



Systematic Carbon Assessment of Road Infrastructure Projects

Aligning Transport Portfolios with Decarbonisation Goals through Digital Intelligence

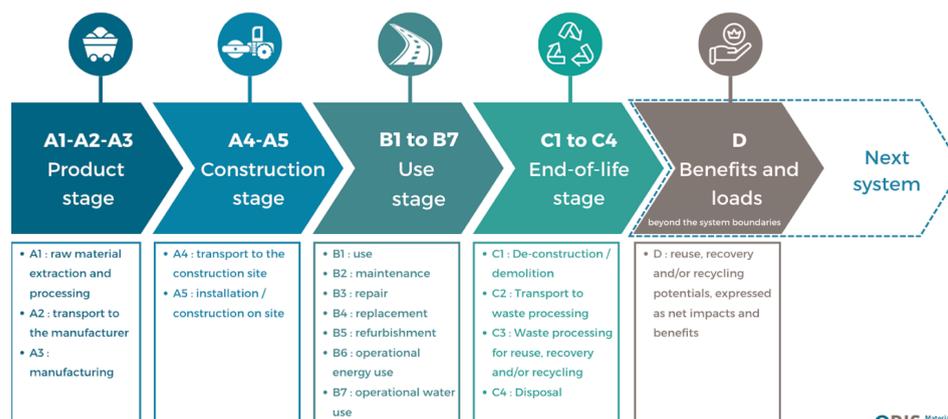
Target focus: Multilateral Development Banks with Transport Portfolios, Engineering Companies

Executive Summary

MDBs face a mandate to align transport portfolios with the Paris Agreement, yet a challenging **data gap hinders effective mitigation planning**. Current carbon assessments rely on broad averages and often occur too late in the design process to influence core project decisions. ORIS proposes a systematic, digital pilot to model **full-lifecycle CO₂eq and costs at the concept stage**, transforming infrastructure carbon from a reporting challenge into a design-stage opportunity.

The Challenge

- Late-Stage Visibility:** Carbon impacts are assessed at later design stages, locking in high-embodied-carbon structures when mitigation is treated as an add-on rather than a core design measure.
- Inconsistent & Global Methodologies:** Teams rely on fragmented reports and broad averages that lack project-specific granularity; failing to capture the carbon intensity of tunnels, bridges, and viaducts, or the emissions factors of local materials and country-specific fuel mixes.
- Complexity in Scenario-Based Decision-Making:** Identifying the optimal balance between cost and carbon reduction requires modelling numerous mitigation scenarios and design iterations. Without a unified digital tool, it is difficult for project leaders to compare these strategies accurately, making it nearly impossible to justify the best cost/carbon mitigation trade-offs before project designs are locked in.





The ORIS Solution: Digital Intelligence for Decarbonization

ORIS moves beyond traditional consulting by providing a digital twin of the project corridor that links engineering specifications directly to environmental metrics.

<p>01. Component-Level Modelling</p> <p>Assess the carbon footprint of every bridge, tunnel, and pavement section, not global averages.</p>	<p>02. Baseline vs Optimised Analysis</p> <p>Model Business-as-Usual against optimised alternatives to visualise cost/carbon trade-offs.</p>	<p>03. FIDIC CMF Alignment</p> <p>Methodology mapped to the FIDIC Carbon Management Framework, supporting projects toward higher carbon maturity.</p>	<p>04. Full Lifecycle Integration</p> <p>Model pavement design, maintenance cycles, and vehicle fuel savings to quantify net mitigation over the asset's service life.</p>
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Key Benefits & Quantifiable Impact

Data-Driven Decision Making
 → Interactive dashboards let PTLs instantly compare scenarios and design iterations, simplifying cost/carbon trade-offs and building the evidence base for internal approvals.

Consistent Portfolio Monitoring
 → Establishes a harmonised methodology for MDBs to benchmark projects across different regions and teams.

Up to 50% Carbon Reduction and associated costs for the entire life-cycle
 → Early-stage alignment, design and material optimisation can drastically reduce embodied carbon without compromising structural integrity.

Paris Agreement Alignment
 → Provides the technical foundation to demonstrate consistency with low-carbon pathways (BB1) and with adaptation readiness (BB2; see concept note).

Illustrative Use Case: Siddhartha Highway, Nepal (AIIB)

In collaboration with the **Asian Infrastructure Investment Bank (AIIB)**, ORIS conducted a Mitigation Report for the Siddhartha Highway. The project involved significant tunnelling and bridges, a high upfront carbon commitment. By modelling the full lifecycle, ORIS demonstrated that the optimised alignment would save **2,381 kTCO₂eq in traffic emissions over 20 years**, overwhelmingly offsetting the construction footprint. Specific interventions, including low-carbon concrete and circular-economy reuse of tunnel-blasted rock, further reduced construction impact by ~50 kTCO₂eq.

