By using a renewable raw material resource-efficiently, the forest industry seeks solutions for limited natural resources and for mitigating climate change.

Operations are based on an efficient partner network where products are refined in collaboration by various experts in the value chain.

Forest industry products are recyclable and after they are completely used, they can be used for energy production.





ÄÄNEKOSKI MAKES THE MOST OF WOOD

Metsä Group's new bioproduct mill in Äänekoski does not use any fossil fuels. It makes the most of wood and produces zero waste. At the same time, it aims to generate new business.

An industrial ecosystem of global significance is developing around the bioproduct mill, which produces pulp, biomaterials, bioenergy, biochemicals, as well as fertilisers.

An efficient partner network serves as the mill's business model and refining new products is an effort jointly undertaken by various companies and experts.

New processed products obtained from pulp and related production side streams include, for example, lignin-based products, biocomposites, as well as textile fibres.

- The number of people on the planet and the continual increase in quality of life, as well as the limits related to cotton fibre, open up significant opportunities for wood-based textile fibres. That is why Metsä Group is interested in this value chain, says **NIKLAS VON WEYMARN**, Vice President of Research at Metsä Fibre.



INDUSTRIAL ECOSYSTEM REDUCES CARBON FOOTPRINT

Aqvacomp Oy manufactures a biocomposite with a unique technology developed and patented by Elastopoli Oy. The biocomposite is the only material that can use fibre directly from the pulp manufacturing process without drying. Aquvacomp wants to expand its production next to the bioproduct mill in Äänekoski.

- In addition to the obvious logistical advantages, integrating with the bioproduct mill is a brilliant solution in terms of the carbon footprint of the end product. For example, electricity generated in the bioproduct mill can be used to manufacture the biocomposite. The method has been calculated to reduce the carbon footprint of Aquvacomp's biocomposite by 20-40 per cent compared to the carbon footprint of corresponding fibreglass-reinforced plastic, says Aquvacomp Managing Director **JARI HAAPANEN**.



THE FOREST INDUSTRY NEEDS AN EXPERT WORKFORCE

The forest industry has hit its stride. The sector is investing and creating new things – and Finnish forest industry products are selling around the world. Having enough qualified workers is a central factor in competitiveness.

The job descriptions of experts in the sector are undergoing change. Digitalisation and globalisation, for example, are changing the nature of work and the skills that are in demand. Both training and people need to be more varied and flexible so that new products and services can be created. The forest industry offers new kinds of solutions to other sectors too, for example, for construction and the chemical industry as well as for the health and wellbeing sectors.

New ideas are often born from collaboration between different sectors and players. This is why research operations as well as strengthening collaboration between universities and the business world results in innovations that generate new business.

An expert workforce is a prerequisite for forest industry success. The forest bioeconomy offers its workers responsible and meaningful work.



DIGITALISATION

DATA MUST BE USED WISELY

Wood processing company Versowood manages and utilises data in both management functions and in its central operative business from wood procurement to the production and processing of sawn timber. The objective is to collect, refine and share information as efficiently as possible.

- In wood procurement, we fully utilise Business Intelligence data to manage raw material flows as well as to lead and analyse harvesting and transport operations, says the company's CEO **VILLE KOPRA**.

About 45 forestry experts are responsible for Versowood's raw material procurement. The company works with over 300 contractors who are responsible for harvesting and transport. These functions, too, are part of the company's IT, BI and integrated systems.

Different kinds of analysis tools bring a new dimension to data management as well as a tremendous competitive advantage to the organisation. Because of this, the need for analytics experts is growing all the time.

- The world is changing. The increase in the amount of data and its utilisation in a continually digitalising world also requires leadership, Kopra says.



WOOD LIFE GIVES WINGS TO WOOD

The Aalto University's interdisciplinary Wood Life project has examined new opportunities for wood use. This means developing, for example, new coatings and cellulose-based textiles to be used in construction and as packaging material. The objective has been to, for example, create energy-efficient living spaces and to promote the use of wood and plant-derived materials.

