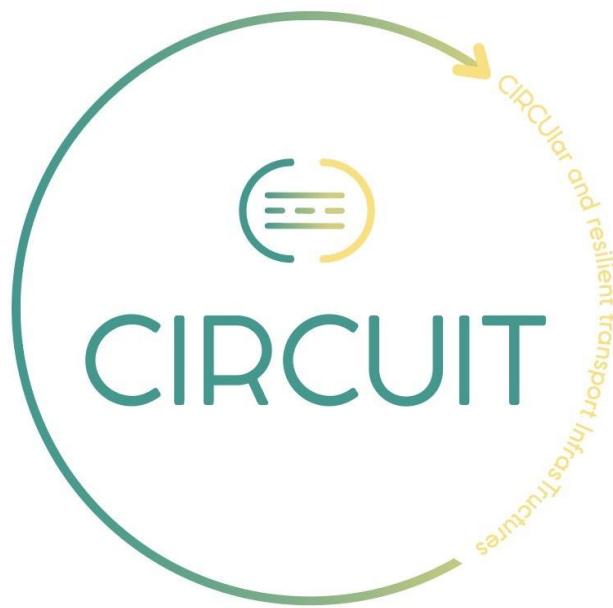




Deliverable 1.3

Circularity Analytics Tool (CAT)

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

Context

Measuring circularity in transport infrastructure has historically been limited to qualitative assessments or high-level material flow estimates. The CIRCUIT project addresses this gap with a software tool that calculates quantifiable circularity scores directly from BIM models.

The Circularity Analytics Tool (CAT) was developed as part of the CIRCUIT digital platform ecosystem. It operationalises the KPIs defined in D1.1, allowing practitioners to assess the circular performance of infrastructure assets at three levels of detail — system, component and material — and compare design alternatives before construction begins.

At a Glance

Input format: IFC (open standard, BIM software-independent)

Output levels: System → Component → Material

Core indicators: Cir 1: Reusability | Cir 2: Recyclability

Current proof of concept: Bridge structures

Platform integration: CIRCUIT digital platform (API)



How the Tool Works

 **Input:** An IFC file exported from any BIM software. The tool reads structural elements, connection types, material specifications and geometric properties automatically.

 **Cir 1 — Reusability score:** Evaluates each structural element's potential for disassembly and reuse based on prefabrication level, connection type, accessibility, independence from adjacent elements, geometry and transport feasibility.

 **Cir 2 — Recyclability score:** Calculates material-level recyclability indices based on material type and end-of-life recovery rates, aggregated at component and system level.

 **Output:** Circularity scores at system, component and material levels, exportable to the CIRCUIT digital platform for benchmarking, temporal tracking and peer comparison.

 **Interoperability:** Built on the open IFC standard — fully independent of the BIM software used by designers or asset managers, ensuring broad applicability across the sector.

Takeaways for Practitioners

1. Integrate CAT assessment at the design stage — not after construction. Circularity scores can be used to compare design alternatives and influence material and connection choices before they are locked in.

2. Use reversible connection types wherever structurally feasible: the tool's scoring shows that connection type is one of the highest-impact variables on the reusability score.

3. Specify prefabricated elements where possible — prefabrication level is a key driver of the Cir 1 reusability score.

4. Use the CAT outputs within procurement processes: circularity scores can feed directly into MEAT criteria and GPP tender specifications.

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