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Non-parametric Linear Technique for Measuring the Efficiency of Winter Road Maintenance in the Arctic Area

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Abstract : Improving the performance of Winter Road Maintenance (WRM) can increase the traffic safety and reduce the cost as well as environmental impacts. This study evaluates the efficiency of WRM technique, named salting, in the Arctic area by using Data Envelopment Analysis (DEA), which is a non-parametric linear method to measure the efficiencies of decision-making units (DMUs) based on handling multiple inputs and multiple outputs at the same time that their associated weights are not known. Here, roads are considered as DMUs for which the efficiency must be determined. The three input variables considered are traffic flow, road area and WRM cost. In addition, the two output variables included are level of safety in the roads and environment impacts resulted from WRM, which is also considered as an uncontrollable factor in the second scenario. The results show the performance of DMUs from the most efficient WRM to the inefficient/least efficient one and this information provides decision makers with technical support and the required suggested improvements for inefficient WRM, in order to achieve a cost-effective WRM and a safe road transportation during wintertime in the Arctic areas.

Keywords : environmental impacts, DEA, risk and safety, WRM
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