Simulation Study with different Planning Scenarios of Motorway A8 near Munich`s Südkreuz

Master‘s Thesis of Anestina Dimitriadou

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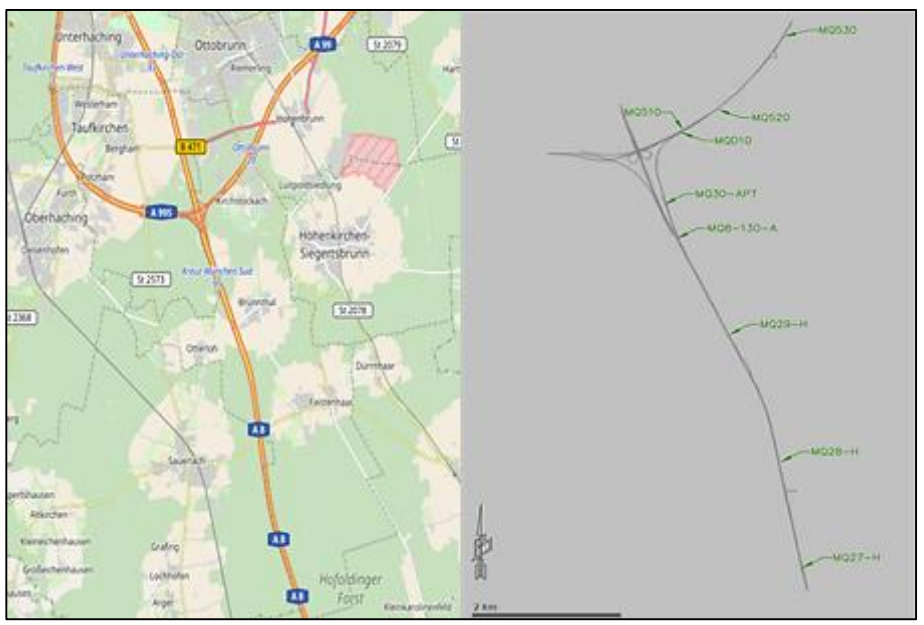
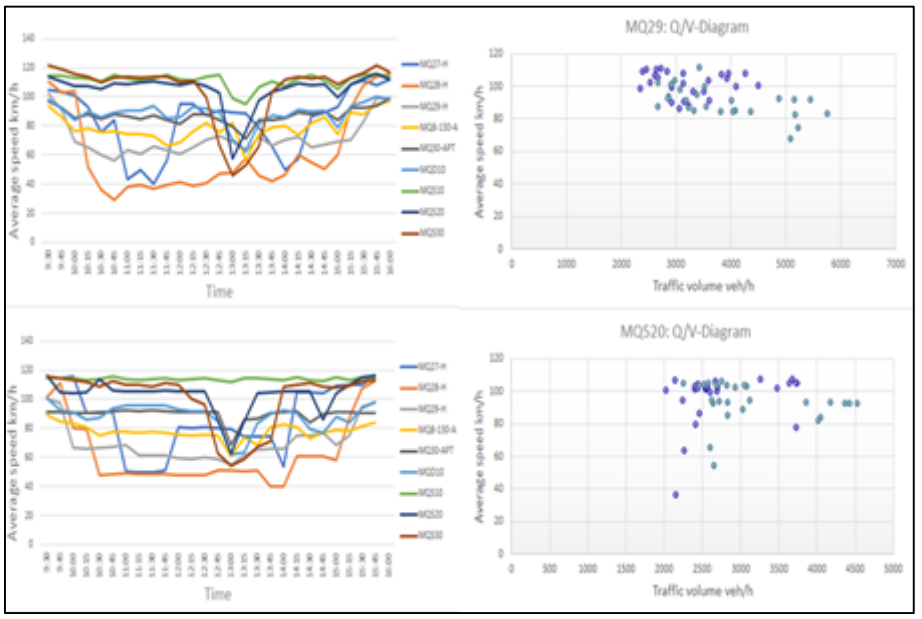


