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## Circular strategies for bio-based composite materials in four market segments

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### **Abstract**

A transition to a circular and biobased economy that also increases Sweden's collective innovation ability requires competence in numerous disciplines and technologies, as well as knowledge in the biomass and in value chain organization. Realizing benefits of circular economy means working and learning together in innovative ways. The 3.5-year BioInnovation project BioComposites contributed to Sweden's and EU's climate and sustainability goals by fostering the leap from small-scale investigation to large-scale demonstration of biobased composites. The project's four subprojects involved 24 partners, where 20 of these were industrial partners, reflecting the industrial focus of innovation. The biobased composite materials were tailored to perform in the market segments of paper-based bottles, high-performance biobased sheet moulded compounds for vehicle components, novel prosthetics and accessories, and compression-moulded furniture and interiors components.

The demand for biobased materials and biocomposites is growing globally as many organisations face the transition to a biobased economy. At the same time, the European waste policy proposal within the Circular Economy Package sets strategies for addressing smart design and proper sorting of plastics to increase recycling rates but for biocomposites, a complex question arises from the from the life cycle perspective: how to secure sustainable end-of-life management of novel biocomposites, which combine different components (e.g. polymers, fibres, fillers, compatibilizers, additives; some of which are today fossil-based) into one single material?

A transition to a biobased economy, i.e. transitioning from fossil-based to renewable raw materials, raises challenges and implementing the principles of a circular economy is not always straightforward. Circular economy strategies are expected to create €600 billion in savings for EU businesses, create 580 000 jobs, and reduce EU carbon emissions by 450 million tonnes by 2030. Circular strategies are predicted to help close the emissions gap and course-correct the global economy, which is today only 8.6% circular. Furthermore, market

adoption of new biobased materials requires consumer acceptance, especially if products are made in part from recycled materials or waste streams. These factors can hinder product adoption and diffusion in the marketplace.

We analysed how the companies working in each market segment work today with circular strategies and what needs to be implemented in the future to realize the benefits of a circular economy. One subproject worked closely with potential end-users. Material loops internal to the companies were identified as well as external loops. The project demonstrators were set in the context of circular business model opportunities according to two different models. A circular strategy framework was set up for each case.

This presentation will show some of the resulting demonstrators, present some of the scientific, industrial and commercial issues that arose from developing biobased composite materials for different market segments. Circular strategies that can be put in place in the short, medium and long term will be presented.