

# Facts of the project

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Further information:	<a href="http://www.thelma-emobility.net">http://www.thelma-emobility.net</a>

# Technology-centered Electric Mobility Assessment



## THELMA

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*THELMA is a technology-based, integrated assessment of electric vehicles' potential in the Swiss transport sector. The environmental, economic and social performance of a range of current and future electric and non-electric vehicles is combined with forecast transport demand, fleet penetration scenarios and charging patterns to model changes in the Swiss grid's net demand, cost and reliability.*

### Statement of the problem

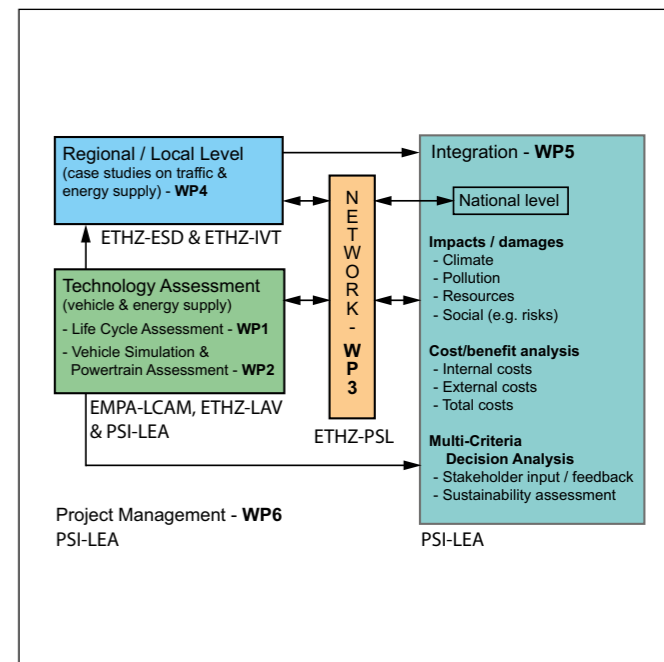
There are two main problems with our current light vehicle fleet. First, oil is increasingly scarce, with geopolitical and resource uncertainties driving volatile prices higher. Second, CO<sub>2</sub> and other emissions cause environmental and health damages, and it is difficult to capture mobile emissions or substitute other fuels. Using the low CO<sub>2</sub> Swiss electricity mix represents an attractive way to protect the climate, ecosystems and human health, while assuring security of supply and affordability.

### Goals

THELMA's purpose is to make a comprehensive assessment of the tradeoffs and sustainability implications of the increased use of light electric vehicles, as compared to other drivetrains and fuels. The goal is to compare a full range of vehicle technologies, based on those criteria considered important by major stakeholders. These measure both direct and indirect effects, i.e. not just exhaust emissions and downwind health and environmental impacts, but also upstream fuel chain effects. This technology-based analysis is then used as a basis for national level scenarios that include electric grid related impacts. These national scenarios are supplemented by local community case studies. Ultimately, the analytic results will be integrated using both the total cost approach and multi-criteria decision support, to form a transparent and trustworthy basis for evaluating sustainability and inform decisionmakers and stakeholders.

### Approach and Outlook

The THELMA approach starts by characterizing a wide range of drivetrains (not just electric vehicles) and energy carriers (batteries and fuels) that are combined with other options to define a «virtual fleet» of vehicle designs. Life cycle analysis provides a vector of burdens for energy carriers and vehicle materials, which are combined with vehicle data to obtain burdens per vehicle and per km. National scenarios are composed of future transport demand, the new vehicle penetration into the Swiss fleet, and charging and vehicle-to-grid patterns. Technology and scenario data are then used to find the distribution of net grid load patterns by location and time of day, so that transmission grid modeling can be used to determine effects on system dispatch (plant operation), costs, grid constraints and equipment life. Internal and external costs are combined to give total costs that can be compared to multi-criteria rankings of vehicles and scenarios based on stakeholder preferences.



*THELMA Framework diagram, with work package tasks & partners.*