

## **Regenerative wood-based building products for a resource-constrained world**

Supervisor: Prof. Mark Hughes

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We are now looking for a **Doctoral Researcher in the field of wood material technology**.

Are you passionate about exploring the potential of wood to create the beautiful and sustainable buildings of the future? We are now seeking a doctoral researcher to study how wood from demolished buildings, and other currently unused sources, can be used in new materials for construction. Competition for forest resources is increasing and to meet the expected demand for future wood-based building products, whilst preserving or rejuvenating forest ecosystems, alternative raw materials and radically new design approaches are needed. In line with circular economy principles, future wood products should be both long-lasting and easy to dismantle for material recovery, whilst causing no harm, or even being regenerative. In a resource-constrained world, manufacturing will need to incorporate a multitude of new raw materials including underutilized forest resources, industrial wastes and recovered wood; we have recently shown, for example, that there is an abundant resource of wood in the current Finnish building stock that could be utilized in new materials. New design approaches and innovations in materials science will be needed. At the nexus of design and materials science, the aim of this doctoral study is to research how underutilized wood streams and wastes can be used to create resource-efficient, regenerative, wooden building materials that help mitigate climate change and preserve biodiversity.

### **Scientific environment**

The doctoral studies will be carried out in the [Wood Material Technology group](#) at the Department of Bioproducts and Biosystems, under the supervision of [Prof. Mark Hughes](#). The group's research focus is the resource-efficient use of wood and biomass to support a sustainable built environment. Applying circular economy and materials efficiency principles, especially wood cascading, the group has been researching the use of wood in sustainable construction for over a decade, in close cooperation with the Aalto departments of architecture and civil engineering. The Department of Bioproducts and Biosystems is well equipped with state-of-the-art analytical equipment and has access to the extensive bioeconomy infrastructure on the Otaniemi campus, as well as access to national scientific computing services. The successful applicant will join a team of motivated researchers, providing the opportunity for working in close cooperation with other group members.

*In the first weeks, you will be assigned your own onboarding buddy who will help you get started with your work and studies at Aalto.*

### **Your role and goals**

In this project you will investigate the availability, characteristics, and material properties of a variety of underutilized wood resources, including primary wood resources (e.g., thinnings, non-commercial species, small diameter trees) as well as industrial cut-offs and rejects, and secondary sources of wood such as demolition wood and construction waste. You will study ways in which these resources can be utilized in the manufacture of wood-based building products for either structural or non-load bearing applications, using approaches that enable the recovery of the materials and their subsequent reuse in a materials cascade at end of life, whilst minimizing harm during production and use. This will involve

the manufacture and testing of physical samples, as well as numerical modelling and an analysis of the potential environmental benefits, especially the contribution towards climate change mitigation.

### **Your experience and ambitions**

We are looking for a highly motivated individual with a strong technical background in a relevant field and who is inspired by the prospect of working in a multidisciplinary context towards the goal of reducing the impact of buildings. The successful candidate should be interested in both experimental and analytical research. Interest and skills in design would be an asset, and experience of life cycle assessment would be an advantage. Examples of relevant master's degrees include, but are not limited to, materials science, materials engineering, wood material science, wood technology, mechanical engineering, civil engineering, structural engineering, timber engineering and related engineering subjects.

To be eligible, you must have a master's degree (completed by 31 July 2024 or preferably earlier) in a relevant subject. A strong desire to work in a diverse, multidisciplinary environment will help ensure full integration into the research group and provide cooperation opportunities within the wider Aalto University community. Fluent English, both written and spoken, is prerequisite.