

Wood *for* Health

Promoting safe and extended use of wood products in health buildings through development of antimicrobial surfaces, hygiene concepts, and guidelines

Report of year 2022

31.3.2023

ForestValue



Short summary of the project plan

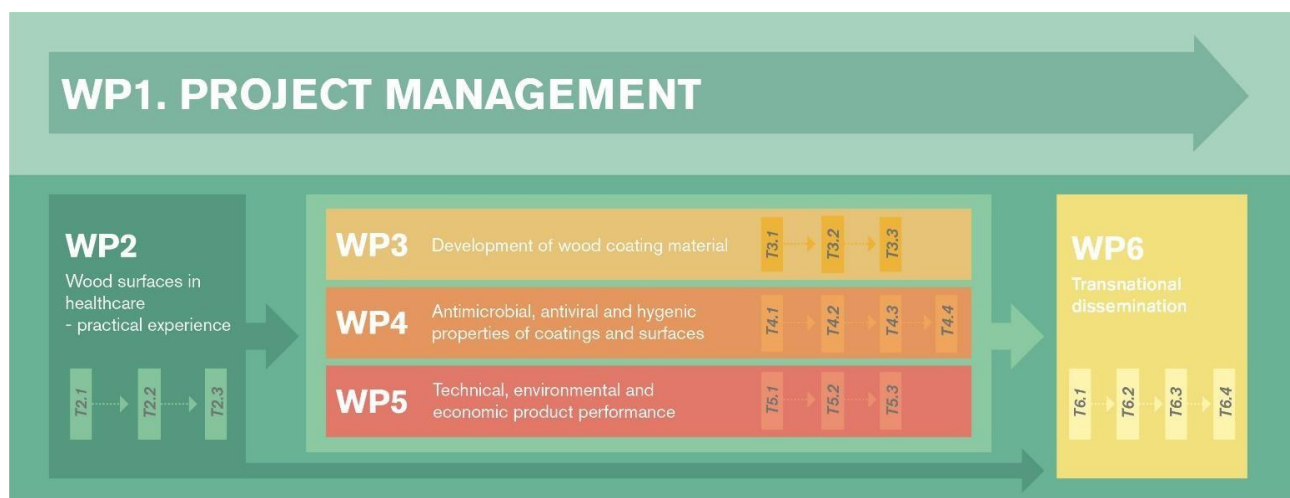
Wood has calming effect on people. It affects indoor air quality and sequesters carbon. To support the natural good properties of wood, this project will study the cleanliness and cleanability of wooden surfaces, develop innovative antimicrobial and breathable coatings and compile the first European guidelines on using wood in different premises and surfaces of health care buildings. Three different approaches have been planned for the development of new coatings, and both coatings that create a film as well as completely breathable coatings without films are included. Natural polymers are also being experimented with in the coatings as antimicrobial factors instead of traditional toxic chemical compounds. Processed and unprocessed wooden surfaces are being studied in terms of hygiene, mechanical and chemical durability, light resistance, flammability and water vapour permeability. All of these are significant properties in health care premises.

The aim of the WOOD for HEALTH project is to promote the use of wood in health care buildings. The project is led by the University of Oulu from Northern Finland, and has altogether seven partners from Finland, Germany, Latvia and Norway. Partners: 1. University of Oulu, Finland; 2. White Arkitekter, Sweden; 3. Fraunhofer Institute for Wood Research, WKI, Germany; 4. The Norwegian Institute of Wood Technology (NTI); 5. The Latvian State Institute of Wood Chemistry (LSIWC); 6. Auro Pflanzenchemie AG, Germany; 7. Iecavnieks & Co, Latvia.

Project health:

Project is on track, although its start slightly delayed due to delay in official project grant decisions in Germany. However, German partners followed the project and participated in planning of its activities even before their official funding decisions. The project had its first face-to-face project meeting in September in Göttingen, and partners met in monthly meetings via Microsoft Teams and work packages had meetings of their own when needed. Active collaboration and interactions formed between partners already at the beginning of the project. Likewise, external communication started together with the project: project web pages and LinkedIn accounts were established and are updated regularly. The commencement of the project was advertised by press release in each partner country.

Summary:



Project Consortium Agreement was signed by all partners 2.2.2022. The most of national funding decisions were done in January or February. The last grant decision was done in August (Germany). Project Kick-off meeting was held via MsTeams 28.2.2022. As mentioned above the project

commencement was advertised in each country by press release (See Annex No 1) and by news article at least on webpages of partner organizations.

Project management (WP1) and Transnational dissemination (WP6) started immediately when the project commenced. WP 2 Wood surfaces in healthcare buildings – practical experience, and WP3 were the first ones of research work packages to start activities.

