Interreg Baltic Sea Region

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CIRCULAR ECONOMY CompositeCircle

Workshop 4: Waste Management of composite materials: from dismantling to recycling

Riga 20.-22.1.26

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CompositeCircle: Events in Latvia 20.1-22.1.26

The project's fourth workshop was held in Riga, Latvia, beginning with internal meetings to review the project's progress. In parallel, an international seminar for various stakeholders was organized. The main theme of the workshop was waste management, focusing on practical knowledge and strategies for handling composite waste from decommissioned wind turbines in compliance with legal requirements. The aim was to promote collaboration between wind energy operators, waste management companies, and technology providers to ensure that composite materials are managed safely, efficiently, and sustainably.

CompositeCircle Internal meetings 20.1-21.1.26

During the meetings, project activities were reviewed in detail, best practices and key challenges were identified, and a shared overview of the project's progress was developed. This supported planning the next steps for the pilot phase. Discussions particularly focused on the status of data collection, consistency of materials, and coordination between different functions to achieve the project goals effectively. The need to supplement background information, clarify guidelines, and develop common operational models supporting practical circular economy and waste management implementation also emerged. Special attention was given to challenges related to logistics, material handling, and decommissioning, as well as how regulatory requirements can be addressed throughout the process. The discussions highlighted that identifying best practices and deriving guidelines from them helps stakeholders apply legislation effectively and ensure safe, efficient, and environmentally responsible handling of materials.

Photo 1. Exploring new perspectives in waste Management. Photo: Harri Joensuu

On the second day of meetings, the focus was on the project's experimental work as well as the requirements and applicability of end products. Discussions covered the development of experimental methods and materials for handling composite waste. Solvolysis experiments continued at the laboratory scale and recovered glass fibers were sent to different partners for testing.

The sessions also addressed the development of new composite materials for end products, the organization of testing processes, and the definition of parameters among different stakeholders. Recovered fibers and resins were compared to industry standards, including flexural testing, and their suitability for epoxy applications was assessed. The aim of the discussions was to evaluate the reusability of materials and their chemical and mechanical properties to generate reliable data for the development of new composite products. The day concluded with a company visit to a Latvian waste management center, where participants were briefed on the potential recycling of composite waste.

Workshop 4: Waste Management of composite materials: from dismantling to recycling

The workshop was held on Thursday, 22 January 2026, and provided participants with practical information and operational models for managing composite waste from decommissioned wind turbines. Activities were designed to comply with existing legal requirements and to promote collaboration between wind energy operators, waste management companies, and technology providers, ensuring the safe, efficient, and sustainable handling of composite materials.

The workshop included a presentation of the project as a whole and its future plans, with a particular focus on composite waste management in the Baltic Sea region. The presentation addressed key challenges in wind turbine recycling and highlighted the importance of recycling for conserving energy and raw materials while reducing environmental impacts. New recycling solutions are needed, as mechanical recycling alone is not the most effective option. The project aims to develop a cross-border, economically viable value chain for composite waste recycling and to enable the reuse of composite materials in the production of new composites. The outcome of the project will include a guide for stakeholders on best practices across the value chain.

In the second part of the presentation, the focus was on practical waste management measures. Key challenges in recycling wind turbine blades were identified, noting that composite blades are currently classified as construction and demolition plastic waste. The responsibilities of waste management companies regarding material handling and required infrastructure were outlined, along with the different stages of the recycling process, such as on-site shredding of blades, transportation, further size reduction, and pre-processing for cement kiln use. The presentation concluded with estimates of dismantling and handling costs.

Company Introductions, Challenges, and Solutions in the Recycling Value Chain

AJPower: Closing the Loop on Composites: Are the Baltics & Nordics Ready for Industrial-Scale Recycling?

After the project presentation, the session moved on to company introductions, which provided practical solutions and perspectives on the challenges discussed. The presentations began with AJPower, who showcased their approach of turning waste into value, highlighting that recycling especially for composites remains a significant challenge. Wind turbine blades are large, making their dismantling and transportation costly and complex. Landfills may not accept blades or other waste without prior treatment or a clear disposal plan. Co-processing of composite waste consumes substantial energy and resources. In the recycling process, material's value often decreases, making sorting difficult, and in some cases, using recycled material can be more expensive than virgin material.

Proposed solutions included creating demand for recycled materials through governmental and municipal initiatives, regulatory support, and implementing recycling close to production sites. A closed-loop system requires initial investments and close communication between decision-makers

and stakeholders. The discussion noted that pilot testing at a larger scale would require approximately 10,000 tons of material per year for economic viability. Additionally, taxation could be used to incentivize the use of recycled materials over virgin raw materials. Wind turbine blades account for only part of the total material, as other components can be sold for recovery, helping to reduce overall dismantling costs.

The European Composites Industry Association: What do we know about the circularity of composites and what can we do together to promote it?

In the second presentation, the European Composites Industry Association (EuCIA) focused on the European composite materials sector and its circular economy. The presentation began with an overview of the association, its missions, and its role in standardization, education, and networking. The importance of composite materials in the green transition was highlighted as they are durable, versatile, and widely used in transportation, renewable energy, aviation, electronics, infrastructure, and leisure products. While recycling technologies are advancing, industrial-scale infrastructure remains limited, and material passports were identified as essential enablers for effective recycling.

