

COST Action CA23117: CIRCUL'ARTs

WG4: Innovation through creative and circular technologies:

Upcycling of Wind Turbine Blades to Modern Structures and Infrastructure
in Indonesia

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SUMMARY

Circular economy provides a comprehensive framework for mitigating material waste by promoting the closure of resource loops. In this context our study applies a method that, rather than treating blades as waste, positions them as valuable resources that can be circulated to reduce environmental burdens, avoid new material extraction, and support sustainable energy transition.

The study prioritises upcycling pathways, which preserve or enhance material value compared to conventional recycling or downcycling. By examining the technical, logistical, and environmental challenges associated with blade disposal in a third world country, the research aims to identify innovative upcycling solutions that contribute to a more circular and resource-efficient energy system. Global case studies highlight both the complexity of managing composite materials and the opportunities for structural reuse. Case studies demonstrate the feasibility of converting decommissioned blades into pedestrian bridge components, while other initiatives explore the integration of blade roots into housing structures in earthquake-prone regions.

Potential applications include bridge construction, repurposing blade sections for infrastructure or furniture, and converting long blades from wind farms into fishing vessels. Overall, the findings underscore the viability of upcycling strategies to reduce environmental impacts, while generating social and economic value, particularly in developing-country contexts.