WP2 has started to collect international examples about the use of wood in health care buildings and identified good practices. It also re-visited Queen Silvia Children's Hospital design and considered whether it would have been possible to use even more wood there on surfaces. At the end of year, gathering of national regulations affecting construction and use of wood in health care building was started.

WP3 selected first binders and antimicrobial compounds for testing of antimicrobial effect. Film forming binders such as acrylates and polyurethanes, as well as non-film forming binders such as oils are under investigation to develop formulations with antimicrobial additives. In addition, antimicrobial polymers with functional groups chemically bonded to the binder were developed. Here several approaches including acrylate and polyurethane dispersions that bear antimicrobial groups such as tertiary amines are planned.

WP4 started assaying antimicrobial activities of all received samples at the end of the year 2022. The first promising antimicrobial compounds were already identified from initial results.

WP5 has started. Based on results in WP2, 3 and 4, seven coating formulations were selected for detailed characterisation in Task 5.1. The work is in progress at the time of writing this report.

WP6 Transnational dissemination run all the year. Table of dissemination activities is attached to the report as an appendix 2. The project was connected to ForestValue community at latest in the ERA-Net ForestValue Conference in Madrid, Spain, September 28-29, where the project was presented.

More detailed description of tasks in WPs is presented below.

Work Package 1 Project management: High-level overview

The WP1 coordinates work between partners and WPs. Monthly meetings are the main internal forum for discussion and interaction between partners. They have taken place regularly since March 2022 and are a good practice. Monthly meetings are complemented with WP meetings which can include 1 or more work packages and are called to meet by WP leaders. WP meetings discuss and agree execution of WP tasks more in details. In 2022, WP3 organised meetings attended by Latvian and German partners to agree about the work on wood coating materials and formulations. Main project meetings are organised twice each year: the first was Kick-off meeting of the project on 28.2.2022 in Teams, and the second one the first face-to-face meeting of the consortium on 22.9.2022.

WP1 takes also care of contacts with ERA-Net ForestValue Coordination Office and delivers to partners messages and information obtained from the Coordination Office. The WOOD for HEALTH project was introduced to the ForestValue community in ForestValue Newsletter 10, and in the ERA-Net ForestValue Final Conference in September in Madrid. WP1 also monitors use of project resources, reaching Milestones and realization of budget. It maintains Sharepoint & Teams accounts for internal dissemination and sharing of documents. WP1 is led by the University of Oulu.

Scheduled Milestones for the first 12 months were:

- *MS1.1 Kick-off meeting (MS1.1.1) (M1) and consecutive main project meetings (2nd MS.1.1.2; M8):* Kick-off meeting was 28.2.2022 in MsTeams, and the second project meeting 22.9.2022

in connection of 18th Annual Meeting of the Northern European Network for Wood Science and Engineering (WSE 2022), in Göttingen, Germany.

- *MS1.2. MsTeams and Sharepoint created (M2)*; The first version of MsTeams folders was created in March (M3), and it was improved continuously during the year.
- *MS1.3 Monitoring framework (M3)*; The monitoring is done in connection of monthly meetings organised using MsTeams. The progress of deliverables and WPs is discussed in each meeting. The monthly meetings started in March.
- *MS1.4. Reports to ERA-Net ForestValue and national funding bodies (MS1.4.1, month M14)*; These reports have deadline in March 2023 (M15), and they will be submitted in March.
- *MS1.5 10th internal newsletter for a year published (M12)*. Monthly meetings replaced internal newsletters. It was realized at the beginning of the project that it is far more useful better to discuss interactively than prepare newsletters. Monthly meetings were organised from March every month except in July.

WP1 progressed in 2022 as scheduled. Only change to plans was replacing internal newsletters by monthly MsTeams meetings. It was also noticed that it is important to discuss monthly. In 2023 also advisory groups will start their work.

Work Package 2 Wood surfaces in healthcare buildings – practical experience: High-level overview

With its point of departure in practice, WP2 lays the ground for the relevance of the project's research and development. White Arkitekter's profound knowledge and practical experience of wood in architecture is used to explain, instruct and recommend where and how wood can be used in healthcare environments as well as where development is needed to meet these requirements. International healthcare references and examples of national legal requirements are also compiled as a knowledge background for the project.

Scheduled Milestones for the first 12 months were:

- *MS2.1 Developed from the case of the Queen Silvia Children's Hospital the team produces an illustrated and commented framework to inform the following WPs concerning zoning, surfaces and requirements (M6)*; The report was finished and shared within the project in its final version in November 2022.
- *MS2.2 A compilation of built examples that will be commented and used as illustrations in the Guidelines of WP6 (M9)*; The work has started and is slightly delayed but will be finished in Q3 2023.
- *MS2.3 The overview of differing rules and regulations gives input to following WPs. Specific details about progress, accomplishments, and upcoming work (M12)*; The work has started and is slightly delayed but will be finished in Q3 2023.

