sccer mobility
Swiss Competence Center for Energy Research
Efficient Technologies and Systems for Mobility

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Trends, Behaviour and System Dynamics – Guiding Principles for Transformation

Today, the transport sector is responsible for 32% of Switzerland's CO_2 emissions, making it the biggest CO_2 emitter, ahead of the industry (20%) [1]. Therefore, the capacity area B2.1.2. aims at building a general understanding of the behaviour of mobility users and the Swiss mobility system with its components by developing a system dynamics based model and research about best practice. With empirical results on mobility attitudes and behaviour the model describes the interactions and feedbacks between the components of the Swiss mobility system affecting CO_2 emissions. Together with the transformation framework and trends in mobility, we elaborate policy recommendations for the sustainable transformation of the Swiss mobility. The knowledge gained from this project is expected to accelerate the implementation of policies targeting the transformation of the current Swiss mobility system to a carbon-neutral and energy efficient one.

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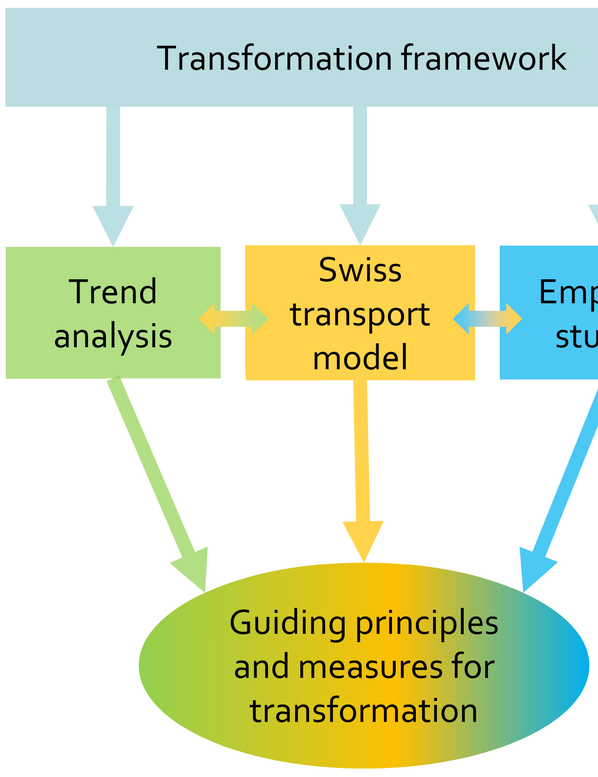
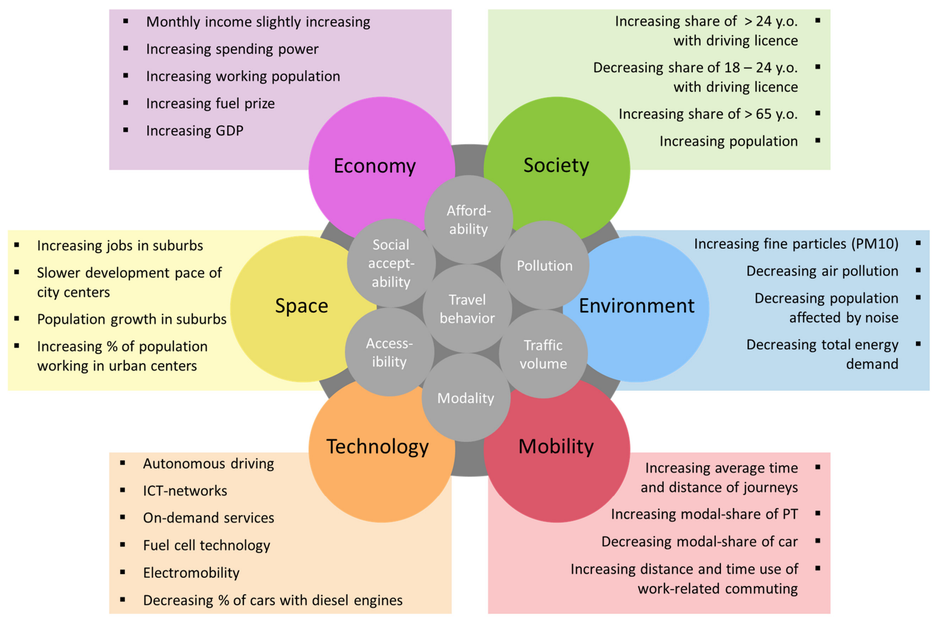
Approach



