

# CIRCULAR FOREST BIOECONOMY

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Finnish cities and regions mobilize to achieve a sustainable bio-based circular economy.

## COMMITMENTS

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FINLAND

Pop. 5,550,066

338,455 km<sup>2</sup>

164 m.a.s.l.



KEY CONCEPTS

WOOD BIOMASS

CIRCULAR ECONOMY

FOREST BIOECONOMY

R&D

**A progressive alignment of the different general and sectorial policies, together with an investment in R&D, clean technologies, more efficient processes, and innovative solutions in Finland, has led to the development of a knowledge-based economy moving towards a forest bioeconomy; and, more recently, towards a 'circular' forest bioeconomy. An outstanding example is the European BIOREGIO project in the Päijät-Häme region.**

## A LONG-STANDING JOURNEY

Finland and Sweden are the most forested countries in the European Union. Over three-fourths of the land area of Finland, corresponding to 23.1 million hectares is covered by forests (forested land and poorly productive forest). Finland's share of the global paper and cardboard exports is 8%, and the

pulp and sawn wood exports are 7 and 6%, respectively (Food and Agriculture Organization of the United Nations, 2021).

The Finnish forestry sector has a long tradition. Since the 19<sup>th</sup> century, forests have had an essential role in the Finnish economy as a source of wood fuel, fur trade, tar production, and slash-burning<sup>1</sup>. The main uses of primary wood in Finland are pulp and sawmill and wood product industries, and over 80% of primary lumber is used for this purpose (Figure 1). In 2018, about 27% of Finland's total consumption of energy was produced with wood fuels. Most of these were by-products and residues of the forest industry, i.e., black liquor, bark, sawdust, etc. In addition, logging residues (branches and tops, 34%), stumps (15%) and small diameter stems, and large-sized cull trees were used in combined heating and power (CHP) plants.

The potential use of **wood biomass** in climate change mitigation has gained much attention during the

past years. Wood biomass is, when sustainably grown, a renewable resource and largely recyclable and reusable material (Figure 2). Furthermore, new technologies and solutions required for deploying Nature-Based Solutions for different purposes, such as biodiversity conservation, offer opportunities for R&D collaboration between other actors. For example, at Hiedanranta —one of the main NBS demonstration sites in Tampere, Finland— local universities are successfully working with local companies producing biochar to develop new bio-filtration solutions. The mentioned solutions are used to treat polluted water, which in turn can lead to the creation of new local businesses around NBS. (Herzog & Rozado, 2019).

## USING FORESTS TO PROTECT FORESTS

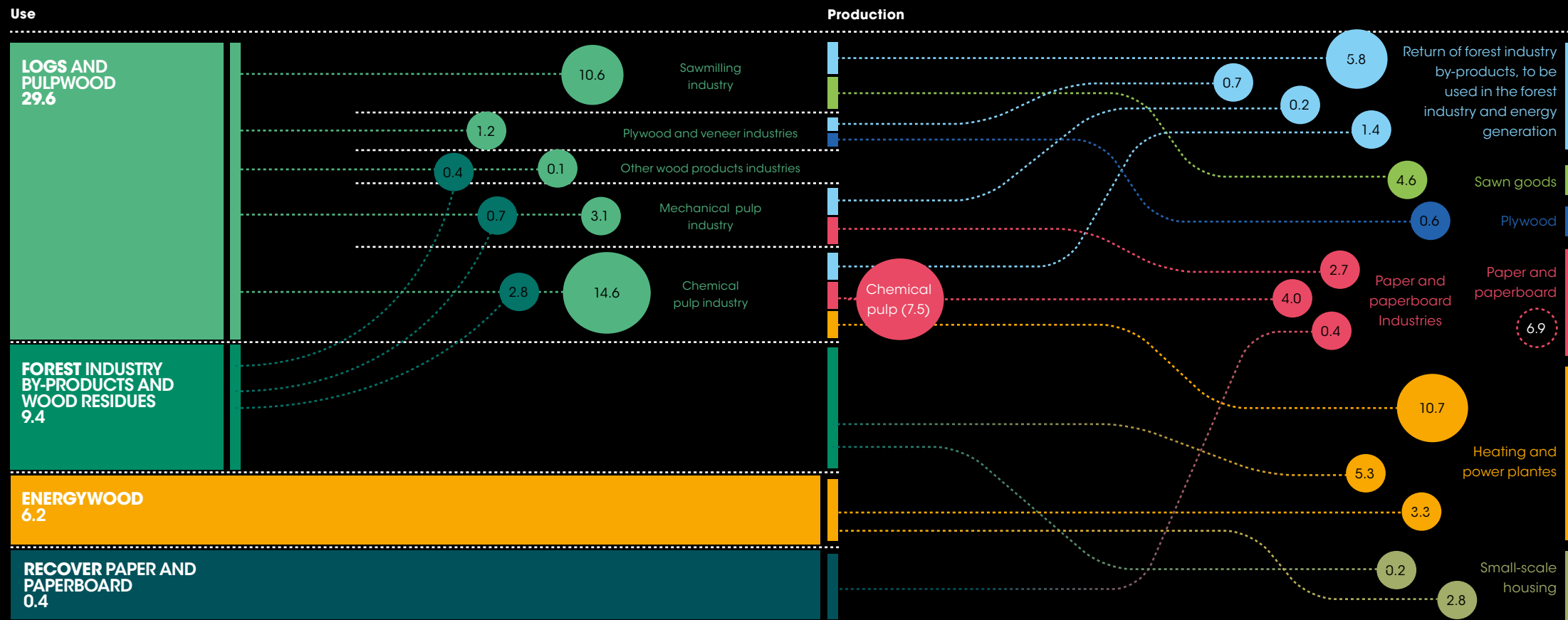
A progressive alignment of the different general and sectorial policies, together with an investment in **R&D**,

