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Rethinking end-of-life renewable energy assets as components of sustainable urban infrastructures

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Abstract:

This study explores some plausible end-of-life decommissioning options for composite materials in renewable energy assets for developing low-cost public infrastructures. This has been demonstrated through a case study for wind turbine blades. The study presents outcomes of a survey that was deployed to understand consumer perception of the proposition to utilise the end-of-life wind turbine components as bus stop shelters. A total of seventy one fully completed survey responses were analysed. The results showed considerable acceptance level for the proposed design concept for aesthetics and cost-efficiency (respectively 85% and 65% affirmative responses). Although the respondents had limited technical knowledge on the composition of the decommissioned blades, over 58% supported the idea of repurposing hard-to-recycle composite materials as building components. The study outcomes therefore showcase that adequate repurposing could offer a cost-effective and socially acceptable solution to managing end-of-life renewable energy assets in years to come. It also offers a new pathway for developing urban resilience through local regeneration and economic activities. This can be specifically of relevance to developing nations with limited scope of adopting costly recycling of composite renewable assets more sustainably using local capacity.

Keywords: decommissioning, end of life; infrastructure; upcycling; wind turbine.

Main highlights: add four to six short sentences that capture the main takeaways of the paper. Each sentence should not exceed 100 characters.

- Potential for structural repurposing of hard-to-recycle composite materials as building components has been explored.

- A number of design options for structural repurposing have been evaluated through consumer feedbacks.
- Adequate repurposing could offer a cost-effective and socially acceptable solution to managing end-of-life renewable energy assets.
- The proposed repurposing route offers a new pathway for urban resilience through local regeneration in developing economies.