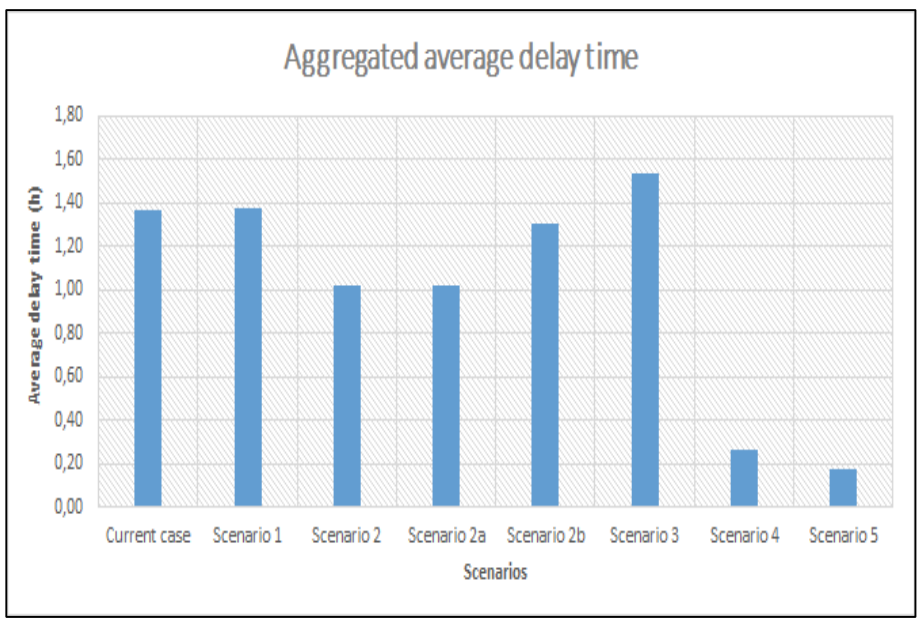
The ever-growing transport needs for people and goods create special traffic demand patterns on Motorway A8. The traffic volume over Munich’s Südkreuz is due to a large number of daily commuters as well as to holiday traffic. On an average workday, traffic jams are typically caused in the morning and evening peak hours. Even more problematic is the situation, though, during the holiday period. Motorway A8 constitutes the link between Salzburg and Munich. Most vacationers from the southern holiday destinations travel on A8 and desire to reach A99 in order to travel around the metropolitan area of Munich. This connection is implemented over Munich’s Südkreuz via the two-lane ramp, which therefore represents a capacity bottleneck. The aim of this thesis is to examine new approaches in order to improve the traffic quality and flow near Munich`s Südkreuz. For this purpose, a microscopic simulation is built into the software tool Vissim 9, which takes into account a wide range of factors that influence traffic.

Initially, the model is calibrated based on the real measured data provided by the Autobahndirektion Südbayern (ABDS). The model includes both a regular workday and a holiday period. The calibration is an iterative process to adapt the parameters of the simulation components in such a way, that the simulation reproduces the observed conditions with sufficient accuracy. The criterion analyzed is the real values of average speed, which is measured at the selected detectors. These measuring cross sections are placed at the exact locations of the real network. Subsequently, the simulation network is validated according to a new dataset. Within the validation process it is checked whether the model is reliable and can be adjusted to another environment. An additional way to check the validity of the model is the control of the average cruising speed and the traffic volume, namely the “Fundamental Q/V Diagram”. From this diagram it can be estimated whether the speed and the load of the traffic flow correspond to the real measured values for the entire simulation.



Average travel speed
(Up: Real values, Down: Calibrated values)

Validation: Q/V Diagram



The resulting calibrated Vissim model acts as test bed for the development of five scenarios. These propose different solutions in terms of structural and traffic control approaches, in order to improve traffic conditions. Each scenario is analyzed and simulated for two different traffic demand models and encompasses extreme traffic conditions, too. Following this, an evaluation is performed based on the correlation of the average travel times, delay times and cruising speed produced after a multi-run is carried out. Results show that the recommended expansion of the motorway section in Scenario 5 mitigates the massive congestion and increases the road capacity. This is demonstrated by great reduction of the cumulative delay time and the rise of the average speed of all vehicles in the simulated network to a rather satisfactory level. Capacity related measures thus, guarantee considerable enhancement of the network, even when high demand is encountered. In conclusion, the traffic quality is significantly improved and the traffic flow is harmonized.