clean technologies, more efficient processes, and innovative solutions in Finland, has led to the development of a knowledge-based economy moving towards a **forest bioeconomy**; and, more recently, towards a 'circular' forest bioeconomy. In turn, this has also created dynamic business ecosystems and competitive poles in the cities in these regions, thus helping them attract talent and consolidate their population. As an additional aspect to be highlighted, the active participation of these regions, as well as the universities, research centers, and companies located in their territory, in European R&D projects, and the scientific-technological collaboration with other Nordic or international partners, decisively contributes to the continuous improvement of the sector, the exchange of valuable experiences, the creation of networks, and the formation of solid alliances for future growth.



**DISTRIBUTION OF THE MAIN USES OF PRIMARY WOOD IN FINLAND.**

Source: Adapted from Natural Resources Institute Finland-Luke.



Potential use of wood biomass by the Finnish forestry sector. Source: VTT



Dental crown made with nanocellulose-based composite. Source: VTT

**THE FIRST ROADMAP FOR AN URBAN-REGIONAL CIRCULAR ECONOMY**

Päijät-Häme is a region in southern Finland characterized by the presence of several urban areas that have been overgrowing since the middle of the 20th century, mainly around cities such as Lahti and Heinola (Päijät-Häme Regional Council, 2021). Although it positively impacted its development and positioning as one of the country's most vital economic poles, this transformation also significantly degraded its environmental conditions. Consequently, the region began to promote transformation processes, supported by greater social awareness, that have made it a pioneer in the development of initiatives related to water treatment<sup>2</sup>, aquatic ecosystems and soil recovery, forest protection, development of green roofs, and actions to implement new models based on knowledge, innovation, and technology inspired by nature.

Furthermore, in 2017 the first **circular economy** regional roadmap focused on the Päijät-Häme region was

launched, establishing objectives as well as measures to address new production models around materials, energies, circular bioeconomy, consumption patterns, and innovative solutions (Vanhamäki 2020). Within the roadmap framework, Päijät-Häme promoted the BIOREGIO project, a commitment to developing regional circular economy models through a five-year Interreg project (2017 to 2021). The project was financed by the European Regional Development Fund (FEDER), in which Päijät-Häme was represented by the University of Applied Sciences (LAB) and the Regional Council of Päijät-Häme (Vanhamaki 2019).

**BIOREGIO: REGIONAL BIO-BASED CIRCULAR ECONOMY MODELS**

BIOREGIO is an example of how the objectives of sustainable transformation contained in national policies first give rise to new regional policies. These policies later translate into concrete projects adapted to the specific context in which regional stakeholders concur to co-de-

velop innovative solutions with business potential. To that end, BIOREGIO sought to improve regional policies by emphasizing the importance of implementing the bio-based circular economy through technology transfer, knowledge sharing, and cross-border cooperation.

Thus, BIOREGIO has made it easier for sectors and companies to renew their processes through cooperation in R&D. As a result, in Päijät-Häme, the incorporation of bio-based circular economy models is growing. This growth increases the competitiveness of cities such as Lahti and reduces the environmental liabilities left by poor waste management or residential and industrial dumping.

Within the framework of BIOREGIO, new types of collaborative economy services are also being developed as part of these bio-based circular economy initiatives. For example, innovations are being created by developing and researching wood-based materials (Figure 3). In Heinola, a complex of diverse bio-villages is being developed, studying the use of straw as a product with

high added value. Also, new solutions are being invented to promote urban agriculture, which is increasingly being established in parks and other green areas. In this way, new types of collaborative bioeconomy services are being developed as part of the circular economy models that have allowed the transformation of this region.

**KEY LESSONS**

➔ Transformative actions and initiatives guided by bio-based circular economy models offer regions and cities the possibility of developing new policies and implementing new technologies and cooperation models to improve knowledge-based production processes.

➔ BIOREGIO is a benchmark for the value of a circular economy based on biological materials and the increase in their recycling rates. This project has helped identify possibilities to close loops in using biological components, seeking to increase their reuse and reduce their disposal and social and environmental impacts.