As traffic problems on roadways have been increased, active traffic management systems (ATM) using proactive traffic management concept have been deployed on freeways and arterials. The ATM is to integrate and automate various traffic control strategies such as variable speed limits, queue warning, and ramp metering through a decision support system (DSS). Besides, over the past several decades, there have been a lot of efforts to integrate freeways and arterials for the efficient operation of roadway networks. Even, it has been required that these systems should prove their effectiveness in terms of travel time reliability. Therefore, this study aims to develop a new concept of a decision support system integrating variable speed limits, queue warning, and ramp metering on the basis of travel time reliability of freeways and arterials.

Regarding the data preparation, in addition to collecting multiple data sources such as traffic data, crash data and so on, it was investigated what kinds of traffic data sources can be applied for the analysis of travel time reliability. Although there are many kinds of real-time traffic data from third-party traffic data providers, it was confirmed that these data cannot represent true travel time reliability through the comparative analysis of all kinds of measures regarding travel time reliability. Related to weather data, it was proven that nationwide land-based weather stations can be applicable.

Since travel time reliability can be measured by using long-term periods for more than six months, it is necessary to develop models to estimate travel time reliability through real-time traffic data and event-related data. Several models were developed to estimate the standard deviation of travel time rate [minute/mile] corresponding a statistical range measure and also representing travel time variability.

Finally, a DSS using a model predictive control method to integrate multiple traffic control measures was developed and evaluated. As a representative model predictive control, METANET model was chosen, which can include variable speed limit, queue warning, and ramp metering. The developed DSS identified a proper response plan by comparing travel time reliability among multiple combinations of current and new response values of strategies. In the end, it was found that the DSS provided the reduction of travel time and its reliability for travelers through the recommended response plans.