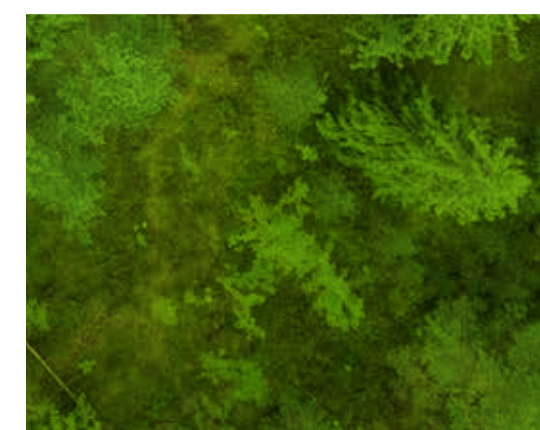
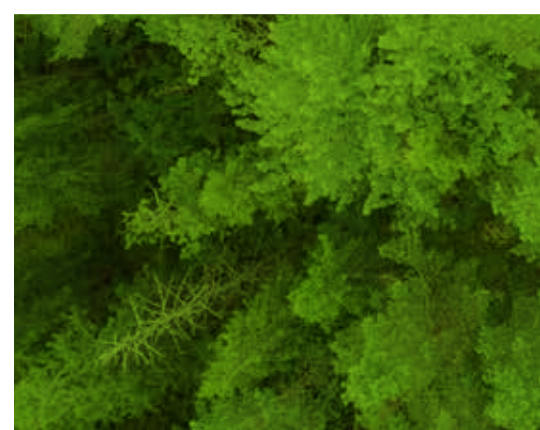
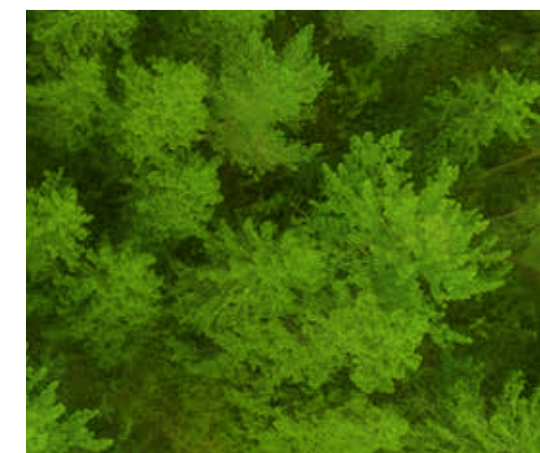
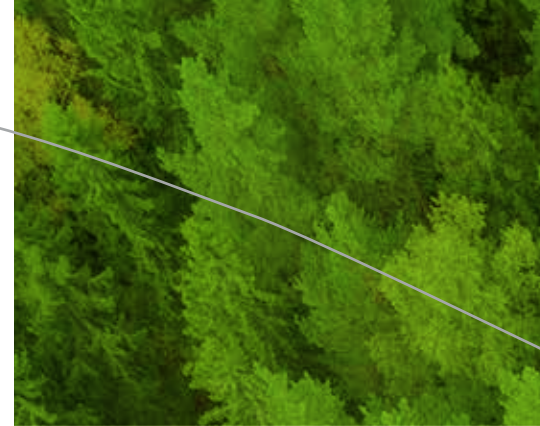
- As part of Wood Life, I have been able to influence how natural materials are being developed and how they will be used in the future, says **NINA FORSMAN**, a biotechnology M.Sc. working on her dissertation.

Renewable wood is a carbon neutral construction material and it also offers health and wellbeing benefits. Wood surfaces balance humidity and temperature changes within a space, which directly affects the energy efficiency of a space.

Consumers, builders, and material designers all benefit from the results of the Wood Life project.

- The project has, for example, developed coatings that repel water but still retain the good characteristics of untreated wood: binding and releasing moisture, breathability, and even antibacterial qualities. Furthermore, architecture students have investigated how the amount of wood used in spaces influences people's experience and enjoyment, Forsman explains.

New technologies bring new opportunities to traditional wood construction. In future, wood surfaces can be protected from not only moisture but also from, for example, damage caused by UV rays.






A healthy forest is the foundation of the bioeconomy. The forest industry brings Finns wellbeing through wood-based solutions and through investments, employment, and taxes paid. The forest industry manufactures carbon-binding, climate-friendly products from a renewable and recyclable raw material, it directs consumption in a more sustainable direction, and saves the environment.

The forest industry is Finland's biggest export sector and it is a significant employer, especially in regional areas of the country. Forest industry companies use many products and services offered by other Finnish businesses. The forest industry provides a living for about 150,000 people in Finland, directly and indirectly.

The Finnish forest industry's ability to transform will determine its success in the global economy. Determination to strengthen expertise and innovativeness require investment and commitment to long-term research and development operations. Success in the global competition is determined by how competitive and customer-oriented forest industry products and services are.



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Finnish Forest Industries