The Key Performance Indicators of the Swiss Mobility System
A systemic approach to research activities within the SCCER Mobility network
Amin Dehdarian
The Learning Lab – Future Transport Systems, ETH Zurich

Introduction
In order to “establish the key performance indicators (KPIs) for all SCCER Mobility solution pathways”, as a requirement from 2017 evaluation panel, a systemic approach was taken towards understanding research activities within the SCCER Mobility network. Key performance indicators are a set of performance measurement, which evaluates the success of a specific organization in achieving its goals (Fitz-Gibbon, 1990). In this respect, the starting point is:

• how to define and select the indicators of a sustainable mobility system in Switzerland, and
• how to explore the extent the main concepts and results of SCCER Mobility research activities are relevant to the selected KPIs.

Methodology
The methodology has two main steps (figure 1). In the first step, internal analysis of the main research activities is done. It means understanding the primary contributions and applications of the research activities, their links to other research project, and developing a solution pathway, or a map of technological or innovation readiness by including the prerequisites and subsequent steps in the development of the innovative solution. In the second step, the external analysis is done. It focused on the potential relevance of the activities to the key performance indicators, and the logic behind this relevance in order to be able to analyze the relative relevance of different research topics.

Summary of Research Activities and KPI Ratings
for each of the five capacity areas, a table summarizing the main concepts and the relative relevance to the KPIs is provided, visualized to see the aggregated relevance (figure 2). For instance, here for CA A2, there are four main concepts with their potential relevance to the KPIs.

The initial list of KPIs had three commonly used indicators of the emission reduction potential of each technological solution, or facilitating the emission reduction of other solutions. The cost reduction potential of the solution, or facilitating the cost reduction of other solutions. And scalability: the potential of extending the domain of innovative solution to other sectors, geographical areas or innovation systems, or facilitating the scaling up of niche innovations for mass production. Based on expert opinions, later a fourth indicator was added, as industrial or social implementation which tries to bridge the gap between scientific research and real world conditions: it is the extent innovative solution is being tested with industrial actors, or applied by social actors in daily life in order to test the applicability of the solution.

Solution Pathways
The solution pathway provides a path of innovation development including the prerequisites, and potential next steps for each of these four concepts. Figure 3 shows the solution pathway for CA A2 as an example.

Cluster Analysis
As a complementary analysis, it was investigated how the concepts could be clustered based on their relevance to the KPIs and the general classification of research activities (being part of a specific CA). For clustering algorithm, the concept of cosine similarity was used, as a measure of similarity between each pair of concepts. The algorithm was implemented in three levels for a robust analysis: 1) Based on KPI ratings only 2) Based on KPI ratings and CA groups (A or B) 3) Based on KPI ratings, CA groups (A or B) and CAs (A1, A2, A3, B1, B2).

Then, for each level, a network of similarities was constructed. By keeping the highest 20% of similarities, the clusters of concepts for each network were identified. Comparing the results of all three networks, resulted in the identification of four clusters (figure 4).

Cluster 1: decarbonization in a tested
• High emission reduction
• Low scalability
• Low industrial/social implementation

Cluster 2: cost matters!
• High cost reduction

Cluster 3: green innovation first!
• High emission reduction

Cluster 4: even more technology!
• High scalability & industrial/social implementation
• Low emission reduction

References
• Dehdarian, A. (2020). The Key Performance Indicators of the Swiss Mobility System: a systemic approach to research activities within the SCCER Mobility network. Working paper. ETH Zürich

Contact Information
Dr. Amin Dehdarian
Institute of Energy Technology, Aerothermochemistry and Combustion Systems Laboratory (LA V) – ETH Zurich
Email: dehdarian@lav.mavt.ethz.ch
Phone: 044 633 99 52