The presentation also introduced the European Circular Composites Alliance (ECCA), a EuCIA-led forum coordinating circularity efforts for composites across Europe. ECCA brings together stakeholders, promotes circular economy practices, influences EU legislation, and helps build a functional value chain. Its activities are supported by five working groups covering the entire value chain from raw material producers to manufacturers, recyclers, and policymakers. ECCA has achieved rapid membership growth and serves as a unified voice for advancing circularity in the European composites sector.

Conversation kickstart workshop

During the workshop, a guided discussion activity was held to identify the key development areas and solutions in waste management and recycling. Groups examined the four main themes of the composite recycling project and selected the most important one to present to others. The themes included ensuring material quality and consistency, where material passports play a central role; harmonizing legislation across the value chain, including at the international level; promoting market demand through regulation, material passports, and design-for-recycling practices; and defining recycling criteria to ensure the efficient utilization of materials.

Photo 2.Project manager Eemeli Seppänen presenting the project at the workshop. Photo: Harri Joensuu

Riga Technical University: Textile sustainability in practice: Waste management

After the guided discussion activity, three presentations were given, the first of which was by Riga Technical University on textile waste management in the EU. The presentation highlighted that approximately 12 kg of textile waste is generated per person annually in the EU. Most textiles are imported from China, which raises environmental concerns. Textile waste can originate from pre-consumer or post-consumer sources, and its recyclability depends on knowing the material composition. Recycling methods include mechanical recycling (shredding fibers), thermo-mechanical recycling (dissolving cellulosic textiles and re-spinning them into man-made fibers), and chemical recycling (breaking down polymers into monomers). Discussion points included safety concerns when handling short fibers, potential restrictions on recycling Chinese products in the EU, and the fact that fibers shorter than 20 mm can only be used as fillers rather than spun into yarn.

SCHWENK Latvia: Co-processing of wind turbine composite materials in the cement industry

The Schwenk presentation focused on their operations and the Broceni cement plant, including the clinker production process and the use of alternative fuels. In Schwenk's process, 97 % of the fuel is alternative, such as solid recovered fuel (SRF), shredded tires, tire fibers, and neutralized contaminated soil. Alternative fuels must meet specific requirements because they affect not only

energy output but also the quality of the final product, while environmental considerations must also be addressed. Particle size determines which materials can be used in the process, as oversized pieces cannot be fed into the kiln.

The presentation specifically addressed the potential use of glass fiber composite waste from wind turbine blades as fuel. Samples were sorted by size and composition, as the material included large hard pieces, adhesive residues, plastic, wood, and cork. The smallest fraction was crushed to approximately 1 mm for testing. Analyses showed that the glass fiber waste mainly consists of glass fibers and has a high ash content, which affects both the combustion process and the quality of the clinker. Initial tests demonstrated that composite waste can be used as fuel, but its utilization requires investments in dust handling, feeding systems, reception and silo facilities, and automation. The presentation provided a comprehensive overview of how composite waste can be integrated into cement production efficiently and safely, as well as the technical and economic requirements involved.

ReWind: How digital solutions unlock value in wind turbine decommissioning?

The final presentation was given by the ReWind organization, focusing on the added value of wind energy for customers. It emphasized that the economic interests of wind farm operators should be better aligned with circular economy objectives. Since wind turbines often exceed their original design lifespans, data-driven end-of-life planning is crucial for optimizing decommissioning and material recycling strategies.

In terms of material flows, steel and concrete account for most decommissioned volumes and can largely be handled through existing recycling infrastructure. In contrast, critical raw materials, such as rare earth elements, require improved collection, disassembly, and recycling systems to ensure long-term supply security.

Composite wind turbine blades remain the primary challenge due to their complex material structure and limited recyclability. This highlights the need for continued innovation in composite recycling technologies and greater consideration of design-for-recyclability principles to advance circularity in the wind energy sector.

Discussion panel

The workshop concluded with a panel discussion examining the recycling of fiber-reinforced composites from multiple perspectives, including technological development, legislation, economic conditions, and market needs. Panelists emphasized that the biggest challenges to expanding recycling lie in economic and regulatory factors. Success requires a viable business model, reliable supply of raw materials, and consistent, predictable material quality.

Manufacturers play a central role by applying “designed-for-recycling” and “remanufacturing” principles, where recycled material is processed into reusable products. Policymakers and other decision-makers can help build confidence in the use of recycled materials, and their involvement is crucial to provide clear and harmonized guidance for dismantling and recycling processes.

The discussion also highlighted that composites should not be treated as ordinary waste, as they often outperform other materials in terms of performance and durability. Nearly all composites can be recycled if it is environmentally and economically sensible. Collaboration across the value chain was underscored as essential; material recyclability, raw material reliability and market acceptance can only be ensured if technology providers, manufacturers, waste management companies and regulators work together in a coordinated and comprehensive manner.

Overall, the week was highly successful and met its intended objectives. Project partners gained new perspectives on waste management and recycling opportunities, and concrete development ideas for future activities were also identified. Active participation and open interaction enabled the creation and sharing of additional knowledge related to the identified challenges, strengthening a shared understanding of the topic among participants. Discussions held during the event created opportunities for new networks and further strengthened cooperation within the project. The workshop further expanded the network, thereby enhancing the project's impact and laying the foundation for continued collaboration.