Verification of the ELISA eHighway Evaluation Concept

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Research Questions

- Road freight transport significantly contributes to CO₂ emissions and air pollution, in some situations even reaching up to a critical level for human health.
- To overcome environmental issues for road freight transport, the electric road freight transport system with overhead wires on motorways, called eHighway, was developed.
- This system offers both, renewable energy consumption and flexible operation ability for freight transport.
- The project ELISA is an implementation project in the German Federal State of Hesse supported by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) to build and operate a test track and to evaluate the overall eHighway system.
- The evaluation concept for the eHighway operation was developed by the project team during first phase of the ELISA project.
- The main research question addressed by this contribution is to verify that the proposed eHighway evaluation concept can be applied with available datasets.
- This contribution demonstrates the general methodology of this verification process by using the example of impacts on traffic flow resulting from eHighway construction works.

Methodology

- The verification process for the ELISA eHighway evaluation concept is developed for each measurement within the concept, depending on the availability of the data.
- Datasets from different sources, such as traffic data, vehicle data, traffic flow detector data, environmental data, accident data and incident data, are organized for further analysis including data management, data clean-up and data merging processes.
- The methodology for the evaluation is a systematic comparison of the parameters regarding different aspects during and after construction of the eHighway system with reference values extracted for conditions without eHighway.

Sample Results: Impacts of the eHighway on Traffic Flow in Case of Disruption

- The right lane closure on MCS4 (on the ehighway test track) is observed (Figure 6). Truck volume was shifted to the mid-right lane due to the closure. Right and mid-right lane closures are observed for MCS1 (outside the eHighway test track). Truck traffic was shifted to the mid-left lane and left lane. This was due to another road construction on this location which is confirmed by incident data.
- Average truck speed for the right lane is observed between 80-85 Kmh (Figure 7). It is slightly affected by the construction on the test track due to the right lane closure. Average car speed for the eHighway test track location is oscillating around 100 Kmh which represents the reduced work zone speed limit (Figure 6).
- Flow patterns are recognizable for different traffic conditions and temporal lane closures. The traffic flow detector dataset shows a plausible performance to detect disruptions inside and outside the eHighway test track. “Traffic flow in case of disruption” is successfully investigated by using available datasets.