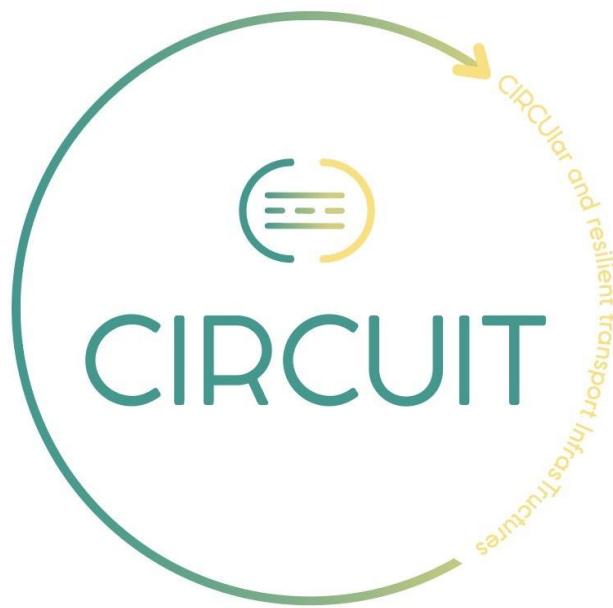




Holistic Circularity Framework

Work Package: WP1 — Holistic Approach Setting up & Co-creation | Date: April 2024 | Authors: Infra Plan (lead), UC, DTT, ACCIONA, IECA

Context

Transport infrastructure accounts for a significant share of Europe's resource consumption and carbon emissions. Yet most roads, bridges and tunnels are still designed, built and maintained within a linear economy model — take, make, dispose.

The CIRCUIT project set out to change this by developing the first holistic circularity framework specifically designed for transport infrastructure, covering the full asset life cycle from performance-based design through construction, maintenance, operation and end-of-life.

The framework was built through a co-creation process involving all actors across the supply and value chain: designers, material producers, contractors, asset owners and researchers from across Europe.

At a Glance

Project: CIRCUIT — Horizon Europe No 101104283

Scope: Roads, bridges, tunnels, substructures

Pilots: 5 countries: HR, ES, NL, SI, IT

Standards reviewed: EN 17472, ISO 15686, CWA 17819, EN 15804

KPI dimensions: Circularity, Environment, Economy, Social



Key Findings

-  The framework is structured around 4 pillars: Reuse, Recyclability, Energy efficiency and Digitalisation — with a BIM/Digital Twin platform as the central backbone.
-  Quantifiable KPIs were defined across 4 dimensions: Circularity, Environment, Economy and Social (including resilience). Each KPI includes a definition, calculation method, data requirements and benchmarks.
-  The framework covers the full life cycle: design, construction, maintenance, operation and decommissioning — with explicit linkage to the CIRCUIT digital platform for data integration and visualisation.
-  Five pilot projects test the framework in real conditions: asset management (Croatia), road pavement (Spain), substructure (Netherlands), bridge (Slovenia) and tunnel (Italy).
-  The framework builds on and goes beyond existing European standards (EN 17472, ISO 15686-5, CWA 17089, CWA 17819) and sustainability rating systems (BREEAM Infrastructure, ENVISION).

Takeaways for Practitioners

1. Adopt a whole-life-cycle perspective from the earliest design stage — circularity cannot be retrofitted after design decisions are locked in.
2. Use the CIRCUIT KPI framework as a common language across the supply chain to compare, monitor and report circularity performance consistently.
3. Leverage BIM and Digital Twin infrastructure as the primary data management layer to enable real-time tracking of circularity KPIs throughout the asset life cycle.
4. Connect circularity performance to procurement criteria — the framework is designed to feed directly into GPP and MEAT-based evaluation methodologies.

Full deliverable (open access): www.circuitproject.eu/resources