Generative Digital Twin & Scenario Planner for Road Networks

Problem Statement

Brisa's infrastructure planning relies on complex simulations that are difficult for decision-makers to interpret.
Assessing interventions (e.g., toll changes, new lanes, or construction phases) is slow, fragmented across teams, and highly technical — delaying investment decisions and reducing transparency in ESG and mobility planning.

Objective

Use **Generative AI** and **Digital Twin technology** to simulate road-network interventions and automatically generate **plain-language impact summaries** for executives, planners, and ESG stakeholders — accelerating decision-making and aligning with Brisa's vision of **safer, smarter, and more sustainable mobility**.

Value Proposition

- **Faster Decisions:** AI-driven summaries of traffic, cost, and ESG outcomes.
- **Transparency:** Explainable and traceable simulation results.
- **Integrated Insights:** Unified financial, mobility, and environmental views.
- **Accessibility:** Natural-language outputs for non-technical stakeholders.«

Business Model Canvas (Summary)

Element	Highlights
Key Partners	A-to-Be, Brisa Infraestruturas, Corporate Strategy, external R&D.
Activities	Data integration, simulation modeling, LLM prompt-tuning, ESG contextualization.
Customers	Corporate Planning, OCC, Sustainability, Executives, Regulators.
Channels	A-to-Be platforms, APIs, dashboards, ESG reports.
Resources	Simulation data, GIS, emissions models, LLMs, ESG datasets.
Costs	Cloud compute, API use, data engineering, maintenance.
Value Streams	Faster analysis & approvals, lower consultancy costs, improved ESG transparency.

Strategic Impact

Transforms simulation data into **real-time decision intelligence**, helping Brisa:

- Shorten planning cycles.
- Improve cross-department collaboration.
- Demonstrate ESG and social impact.
- Establish a scalable AI foundation for Smart Mobility.

System Architecture

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Simulation Data (traffic, cost, emissions)
        ↓
Integration Layer (A-to-Be / APIs)
        ↓
Generative AI Core (LLM + prompt template)
        ↓
Executive Outputs (dashboards, ESG summaries)
```

Workflow

1. **Input:** Traffic, cost, emissions, and construction data.
2. **AI Processing:** LangChain prompt templates feed metrics into an LLM (OpenAI).
3. **Output:** Concise bullet summaries for decision-makers.

Example Output:

- Travel time reduced by ~8 minutes during peak hours
- CO_2 emissions down 4%
- Cost: €24M | Duration: 14 months
- Safety improves due to smoother flow

Technology Stack

Python, **LangChain**, **OpenAI API**
Data from traffic, toll, GIS, and emissions systems
Outputs via dashboards, reports, or conversational AI«

Benefits

- Reports generated in **minutes, not weeks**
- Clear and consistent **ESG storytelling**
- **Lower consultancy and analysis costs**
- Reusable AI framework for planning