Climate Risk Intelligence for Resilient Road Investments

Enabling Asset-Level Adaptation and Risk-Informed Design Decisions

Target: Transport authorities and Multilateral Development Banks (MDBs)

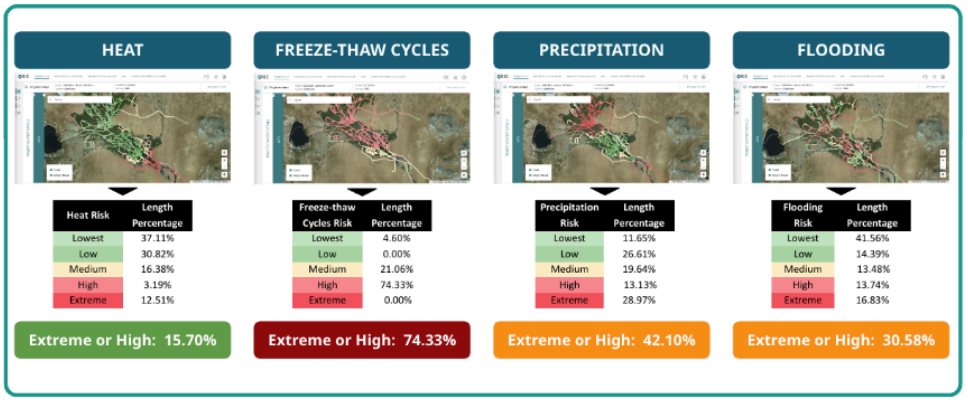
Executive Summary

Road networks are increasingly vulnerable to extreme climate events, yet planning remains "climate-blind," relying on historical data that fails to account for future hazards like extreme heat and flash flooding. ORIS offers an EU-Taxonomy aligned digital framework that integrates high-resolution CMIP6 climate projections with asset-specific material intelligence, providing a structured pathway from generic hazard screening to actionable engineering decisions.

The Challenges

Operating in an environment where climate risk is acknowledged but difficult to operationalise at the project level. Key pressures include:

- 👉 **Climate Blindness in Planning:** Prioritisation relies on historical records rather than forward-looking science, failing to integrate CMIP6-level climate projections into design decisions from the outset.
- 👉 **The "Hazard-to-Action" Gap:** High-level climate maps exist, but there are no digital tools to translate hazard projections into specific engineering requirements for materials and design.
- 👉 **Infrastructure Vulnerability & Maladaptation Risk:** Poorly adapted roads lead to massive economic losses when damaged, and without data-driven insights, agencies risk investing in solutions that fail under future conditions, thereby compounding lifecycle costs.
- 👉 **Difficulty Unlocking Climate Finance:** Without a standardised framework that quantifies resilience and socio-economic benefits, agencies cannot build the business cases required by MDBs and international climate funds.



The ORIS Solution: A Phased Digital Roadmap

Our approach transforms infrastructure planning from a reactive exercise into a strategic, evidence-based process using an EU-Taxonomy aligned methodology.

01. High-Resolution Automated Hazard Screening

Automated screening against 28 climate hazards, combining ECMWF ERA5 historical records (1950–2025) with CMIP6 models, downscaled to 1 km^2 and refined to 30 m^2 for flash flood modelling using local Digital Elevation Models.

02. Engineering-Grade Risk & Vulnerability Analysis

Exposure and sensitivity data are combined to produce a Resilience Risk Index (RRI), filtering out non-material risks and focusing the assessment on hotspots with the highest likelihood and impact to mission-critical operations through 2100.

03. Adaptation & Nature-Based Solutions

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04. Economic Rationale & Cost-Benefit Analysis (CBA)

Climate Value-at-Risk (CVaR) analysis compares the cost of maladaptation against the cost of resilience, quantifying long-term savings and assessing CAPEX eligibility for green financing and Paris Agreement Alignment.

Key Benefits & Quantifiable Impact

📊 Accelerated Due Diligence

Automated CRVA screening delivers results in hours or days rather than months, significantly shortening the project preparation cycle.

🔗 Enhanced Screening-to-Design Traceability

Screening outputs are translated into a structured set of engineering design options, creating a transparent evidence trail across the full project lifecycle.

📋 Streamlined Monitoring & Reporting

Climate risks, adaptation measures, and resilience metrics are structured into a standardised digital format, reducing reporting burden and ensuring alignment with international disclosure standards.

🛡️ Financial Protection

Replaces reactive repair spending with proactive resilience investment, backed by quantified CVaR and avoided-cost evidence rather than subjective assessment.

Conclusion:

Moving from Projection to Adaptation

We propose a targeted deployment on a priority corridor to demonstrate how digital climate risk analytics convert complex projections into decision-ready engineering intelligence, delivering a validated methodology scalable across the full portfolio for systematic climate screening, resilience scoring, and adaptation prioritisation.