The work to gather information about rules and regulations is somewhat more complicated than expected. The rules differ more between countries, regions and even projects than we thought. It is also a challenge that original documents are in different languages with specific terminology that need to be translated.

Work Package 3 Synthesis and formulation of wood coating material: High-level overview

This work package is about the development of wood coatings. Next to antimicrobial properties the surfaces need high resistance to cleaning cycles and UV-light. On the other hand, wood should be allowed to breathe and to show its natural appearance. The WP focuses on three approaches at different TRL levels to balance risk and close-to-market aspects. Non film forming and film forming coating systems by formulation as well as new binders by synthesis of non-leaching functional groups to the polymer are developed.

Scheduled Milestones for the first 12 months were:

- *MS3.1 Woodcoating formulations based on linseed oil is developed and applied on wood species for tests in WP 4 and WP 5 (M12);*

In close collaboration with the industrial partner of the project “Iecavnieks & Co”, water-based, non-film forming coating formulations with linseed oil as binder have been developed. Their properties were tailored to meet the requirements for industrial coating application on wood substrates. These formulations are further used as base compositions for the development of antimicrobial coatings by incorporation of appropriate additives.

- *MS3.2 Woodcoating formulation with antimicrobial additives, UV absorber and other additives are developed and applied on wood species for tests in WP 4 and WP 5 (M12);*

Acrylic, polyurethane and oil-based binders were tested without antimicrobial additives at first. New biobased additives were tested to evaluate antimicrobial properties. Based on these results, antimicrobial formulations have started to be developed. Coating recipes with known biocides are prepared and recipes with new biobased agents will follow.

In addition, work on WP 3.3. has started. Reference acrylic emulsions and polyurethane dispersions (anionic and cationic) are produced in lab scale. This is the basis for antimicrobial polymers, as amines are incorporated into the polymer chain or as side chains. As a result, two amine-containing acrylates and one amine-containing polyurethane were sent for antimicrobial tests in WP 4, but need further improvement.

Work Package 4 Antimicrobial, antiviral and hygienic properties of coatings and surfaces: High-level overview

The WP4 focuses on three high issues: It helps WP3 to find the most effective and stable composition of antimicrobial and antiviral coatings by laboratory assays of antimicrobial & -viral activity and then tests the most promising formulations on various wooden surfaces. WP4 also analyses how various surfaces collect microbes in real building environment and examines how effectively wooden surfaces can be cleaned from microbes and, and whether developed coatings improve this cleanability.

Scheduled Milestones for the first 12 months were:

- *MS4.1 Report on microbial contamination on different surface material in a school and a hospital (M12);* Only University of Oulu is working with this task, and its delay does not affect any other partners. Due to lack of personnel the task was moved from autumn 2022 to autumn 2023.

Antimicrobial activity assays were started in November when partners sent the first samples to the University of Oulu. Agar plates with drilled wells and paper discs were both used for the assays. They

are suitable tests for screening, although casting samples with melted agar on petri dish will be used to study later the most efficient samples and determine the exact concentration required for growth inhibition by the compound. During 2022, LSIWC and Fraunhofer WKI sent 9 samples for analysis and Auro 5 samples.

In 2023 also antiviral activity of the most promising coating formulations will be assayed.

Work Package 5 Technical, environmental and economic product performance: High-level overview

The objective of WP5 is to assess all technical properties of the coatings dependent on the requirement profiles defined in WP2. WP5 will however not include antimicrobial/-viral aspects as hygiene is central in the project and is therefore addressed in a specific work package (WP4). WP5 includes the characterization of important properties in health buildings related to surface protection and maintenance but also the analysis of the water vapor damp diffusion and the moisture buffer value of coated paneling and flooring according to the Nordtest procedure. The latter is used to model the moisture dynamics and the impact on energy consumption and enthalpy (RH and T) of indoor air for a simulated hospital ward room. In addition, preliminary life cycle analysis (LCA) and life cycle costing (LCC) for the new wood coatings is conducted.

There were not Milestones planned for the year 2022 in WP5.

WP5 has started as planned in 2022. Based on results in the first workpackages, seven coating formulations were selected for detailed characterization in Task 5.1. The work is in progress at the time of writing this report. The kick-off in Task 5.2 (hygrothermal modelling) and 5.3 (LCA and LCC) is scheduled for the end of 2023.

