

Locational priority of fixed automated spray technology (FAST) using analytic hierarchy process

INTRODUCTION

Freezing rain and black ice, which mainly occur in winter, would be very dangerous for drivers because of their potential for causing skidding accidents. Since it is difficult to predict where such accidents might happen, road agencies face many problems in terms of traffic operation and maintenance during the winter season. Fixed automated spray technology (FAST) is one of the proactive solutions for black ice and freezing rain. Implementation of FAST is increasingly recognized as an efficient winter maintenance strategy and an active anti-icing practice in Korea. In this study, roadway sections requiring installation of FAST systems on national highways in Korea were first examined, and their priority was produced by integrating the Analytical Hierarchy Process (AHP) method with scoring table provided by the Ministry of Land, Infrastructure and Transport (MOLIT).

PRODUCING A LOCATIONAL PRIORITY

MOLIT uses their own scoring table to determine roadway section that need to install FAST systems. In this study, three additional criteria such as civil complaint, vertical grade, and vulnerable roadway section for snow were considered to reflect current significant issues for winter maintenance. A total of 36 public agencies (two people per one regional office) were allowed to do multiple selections, considered as the most preference in each level. Based on survey results and an arbitrary rating scale developed by Saaty, a pair-wise comparison matrix was developed using Table and Figure illustrates the AHP structure used here. After applying the consistency tests based on Saaty's rules, consistency ratios were obtained with regard to the first and second level of the hierarchy.

Since the AHP was applied to estimate priority in this study, this result significantly differs from that applying MOLIT scoring table only. Consequently, the AHP and MOLIT scoring table produced similar ranking but the combined AHP with MOLIT scoring table can reflect more detailed preferences of potential users in its priority.

CONCLUSIONS

In this study, priorities for installing FAST systems were suggested by integrating AHP with existing MOLIT scoring table in order to achieve effective and proactive snow removal works during the winter season in South Korea. With being used a scoring table used by MOLIT only for the public agencies, our study added three kind of new criteria that would affect priority for snow removal works. The result can be used to allocate available budget and resources for winter maintenance because approximately 30~50 million KRW (USD 26,000~ USD 44,000) per 100-m roadway section is required to install FAST system and even about one million KRW(USD 900) per system would be required annually for the maintenance. Finally, a questionnaire survey was performed to reflect preferences of the public for evaluation criteria, and then the estimated weights were properly produced using the AHP. The final decision score was produced through combining AHP with MOLIT scoring table. On the course of this action, this approach can be used to provide more detailed and systematic order of prioritization compared to MOLIT scoring table only. Finally, it is expected that this study could contribute to determining priority for installing necessary equipment or facilities/system for road management, thereby

leading to more efficient budget allocation, and to more effective management and operation.