Transformation framework and trends affecting the Swiss mobility system

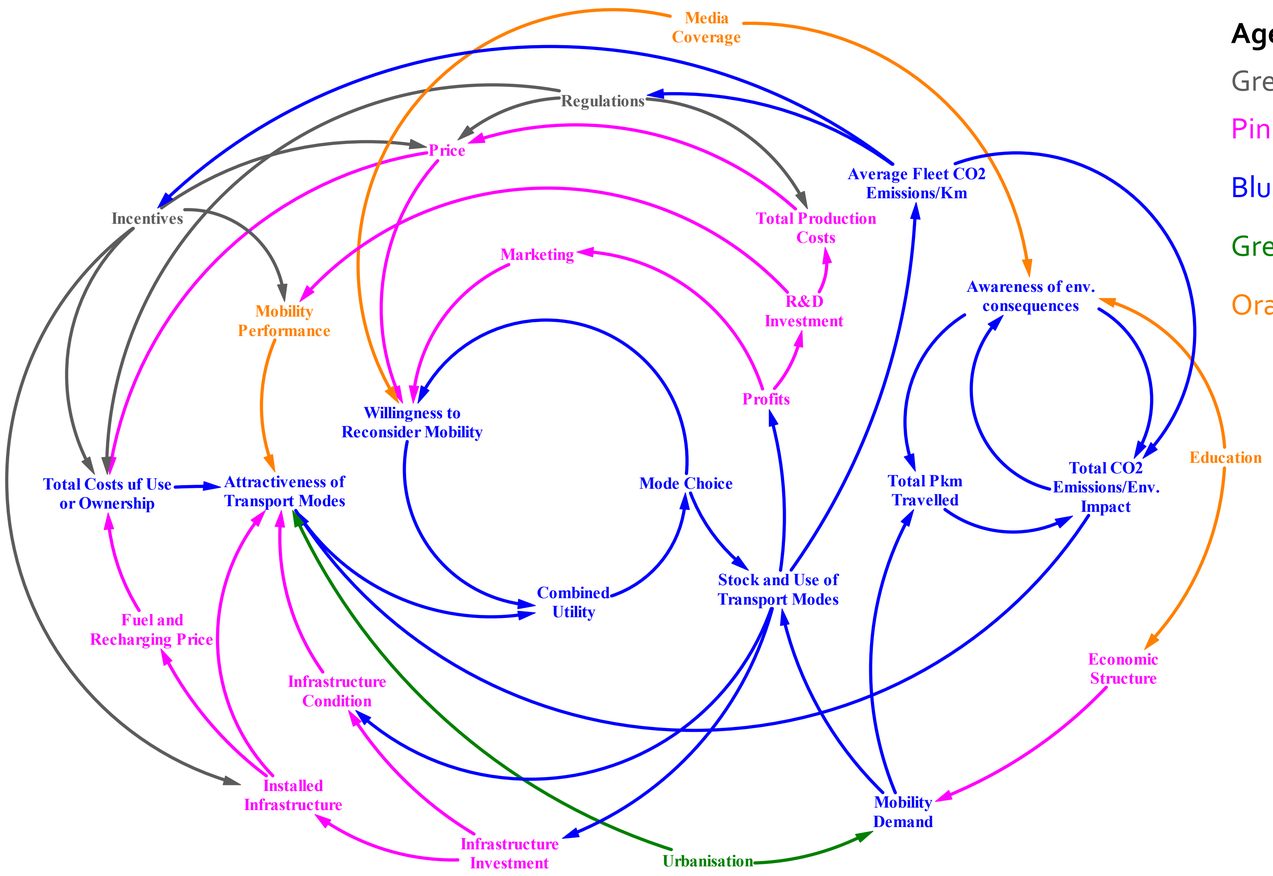
The socio-economic system transformation framework derived from phase one of SCCER – Mobility serves as a baseline for this study. Trend and empirical studies will feed into the Swiss transport model, enabling to quantify «soft» parameters such as awareness of environmental consequences, openness to new mobility systems, or willingness to consider sustainable modes of transport. The system dynamic model enables the identification of «hotspots», where a change in one component (e.g. CO_2 tax, or attractiveness of sharing modes) might influence the model through feedback loops. Our focus is on the representation of socio-economic and attitudinal characteristics of the society, deriving guiding principles for sustainable mobility.

Overview of trends influencing travel behavior based on empricial results and analysis of statistical data from Switzerland.



Main components and their feedback structure within the Swiss transport model

We applied a market agent approach by dividing the mobility system into five different «agents» enabling deep understanding of their role in the whole system similar to [2]. The causal loop diagram allows to track impacts from one parameter to the next by tracing the arrows, eventually leading to loops that balance the system or reinforce it. The diagram serves as a qualitative overview of the complex mobility system and is a first step in model building.



Agents:

Grey	Policy
Pink	Economy
Blue	Society
Green	Spatial Structures
Orange	Institutions

Relevant «soft» parameter

The behaviour of Swiss society in mobility decisions are thoroughly studied by the Microcensus Mobility and Transport conducted every 5 years [3]. It gives insights into the socio-economic characteristics and behaviour of travellers, distinguishing between mobility reasons (e.g. leisure, shopping, commuting, etc.), mode choice, education and many more. However, when it comes to new forms of mobility options such as car/ridesharing or mobility as a service, additional studies are needed. Thus, our research team investigates the openness of users towards new mobility services. Furthermore, focus is given to quantify utility criteria of mobility options including comfort, quality, health or vehicle efficiency attributes, which are influencing the mode choice decision. Available literature is screened for parameter values of the many system components, which improve the quantitative transport model. The screening is done in parallel with SCCER Joint Activity. While we get access to a plethora of parameter values relevant for the model, we provide insights into how these parameter influence the system, mutually benefitting from each other.

Expected impact

The study is expected to yield answers to the following questions:

- What trends need to be adressed?
- What are the components of the Swiss mobility system and how do they correlate with CO_2 emissions?
- What are the technologies and mobility strategies, which can help us reach the goals of the energy strategy?
- What policy strategies or initiatives can effectively foster the transformation from the current carbon-based mobility system to a sustainable one in 2050?

References

[1] BAFU, 2017. Kenngrössen zur Entwicklung der Treibhausgasemissionen in der Schweiz 1990-2015.
[2] Harrison G. et al., 2016. Powertrain Technology Transition Market Agent Model: An Introduction.
[3] BFS & ARE, 2017. Verkehrsverhalten der Bevölkerung. Ergebnisse des Mikrozensus Mobilität und Verkehr 2015.