Work Package 6 Transnational dissemination: High-level overview

The dissemination activities secure the communication of project results effectively and rapidly with distribution worldwide. The plan addresses the scientific community, policymakers, the industrial community, higher education and the public audience. Additionally, the project goes along with the European bio and circular economy strategy which opens further opportunities in dissemination.

Scheduled Milestones for the first 12 months were:

- *MS 6.1 Website has been implemented (M3); Link to website: <https://www.woodforhealth.eu/>*
- *MS 6.2. Dissemination & Communication Plan(M6); See Annex No 1*
- *MS 6.3 Report of 1st year dissemination and communication activities and assessment (M12); See Annex No 2*

The first year of the project dissemination activities were more devoted to the introduction of the projects background, purpose, objectives and the necessity for such interdisciplinary study, which can provide both health and environmental benefits. The interest of the project activities was high considering that in the first year 25 articles in public media were published; 7 messages about the project were posted on other social media accounts; 4 presentations/posters were presented in international conferences, seminars and workshops; one article was published in conference proceedings. The projects website has reached over 100 visitors from 12 countries. In the projects social media accounts (LinkedIn and Facebook), in total 20 posts were published. LinkedIn has been more successful reaching 100 followers and over 2000 impressions. The planned activities for the year 2023 include the first two scientific articles in SCOPUS indexed journals as well as participation

in social events, conferences and publishing articles in public media. It is planned to continue to be active on the project's website and in the social media accounts.

Additional information and links:

Project website: <https://www.woodforhealth.eu/>

Project LinkedIn account: <https://www.linkedin.com/company/wood-for-health-project/>

Project Facebook account: <https://www.facebook.com/woodforhealth.eu>

Project poster presented for the first time in Göttingen: Kilpeläinen, Pekka; Klasander, Anna-Johanna; Schirp, Claudia; Hundhausen, Ulrich; Andersons, Bruno; et al. (2022) Promoting safe and extended use of wood products in health buildings through development of antimicrobial surfaces, hygiene concepts, and guidelines – WOOD for HEALTH. In: Proceedings of the 18th Meeting of the Northern European Network for Wood Science and Engineering (WSE) 21-22 September 2022 Goettingen, Germany (eds. Brischke, Christian; Buschalsky, Andreas), pp. 77-78. <http://jultika.oulu.fi/Record/nbnfi-fe2023022328472>

News published about the project at partner organization web page

University of Oulu:

- <https://www.oulu.fi/fi/kajaanin-yliopistokeskus/uutiset/lisaa-puuta-euroopan-terveydenhuollon-rakennuksiin>
- <https://www.oulu.fi/en/news/more-wood-health-care-buildings-europe>
- <https://www.oulu.fi/fi/kajaanin-yliopistokeskus/uutiset/kajaanin-yliopistokeskus-vetamaan-eurooppalaista-puurakennushanketta>

White Arkitekter:

- <https://whitearkitekter.com/news/great-added-value-with-wood-as-a-material-choice/>

The Norwegian Institute of Wood Technology (NTI):

- <https://www.treteknisk.no/aktuelt/woodforhealth>

The Latvian State Institute of Wood Chemistry (LSIWC):

- <http://www.kki.lv/en/scientific-activity/projects/woodforhealth-promoting-safe-and-extended-use-wood-products-health>
- <http://www.kki.lv/zinatniskie-virzieni/projekti/woodforhealth-veicinat-un-paplasinat-drosu-koksnes-produktu>
- http://www.kki.lv/doc/lietotaji/arniskk/woodforhealth_press_release_2022.pdf
- http://www.kki.lv/doc/lietotaji/arniskk/woodforhealth_preses_reize_2022.pdf

Iecavnieks & Co:

- <https://www.iecavnieks.lv/lv/musu-uznemums-piedalas-woodforhealth-projekta.--01.01.2022/>

International press release about the project commencement is attached to the report as Annex 1.

Dissemination & Communication Plan is attached to the report as Annex 2

Table of 1st year Dissemination and Communication Activities is attached to the report as Annex 3, evaluation of activities is in the report text under WP6.

Table of planned Dissemination & Communication Activities for year 2023 is attached to the report as Annex 4.

Project presentation in ERA-Net ForestValue Final Conference on 29.9.2022 can be viewed here:

<https://www.youtube.com/watch?v=2KwOOfujCQg&t=9091s>

Blockers:

There are not being any serious blockers. The project was delayed a bit by waiting all national grant decisions, but this did not cause any serious harm and project can be executed according to original project plan.

Additional notes or highlights:

There has been relatively high public interest in the project in some partner countries.

In Finland two professional magazines asked University of Oulu representatives to write article about the project and use of wood in the health care building, respectively, similarly a seminar presentation was invited by a meeting of wood construction experts in Northern and Eastern Finland.