

## Master / semester project

**Title:** Material stock analysis of transport infrastructure in Switzerland.

### Description of research:

In recent decades, the world has witnessed an unprecedented surge in global resource extraction — a trend projected to nearly double by 2050 if current patterns continue. A significant share of these materials is locked into long-lived stocks such as infrastructure, which serve essential societal functions. In Switzerland, ongoing and future investments in the maintenance, expansion, and upgrading of transport infrastructure signal a substantial and sustained material demand.

This project focuses on **quantifying and mapping the material stocks and flows associated with Swiss transport infrastructure** to support sustainable resource management and circular economy strategies. By examining the composition, spatial distribution, and long-term accumulation of materials, the project will provide insights for resource efficiency, recycling opportunities, and climate-conscious infrastructure planning. Spatial analysis will also enable the identification of regional hotspots, critical corridors, and potential hubs for circular resource management. The ultimate goal is to inform resilient, low-impact strategies for transport infrastructure development at both urban and regional scales.

### Objectives

1. **Quantify and map material stocks and flows:** Analyze and spatialize existing datasets on Swiss transport infrastructure to assess current material stocks and historical material flows, and develop projections based on maintenance and expansion scenarios.
2. **Evaluate circularity and environmental impacts:** Identify key opportunities for material efficiency, reuse, and recycling. Estimate the accumulated environmental impacts of critical infrastructure components to support circular and climate-aligned strategies.
3. **Translate results into planning insights:** Highlight regional hotspots of material demand or waste generation, provide recommendations for infrastructure planning and policy, highlighting where interventions (e.g. material substitution, circular procurement, or optimized maintenance timing) could achieve greatest sustainability gains.

### Data available for the student

- National and cantonal datasets on transport infrastructure (e.g., roads, bridges, rail)
- Material intensity data for infrastructure components from literature and Swiss databases
- Environmental impact factors for key materials (embodied energy and CO<sub>2</sub>)

**Start:** Fall semester 2025

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If you are interested, please send your CV and a short letter describing your motivations and future plans to the email: **[francisco.felixmartindelcampo@epfl.ch](mailto:francisco.felixmartindelcampo@epfl.ch)**