



CASE STUDY

Haopeng Wang – RiR
University of Liverpool
Connected Places
Catapult

The Challenge

Transport infrastructure is a major contributor to the UK's carbon footprint - directly responsible for 16% of emissions, and influencing up to 37% through its reliance on high-impact materials like asphalt, concrete, and steel. Waste, inefficiencies, and the conventional use-and-dispose approach across procurement, construction, and end-of-life processes are serious barriers to reaching Net Zero targets.

A key challenge is the uncertainty around the performance of recycled materials, which creates hesitation among industry professionals. At the same time, existing regulations and procurement standards offer little incentive to adopt circular economy approaches. There is a clear and urgent need to measure the potential for circularity, benchmark current practices, and develop practical, evidence-based pathways to embed circular principles across the transport infrastructure sector.

Innovation

Working in partnership with the Connected Places Catapult, the project used a robust mixed-method approach - combining literature reviews, site visits, and in-depth interviews with asset managers, contractors, and policy stakeholders. This enabled a deep dive into current practices and barriers across the sector. We quantified key circularity metrics, including recycling rates, material recovery efficiency, and carbon footprint reductions, focusing on critical materials like recycled asphalt pavement (RAP), recycled concrete aggregate (RCA), and recycled steel. Alongside this, we mapped existing material management practices and assessed the technology readiness of emerging solutions. These insights fed into the development of a Circularity Framework, outlining the technical, economic, and policy levers needed to embed circular economy principles. The project concluded with a set of targeted strategies and actionable policy recommendations to help accelerate circular adoption across the transport infrastructure sector.

Result

Development of a Circularity Framework
The project delivered a comprehensive framework to support the adoption of circular economy principles in the use and management of construction materials across transport infrastructure. Designed as a practical roadmap, the framework empowers industry stakeholders and policymakers to drive improvements in material reuse, reduce carbon emissions, and boost resource efficiency - crucial steps for a sector responsible for a significant share of the UK's carbon output.

Quantifying Circular Potential in Key Materials
Using data gathered from literature reviews, field visits, and stakeholder interviews, the team quantified the circularity potential of three major materials: asphalt, concrete, and steel. The result is a set of evidence-based metrics that demonstrate the environmental and economic advantages of circular approaches -

helping to build a strong business case for shifting away from traditional linear models.

Mapping Current Practices
The project also mapped current material management practices across the transport infrastructure sector, creating a detailed baseline assessment. This work highlighted the gap between current practices and what's possible, identifying inefficiencies and priority areas for intervention. It provides a foundation for targeted innovation and future benchmarking. Strategies and Policy Recommendations
Finally, the team developed a set of actionable strategies and policy recommendations to help close the gap between current practice and circular best practice. These recommendations are designed to influence procurement standards, regulatory frameworks, and industry business models - enabling the wider, long-term adoption of circular economy principles in the UK's transport infrastructure.

Impact

Our work equips government bodies, industry, and research institutions with actionable insights to accelerate circularity: Regulators can update procurement policies to include lifecycle carbon valuation and quality benchmarks for recycled materials. Industry can adopt proven RAP, RCA, and recycled steel protocols validated by pilot schemes, unlocking cost savings and carbon reductions. Research partnerships are strengthened, paving the way for further applied innovation.
This case study underpins potential sector-wide adoption: if scaled nationally, circular construction practices could reduce transport infrastructure carbon emissions by up to 20%, divert over 1 million tonnes of waste from landfill, and deliver over £500M in material cost savings over ten years.



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“Haopeng’s research has provided critical evidence and tools for our industry partners, helping to set new standards for sustainable infrastructure materials.”

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“Working with the Connected Places Catapult has transformed our research from theory to applied solutions, enabling us to demonstrate real-world carbon savings and circular material workflows.”